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Assessment of knowledge, attitude and practice on radiation safety among healthcare workers in selected hospitals of Shillong, Meghalaya

[1]Ms Chongpi Raingam, M.Sc. Nursing Student, College of Nursing, NEIGRIHMS

[2]Prof. Namita Singha, Vice Principal, College of Nursing, NEIGRIHMS

[3]Ms C. E Myrthong, Associate Professor cum Reader, College of Nursing, NEIGRIHMS

[4]Dr. Donboklang Lynser, Associate Professor, Department of Radiology, NEIGRIHMS

Corresponding Author: Prof. Namita Singha, Vice Principal, College of Nursing, NEIGRIHMS.

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Abstract

Background: Despite the fact that ionizing radiation is dangerous, more medical radiation is now being used for patients' diagnosis and treatment. Medical staff who work in radiology, Cath labs, and operating rooms are regularly exposed to this radiation. The study aimed to assess the knowledge, attitude, and practice on radiation safety among healthcare workers in selected hospitals of Shillong, Meghalaya.

Methods: A cross-sectional study including 141 healthcare professionals was carried out in selected hospitals in Shillong, Meghalaya. A self-administered structured questionnaire was administered to the participants for sampling collection. The collected data was analysed using IBM SPSS V22.

Results: Out of 141 healthcare workers, only 5(3.55%) have undergone / attended training on radiation safety. The mean score of the healthcare workers regarding knowledge and practice on radiation safety were 6.15 ± 1.68 and 5.20 ± 1.19 respectively, which significantly indicates the lack of knowledge and poor practice on radiation safety. The mean score of attitudes was 34.87 ± 3.46 which reveals a favourable attitude of the participants towards radiation safety. There were significant association between knowledge and attitude of the participants with demographic variables like gender, occupational category and area of work and year(s) of experience of the participants towards radiation safety.

Conclusion: The study concluded that the knowledge, attitude and practice of healthcare workers on radiation safety were not appealing. One major factor could be lack of proper education and training on radiation safety.

Keywords: Radiation Safety, Radiation Hazards, Knowledge, Attitude, Practice, Healthcare Workers.

Introduction

Radiation is an energy that is emitted from a source as electromagnetic waves or particles[1,2,3]. Radiation exposure is one of the widely known health hazards. Ionizing radiation and non-ionizing radiation are the two categories of radiation. Ionizing radiation is a sort of energy that functions by removing electrons from the

atoms and molecules of different substances, including water, biological tissue, and air,[4] e.g., is x-ray. The majority of non-ionizing radiation poses no danger to our health,[4] e.g., radio frequency radiation, microwaves, infrared radiation

Used of ionizing radiation has substantially expanded due to the development of medical science and the use of new practical applications. The use of X-rays, CT scans, and MRI has grown steadily as a technique of precisely diagnosing patients. The availability and use of fluoroscopic services have also expanded [5].

Over 3,600 million diagnostic radiology exams are performed annually all over the world and 98% of the population are exposed to medical radiation[6]. Radiation damage to tissue and organs depends on the amount of radiation and the types of radiation received. Recent epidemiological research revealed that, even exposure to lower doses of medical radiation during childhood increased the risk of cancer[6]. Compared to adults, children and foetus are more susceptible to ionizing radiation.[7] It is also well known that chronic exposure to extremely low amounts of radiation causes cancer and harms the gonads, blood cells, skin, and eyes[1,6,8,9]. Ionizing radiation at high doses can interact with DNA directly and cause harm by rupturing DNA links or inadvertently by rupturing water molecules around the DNA. Free radicals are unstable oxygen molecules that are created when these water molecules break, and they harm the body's cells and organs[10]. Other adverse effects of ionizing radiation are solid cancer and leukaemia[11,12,13].

Despite its drawbacks, radiation in medicine is widely and routinely used. Avoiding unnecessary radiation exposure and reducing the negative consequences of ionizing radiation are the fundamental objectives of radiation safety and protection[7,14,15]. The guiding principle of radiation safety is “ALARA” which stands for “as low as reasonably achievable”. The Atomic Energy Regulatory Board (AERB) ensures that, nuclear energy and ionizing radiation used in India do not poses an excessive risk to the environment or public health[16]. The International Atomic Energy Agency (IAEA) helps lawmakers and regulators through a thorough system of international safety standards which intended to protect medical staff, patients, and the environment from potentially hazardous effects of ionizing radiation[17].

The development of radiation-based diagnostic and intervention procedures has greatly benefited patients. There is a strong acceptance that procedures like x-ray, CT scan and nuclear medicines have huge benefits that far out weight the risks[18]. Therefore, healthcare workers are repeatedly exposed to an increasing level of ionizing radiation[5]. For this, the researcher decided that it was necessary to investigate the knowledge, attitudes, and practices of the healthcare workers working in few selected hospitals of Meghalaya. This study can help to understand the healthcare workers' knowledge, attitudes, and practices regarding radiation safety as well as the related factors that may have an impact on them.

Objectives

1. To assess the knowledge, attitude and practice on radiation safety among healthcare workers in selected hospitals of Shillong, Meghalaya.
2. To find the association between knowledge, attitude, and practice on radiation safety among these healthcare workers with selected demographic variables.

Research Assumption

1. Healthcare workers working in radiology, Cath lab and OT have good knowledge on radiation safety measures.
2. Healthcare workers have a positive attitude towards

radiation safety.

3. The healthcare workers are not using radiation protective devices, although these devices are available in the facilities.

Material And Methods

Research Approach: Quantitative approach

Research Design: Descriptive Cross sectional

Settings: Operation theatre, Radiology department and Cath lab of NEIGRIHMS, Supercare Hospital, Dr H. Gordon Roberts Hospital and Civil Hospital Shillong, Meghalaya.

Sampling Technique: Total census enumeration

Sample size: 141

Period of data collection: 4 weeks

Criteria of the sample selection

Inclusion criterion

- Healthcare professionals who agreed to participate in the study and signed the consent form.
- Healthcare workers who are exposed to use different levels of ionizing radiation professionally.

Exclusion criteria

- Healthcare professionals who have been temporarily assigned to the departments are excluded.

Data collection tools and techniques

To assess the knowledge, attitude and practice on radiation safety among healthcare workers, a self-administered structured containing 10 multiple choice questions for knowledge, 10 questions using Likert scale for attitude and 8 multles choice questions for practice were used. The tool used for the study consists of four sections.

- Section I: Socio-demographic data of the participants.
- Section II: Knowledge of the healthcare workers on radiation safety.
- Section III: Attitude of the healthcare workers on radiation safety.
- Section IV: Practice of the healthcare workers on radiation safety.
- Section V: Association between level of knowledge, attitude and practice with demographic variables.

Method of study

The study commenced after obtaining ethical clearance from the Institute Ethical Committee. The participants were selected for the study based on the inclusion and exclusion criteria. Prior explanation regarding the study was given to the participants. Informed consent or assent was then obtained. Each participants spent a maximum duration of 10-15 minutes to complete the questionnaires. The knowledge of the participants on radiation safety was categorized into three level: Good, Average and Poor, the attitude into Favourable and Unfavourable attitude, and practice was level as good practice and Poor practice.

Analysis of the data was based on the objectives of the study using descriptive statistics (frequency, percentage, mean and standard deviation) and inferential statistics (Fisher's Exact Test) using Statistical Package for Social Sciences (SPSS VERSION 22).

Results

Section I: Findings Related To Socio-Demographic Variables Of The Healthcare Workers.

Table 1: Frequency and Percentage distribution of healthcare workers according to sociology-demographic variables. n=141.

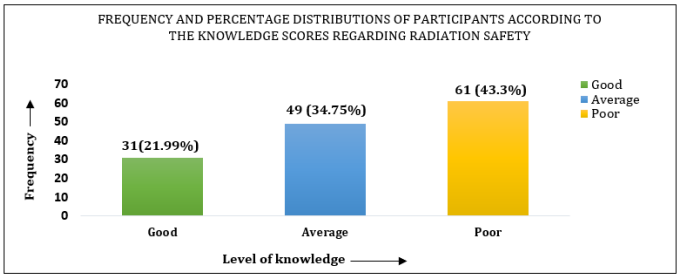
Sociology-demographic variables	Frequency (f)	Percentage (%)
Age (in years)		
21-30	49	34.75
31-40	59	41.84
41 and above	33	23.4

Gender		
Female	88	62.41
Male	53	37.59
Occupational category:		
Nurses	81	57.45
Technicians	56	39.72
Doctors	4	2.84
Year(s) of experience:		
1 – 5 years	51	36.17
6 – 10 years	42	29.79
11 and above	48	34.04
Department (area of work):		
Operation Theatre	80	56.74
Radiology	47	33.33
Cath lab	14	9.93
Undergone/attended training on radiation safety		
No	136	96.45
Yes	5	3.55

The data in Table 1 reveals the socio-demographic characteristics of the healthcare workers. Out of 141 participants, 59 (41.84%) are in the age group between 31-40 years, 88(62.41%) were female. Majority of the participants, 81 (57.45%) are nurses, 48(34.04%) have work experience of more than 11 years and above, 80 (56.74%) are working in Operation theatre. Only 5 (3.55%) of the participants had undergone/attended training on radiation safety.

Section II: Findings related to level of knowledge of healthcare workers regarding radiation safety.

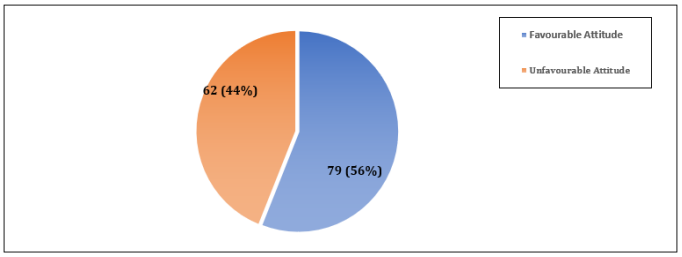
Figure 1: Frequency and percentage distribution of healthcare workers' Knowledge regarding radiation safety. n=141



The above figure reveals that out of 141 healthcare workers, majority of them, 61 (43.3%) have a poor knowledge, 49 (34.75 %) have an average knowledge and only 31 (21.99 %) participants have good knowledge on radiation safety which indicates significant lack of good knowledge. The mean knowledge score of the healthcare workers on radiation safety is 6.15 ± 1.68.

Section III: Findings related to level of attitude of the healthcare workers regarding radiation safety.

Figure 2: Frequency and percentage distribution of the level of attitude score of the healthcare workers regarding radiation safety. n=141



From the above figure, it can be concluded that 79 (56.03%) healthcare workers had a favourable attitude while 62 (43.97%) of the healthcare workers had an unfavorable attitude towards radiation safety. The mean attitude score was 34.87 ± 3.4.

Section IV: Findings related to level of practice of the healthcare workers regarding radiation safety.

Table 2: Frequency and percentage distribution of healthcare workers' Practice regarding radiation safety. n=141

Level of practice score	Range of reference for score	Frequency (f)	Percentage (%)
Good practice	6-8 (> 50 %)	61	43.26
Poor practice	1-5(≤ 50%)	80	56.74

The above table shows that majority of the healthcare workers, 80 (56.74%) in numbers have poor practice and 61 (43.26%) have good practice regarding radiation safety.

Section V: Findings Related to Association Between Level of Knowledge, Attitude And Practice With Demographic Variables.

Table 3: Association between the level of Knowledge on radiation safety among healthcare workers with selected demographic variables.

n=141

Demographics Variables	Knowledge						Fisher Exact Test p-value
	Good		Average		Poor		
	(f)	(%)	(f)	(%)	(f)	(%)	
Age (in years)							
21-30	5	41.7	21	30.9	23	37.7	
31-40	4	33.3	30	44.1	25	41.0	0.883
41 and above	3	25.0	17	25.0	13	21.3	
Gender							
Male	7	58.3	29	42.6	16	26.2	
Female	5	41.7	39	57.4	45	73.8	0.039*
Occupational category:							
Doctor	0	0.0	2	2.9	2	3.3	
Nurse	4	33.3	31	45.6	46	75.4	0.001*
Technicians	8	66.7	35	51.5	13	21.3	
Year(s) of experience:							
1 – 5 years	5	41.7	22	32.4	23	37.7	
6– 10 years	5	41.7	20	29.4	18	29.5	0.661
11 and above	2	16.7	26	38.2	20	32.8	
Department (area of work):							
Radiology	10	83.3	2	47.1	5	8.2	
Cath Lab	2	16.7	7	10.3	5	8.2	0.000*
Operation Theatre	0	0.0	29	42.6	51	83.6	
Undergone/attended training on radiation safety							
Yes	12	100.0	64	94.1	61	100.0	
No	0	0.0	4	5.9	0	0.0	0.187

*Statistically Significant at $p \leq 0.05$ level of significant.

The results in table 5.1 demonstrate that there is a statistically significant association between knowledge and a number of demographic variables, including gender, occupational category, and department (area of work). Thus, it may be stated that knowledge varies by gender, occupational category, and department (area of work).

Table 4: Association between attitude on radiation safety among healthcare workers with selected demographic variables. n=141

Demographics variables	Attitude				Fisher Exact Test p-value
	Favourable		Unfavorable		
	(f)	(%)	(f)	(%)	
Age (in years)					
21-30	25	31.6	24	38.7	
31-40	34	43.0	25	40.3	0.692
41 and above	20	25.3	13	21.0	
Gender					
Male	34	43.0	18	29.0	0.114
Female	45	57.0	44	71.0	
Occupational category:					
Doctors	3	3.8	1	1.6	
Nurses	37	46.8	44	71.0	0.011*
Technicians	39	49.4	17	27.4	
Year(s) of experience:					
1-5 years	21	26.6	29	46.8	
6– 10years	29	36.7	14	22.6	0.039*
11 years and above	29	36.7	19	30.6	
Department (area of work):					
Radiology	31	39.2	16	25.8	
Cath Lab	5	6.3	9	14.5	0.115
Operation Theatre	43	54.4	37	59.7	
Undergone/attended training on radiation safety:					
Yes	76	96.2	61	98.4	0.406
No	3	3.8	1	1.6	

*Statistically Significant at $p \leq 0.05$ level of significant

According to the results in table 5.2, there is a significant association between attitude and demographic variables like occupational type and year of experience. Therefore, we can draw the conclusion that attitude varies by occupation type and level of experience.

Table 5: Association between practice on radiation safety among these healthcare workers with selected demographic variables. n 141

Demographics variables	Practice				Fishers Exact Test p-value
	Good		Poor		
	(f)	(%)	(f)	(%)	
Age (in years)					
21-30years	35	35.0	14	34.1	
31-40 ears	43	43.0	16	39.0	0.864
41 and above	22	22.0	11	26.8	
Gender					
Male	33	33.0	19	46.3	0.098
Female	67	67.0	22	53.7	
Occupational category:					
Doctor	3	3.0	1	2.4	
Nurses	56	56.0	25	61.0	0.875
Technicians	41	41.0	15	36.6	
Year(s) of experience:					
1-5 years	35	35.0	15	36.6	
6-10 years	35	35.0	8	19.5	0.138
11 years and above	30	30.0	18	43.9	
Department (area of work):					
Radiology	31	31.0	16	39.0	
Cath Lab	13	13.0	1	2.4	0.143
Operation Theatre	56	56.0	24	58.5	
Undergone/attended training on radiation safety					
Yes	4	4.0	0	0.0	0.249
No	96	96.0	41	100.0	

According to the results in the above table, there is no association between the practice score and demographic variables.

Discussion

In the present study, out of 141 participants, only 21.99 % have good knowledge on radiation safety which means that there is a significant lack of knowledge on radiation safety. Study conducted by Aspasia Goula et.al in Greek (2021) concluded that health professional' lack of basic and specialized knowledge concerning radiation protection safety which had a negative impact on the provision of health services. In the present study, only 3.55% of the healthcare workers who are potentially

expose to radiation at different department of the hospital had undergone training on radiation safety. Similarly, a study conducted at Ismalia City by Hanan Hassan et.al (2019) reported that only 15.8% of the healthcare workers had training on radiation safety. The present study found that, 56.03% of the healthcare workers have favourable attitude towards radiation. In another study by S.A Tablish and Sajad Bhat in Kashmir Valley (2018) revealed that attitude towards implementation of basic principles of protection from radiation exposure was high among doctors and technologists. According to the present study, majority of the participants, 56.74% have poor practice regarding radiation safety. Similar to this findings, Hanan Hassan et.al (2019) stated that there was an overall inadequacy of radiation safety practices among all participants regarding the use of personal monitoring badges, lead apron and thyroid shield.

Conclusion

Radiation safety is a concern for both patients and healthcare workers working in radiation exposure areas. Good knowledge and practice can help decrease the harmful effects of ionising radiation and prevent needless radiation exposure. The study concluded that majority of the healthcare workers, have poor knowledge and poor practices when it comes to radiation safety although they have a favourable attitude towards it. One major contributing factor could be lack of appropriate radiation safety education and training.

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Author profile

Chongpi Raingam completed her GNM from Jorhat Christian Medical Centre (JCMC), Jorhat, Assam and B.Sc. Nursing (Post-basic) through IGNOU from Regional College of Nursing (RNC) Guwahati, Assam. She worked in Max Heart & Vascular Institute, New Delhi. At present, she is working as Nursing Officer in NEIGRIHMS, Shillong, Meghalaya. She obtained study leave from the institute and pursued her Post-graduation in College of Nursing NEIGRIHMS in the specialisation of Medical Surgical Nursing (Critical Care). She would like to continue her research work that would benefit in nursing education and better patient care.