

# Enhancing the Occupational Health Safety among Radiology Nurses Working in the Hospital of Gurugram, Haryana, India

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## ABSTRACT

This pre-experimental study was done on forty nursing personnel posted in the radiology section of a selected hospital of Gurugram National Capital Region using one group pre-test post-test design. The study sample was selected using convenience sampling technique. A structured knowledge questionnaire and observational checklist were used to assess the effectiveness of the educational package regarding occupational health safety. The mean pre-test knowledge score was 16.65 and mean post-test knowledge score was 22.13. Similarly, the mean pre-test practice score was 12.42 and mean post-test practice score came to be 14.70. The calculated 't' value for knowledge score was 37.099 and the practice score was 11.801 at a 0.05 level of significance. The result reported that nurses were aware of radiation safety and protection, even though it would be helpful if their knowledge and practice are apprised regularly.

**KEY WORDS:** OCCUPATIONAL HEALTH, OCCUPATIONAL HEALTH SAFETY, RADIATION HAZARDS, RADIATION PROTECTION, RADIATION SAFETY.

## INTRODUCTION

In Occupational safety we try to manage dangers at the workplace to achieve an admissible level of risk, whereas in workplace safety pertains to safeguard employees' health and safety while on the job, irrespective of their vocation (Aluko et al. 2016). Occupational health is an area of health care emphasized by many disciplines. It has been dedicated to the well-being and safety of workers in the workplace. It has mainly focused on injury prevention, protection, and employee education. Occupational health and safety focus on to create and maintain a safe and healthy working environment (Aluko et al. 2016; Albander 2021). As stated by National Institute of Occupational Safety and Health (NIOSH), every year, nearly one hundred thousand people pass away owing to occupational health problems, while approximately four hundred thousand fresh cases of occupational diseases are identified each year (Sreekumaran and Balachandran 2018; Albander 2021).

Around 20 lac workers lose their life before natural death time each year from occupational illnesses such as occupational poisonings and cancers, with 16 billion workers suffering from occupational diseases, 27 billion

from workplace injuries and physical hazards such as radiation. Artificial sources account about 16 percent of occupational hazard radiation, mainly medical exposures (Megeed et al. 2019; Albander 2021). The health of the workers faces many risk factors at the workplace which lead to various health hazards. The workers might have cancers, accidents, musculoskeletal problems, respiratory problems, hearing loss, stress-related disorders, infections, etc. Patients and health care workers in several disciplines, including diagnostic radiology, interventional cardiology, interventional radiology, nuclear medicine, and surgery, are concerned about radiation safety (Saha 2018; Frane and Bitterman 2020; Dabhekar and Naik 2021).

Radiation is a sort of energy that manifests itself as waves or particles and is present in everyday lives. Radiation exposure can be internal or external, and it can occur through a variety of routes. Due to the increasing use of ionizing radiation for diagnosis and treatment, patients and healthcare professionals are facing serious health and safety issues. Minor radiation exposure also creates a threat to healthcare personnel (Ploussi and Efstathopoulos 2016; Khamtuikrua and Suksompong 2020; Frane and Bitterman 2020; Dabhekar and Naik 2021). The majority (80%) of our ionizing radiation exposure comes from natural sources, the most significant of which is radon gas, while the remaining 20% comes from artificial origin, mainly medical X-rays

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(Awosan 2016). Emission from these sources is both unseen and odorless, and because health care personnel are generally preoccupied with performing tasks, they may overlook it. As a result, health-care workers are exposed to significantly more radiation than is necessary. Excessive radiation exposure can cause a variety of health problems, including cataracts, hair loss, congenital abnormalities, and cancer development (Salim et al. 2022).

Exposure to these emissions to would be parents may lead to reduced potency, unsuccessful fertilization or implantation, or fetal malformations. Maternal exposure after conception,

might cause the fetal death or anatomical and physiological problems of the newborn. In addition, there may be other ill effects like spontaneous abortion (both early and late), significant or slight congenital anomalies, death around the time of birth, less than average weight at birth, issues related to development or behavior of the newborn, and exposure of carcinogen to fetus by crossing placental barrier (Khamtuikrua and Suksompong 2020; Park and Yang 2021; Salim et al. 2022). Therefore, healthcare professionals need to be fully aware and knowledgeable about the dangers of radiation in order to protect themselves and their patients from adverse effects (Salim et al. 2022).

**Table 1. Socio- demographic variables of participants**

Demographic variables	Categories	Frequency	Percentage
Age (years)	20 to 29 years	37	92.5%
	30 to 39 years	2	5.0%
	40 to 49 years	1	2.5%
	50 years and above	0	0%
Gender	Male	4	10%
	Female	36	90%
Qualification	GNM	9	22.5%
Designation	PB B. Sc Nursing	5	12.5%
	BSC Nursing	25	62.5%
	Postgraduate	1	2.5%
Designation	Staff nurse	26	65%
	Senior staff nurse	11	27.5%
	Assistant head nurse	2	5%
	Head nurse and above	1	2.5%
Working experience (Years)	Less than 5 yrs	30	75%
	6 to 10 yrs	7	17.5%
	11 to 15 yrs	2	5%
	16 to 20 yrs	1	2.5%
	More than 20 years	0	0%
Have you attended training/ refresher courses on radiation safety?	Yes	40	100%
	No	00	00%
How frequently have you attended training/ refresher courses on radiation safety?	Once	25	62.5%
	2 to 4 times	13	32.5%
	5& more than 5 times	2	5%

Three principles of radiation protection stated by The International Commission on Radiological Protection (ICRP) are: justification, optimization (as low as reasonably achievable (ALARA)), and limitation of dose of radiation. The major purpose of safeguard against radiation is to ensure that everyone who works with radiation is properly protected. Health care providers may experience symptoms such as nausea and vomiting within hours as a result of the high degree of radiation exposure administered over a short period of time, which sometimes can lead to mortality in days or even weeks afterward. This research was done with an objective to give adequate and effective information

regarding the importance of using safety measures and protective devices while doing the duty in the radiology department (Ploussi and Efstathopoulos 2016; Frane and Bitterman 2020; Khamtuikrua and Suksompong 2020).

## MATERIAL AND METHODS

A pre-experimental, one group pretest posttest design was conducted for this study. This study was approved by the ethical committee of SGT University, Gurugram. Forty nursing professionals posted in Radiology Department were selected using convenient sampling technique. The

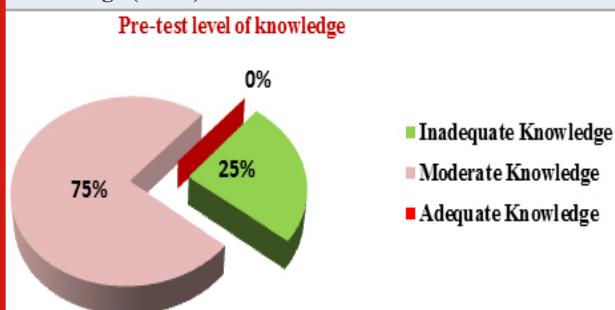
knowledge questionnaire consisted of 25 closed-ended questions that contain selected variables such as age, gender, qualification, designation, year of experience, training/refresher courses attended, and frequency of training undergone, and information regarding the radiation safety measures, protective devices, risks and health effects of radiation exposure. The second questionnaire was an observational checklist, framed to assess the radiation safety and protective measures.

Data collection tools were evaluated by the guide and co-guide and 10 experts from the different fields regarding the content, clarity, and language of the tool. Suggestions were taken into account, and relevant improvements were made to increase the validity of the tools. The willingness to participate in the study was obtained through their consent. The goal of this research project was conveyed to the participants, and they were assured of confidentiality. The study was conducted at Medanta the Medicity, Gurugram in the month of April 2021 after taking formal permission. The data collected in the Microsoft excel sheet was analyzed in SPSS software version 28 and descriptive and inferential analysis was done.

## RESULTS AND DISCUSSION

Times to time many studies are done related to the different aspects of occupational health safety among nursing personnel. Present study was conducted to evaluate the efficacy of the educational package in terms of information and practice of nursing personnel related to occupational health safety. The discussion of this study is based on the data gained through statistical analysis and interpretation of data.

**Figure 1: Pie chart showing percentage of pre-test level of knowledge (N=40)**



### Distribution of the selected variables of the participants:

Majority of the participants (92.5%) were between the ages of 20- 29 years. Five percent were between the ages of 30-39years, 2.5 percent were between the ages of 40 and 49years, and none of the respondents were between the ages of 50years and above. Ninety percent were female and 10% were male. Most of the samples (62.5%) were with BSc Nursing and 65% were Staff nurses, 75% were with 0-5years of experience. All the nursing personnel had undergone training/ refresher courses and 62.5% had attended these sessions only once, 32.5 % had attended 2- 4 times, and only 5% had attended 5 and more than 5 times.

Percentage Distribution of Staff Nurse's Pre Test and Post Test level of knowledge and Practice regarding Occupational Health Safety.

Fig 1 reveals that during pre-test score of 75 percent of nurses had a moderate knowledge score, 25 percent had an inadequate knowledge score, and 0 percent had adequate knowledge regarding occupational health safety,

**Figure 2: Pie chart showing the percentage of the post-test level of knowledge (N=40)**

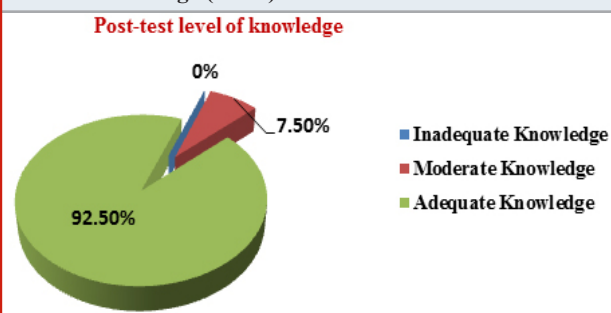


Fig.2 reveals that 92.50 percent of Nurses had adequate knowledge and 7.50 percent had moderate knowledge regarding radiation safety. Thus, most of the respondents had adequate knowledge regarding occupational health safety in the post test. This result agrees with the results of other researchers that the participants had a good understanding of ionizing radiation, knowing their source, benefit, and potential hazard. This is most likely due to a common awareness of radiation and the threats it poses. Even though the nursing personnel are aware of the radiation safety and protection, it would be better to update them regularly. (Luntsi and Ajikolo 2016; Abuzaid et al. 2018; Mohamed et al. 2018). Also, this result goes contra with the findings that all of the nurses did not attend any courses related to radiation protection and most of the nurses were not aware of safeguarding against radiation and their risks. The study concluded that this lack of awareness may lead to very critical effects on both nurses and patients. During and after the formal nursing education, the nurses need some formal training regarding radiation risks and protection courses (Maliro 2011; Muhammad et al. 2015; Partap et al. 2019; Salehi et al. 2020; Salim et al. 2022).

**Figure 3: Pie chart showing the percentage of the pre-test level of practice**

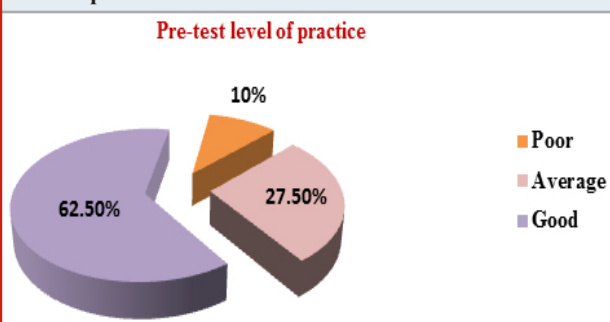


Fig. 3 and Fig. 4 highlight that before administering the educational package, more than half of the respondents had good practice levels (62.50%) regarding radiation safety, although after administering the educational package, their practice levels increased to 95%. Thus, most of the participants had good practice level regarding radiation safety. A similar study was conducted by a researcher on occupational hazards and protective measures among Radiographers in terms of knowledge and practice (Megeed et al. 2019; Salehi et al. 2020).

Figure 4: Pie chart showing the percentage of the post-test level of practice



Table 2. Comparison of the mean pre-test and post-test level of knowledge and practice and standard deviation to assess the effectiveness of educational package.

	Group	Mean ±SD	Mean difference	df	't' value	p-value
Knowledge (n= 25)	Pretest	16.65±1.673	5.48	39	37.099	0.001*
	Post-test	22.13±1.800		39		
Practice (n=15)	Pretest	12.42±1.55	2.28	39	11.801	0.001*
	Post-test	14.70±0.46		39		

\*Significant; p- value= statistically highly significant at 0.05 level of significance

The findings revealed that about two-thirds of the participants had satisfactory practice scores regarding radiation hazards and safety measures (Megeed et al. 2019). On contrary, another study revealed that the lack of knowledge and practice made the nurses unable to protect the patients and themselves against ionizing radiation. The study concluded that the potential benefits of Medical Professionals need to be emphasized in universities and hospitals, where the curriculum contents in radiation sciences are insufficient and recommended medical schools or hospitals for additional training (Ibrahim 2018; Partap et al. 2019; Salehi et al. 2020).

The statistics revealed that the mean difference between the pretest and post-test scores for knowledge was 5.48 whereas the mean difference in practice score between pretest and post-test was 2.28. These data depicted that there is a true difference between the mean score and has not occurred by chance. So as a result, the educational package effectively improved the information and practice regarding occupational health safety among nursing personnel posted in the radiology department. The study concluded that the effectiveness of the educational package was highly effective (Jihad and Khudur 2020).

Chi-square values revealed that no association was found between the post-test data of knowledge and practice regarding occupational health safety among nursing personnel with the selected variables. A similar study

conducted revealed that there was no significant relation of post-test knowledge scores with their demographic variables (Ibrahim 2018). This result of the present study disagrees with another research which revealed that there was statistically significant relation of post-test knowledge scores with their demographic variables (Megeed et al. 2019).

## CONCLUSION

The findings of the present study conclude that most of the participants had adequate level of knowledge and practice regarding radiation safety and protection after administration of educational package. Even though the nursing personnel had awareness regarding radiation safety and protection, it would be better to update them on regular basis. Periodic practical courses, regular in-service education program and continuing education courses can be provided to improve and maintain their knowledge and practice regarding radiation hazards and protective measures. Regular monitoring of health care workers who are exposed to the radiation is also very essential.

**Conflict of Interests:** Authors declare no conflicts of interests to disclose.

**Ethical Statement:** Ethical approval was given by the Institutional Ethical Committee in a meeting held

on 28/11/2020. Ethical Approval Number is FON/SGTU/20/262/06.

**Data Availability Statement:** The database generated and /or analysed during the current study are not publicly available due to privacy, but are available from the corresponding author on reasonable request.

## REFERENCES

- Abuzaid, M.M., Elshami, W. and Hasan, H. (2018). Knowledge and Adherence to Radiation Protection among Healthcare Workers at Operation Theater. *Asian Journal of Scientific Research*, 12(1), pp.54–59. doi:10.3923/ajsr.2019.54.59
- Albander, H. (2021). Occupational Health and Radiation Safety of Radiography Workers. *Biomedical Signal and Image Processing*. doi: 10.5772/intechopen.95061
- Aluko, O.O., Adebayo, A.E. and Adebisi, T.F. (2016). Knowledge, attitudes and perceptions of occupational hazards and safety practices in Nigerian healthcare workers. *BMC Research Notes*, 9(1). doi: 10.1186/s13104-016-1880-2.
- Awosan, K. (2016). Knowledge of Radiation Hazards, Radiation Protection Practices and Clinical Profile of Health Workers in a Teaching Hospital in Northern Nigeria. *Journal of Clinical and Diagnostic Research*. 10(8): LC07–LC12. doi: 10.7860/JCDR/2016/20398.8394
- Dabhekar, P.R. and Naik, R. (2021). Study on Work Safety for Employees in Radiology Department. *Journal of Pharmaceutical Research International*, pp.353–358. DOI: 10.9734/JPRI/2021/v33i58A34126
- Frane, N. and Bitterman, A. (2020). Radiation Safety and Protection. *PubMed*. <https://www.ncbi.nlm.nih.gov/books/NBK557499/>
- Gawad, H.A.E., Megeed, A.E. and Mahmoud, A.A.E.R. (2019). Knowledge and Practices of Radiographers Regarding Occupational Hazards and Protective Measures. *IOSR Journal of Nursing and Health Science*, 8(6), pp.64–73. doi: 10.9790/1959-0806066473
- Ibrahim, F. (2018). Assessment of Knowledge of Occupational Health Hazards and Safety Practices among Radiographers in the Greater Accra Region, Ghana. [ugspace.ug.edu.gh. http://ugspace.ug.edu.gh/handle/123456789/25792](http://ugspace.ug.edu.gh/handle/123456789/25792)
- Jihad, S.S. and Khudur, K.M. (2020). Effectiveness of an Education Program on Nurses' Knowledge and practice toward Radioiodine therapy at Alamal Hospital in Baghdad city – *International Journal of Psychosocial Rehabilitation*. *Psychosocial*. 24(1) doi: 10.37200/IJPR/V24I1/PR200711.
- Khamtuikrua, C. and Suksompong, S. (2020). Awareness about radiation hazards and knowledge about radiation protection among healthcare personnel: A quaternary care academic center–based study. *SAGE Open Medicine*, 8, p.205031212090173. doi:10.1177/2050312120901733
- Luntsi, G. and Ajikolo, A. (2016). Assessment of Knowledge and Attitude of Nurses towards Ionizing Radiation during Theatre/Ward Radiography. *Journal of Nursing & Care*, 05(03). doi: 10.4172/2167-1168.1000342
- Maliro, J.F.M. (2011). Ionizing radiation protection awareness study among the nurses working at Queen Elizabeth Central Hospital in Malawi. *Open WorldCat*. <https://www.worldcat.org/title/ionizing-radiation-protection-awareness-study-among-the-nurses-working-at-queen-elizabeth-central-hospital-in-malawi/oclc/778634526>.
- Muhammad, A. et al. (2015). Radiation awareness among nurses in nuclear medicine departments. *Australian Journal Of Advanced Nursing*, 32(3). <https://www.ajan.com.au/archive/Vol32/Issue3/3Alotaibi.pdf>
- Park, S. and Yang, Y. (2021). Factors Affecting Radiation Protection Behaviors among Emergency Room Nurses. *International Journal of Environmental Research and Public Health*, 18(12), p.6238. DOI: <https://doi.org/10.3390/ijerph18126238>
- Partap, A., et al (2019). Knowledge and practice of radiation safety among health professionals in Trinidad. *SAGE Open Medicine*, 7, p.205031211984824. doi: 10.1177/2050312119848240
- Ploussi, A. and Efstathopoulos, E.P. (2016). Importance of establishing radiation protection culture in Radiology Department. *World Journal of Radiology*, 8(2), p.142. doi: 10.4329/wjr.v8.i2.142
- Saha, R.K. (2018). Occupational Health in India. *Annals of Global Health*, 84(3), pp.330–333 doi: 10.29024/aogh.2302
- Salehi, Z et al. (2020). A study to assess the knowledge and practice of medical professionals on radiation protection in interventional radiology. *Indian Journal of Radiology and Imaging*, 30(1), p.64. doi:10.4103/ijri.IJRI\_333\_19
- Salim, F., Nowshin, I. and Begum, M. (2022). Awareness and use of PPE among radiographic workers working in some selected Government and Private Hospital in Dhaka City. *Bangladesh Journal of Medical Science*, 21(1), pp.114–119. DOI: <https://doi.org/10.3329/bjms.v21i1.56336>
- Sreekumaran, J. and Balachandran, R. (2018). A Study To Assess Knowledge And Practice Regarding Occupational Health Hazards Among Nursing Personnel Working In Selected Government Hospital Of New Delhi, *IJSR - International Journal of Scientific Research (IJSR)*, doi:10.36106/ijsr.