

ORIGINAL ARTICLE

**ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE OF HEALTH CARE PROVIDERS TOWARDS RADIATION HAZARD AT ADAMA HOSPITAL AND MEDICAL COLLEGE, ADAMA, EAST SHOA ZONE, OROMIA REGIONAL STATE, ETHIOPIA.**

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## **Abstract**

**Aim:** Radiation exposure is becoming one of the ongoing public health problem. Everyone alive in this world is constantly being exposed to ionizing radiation. Although radiological doses are low and the chance of late effect is minimal, it should be kept as low as reasonably achievable. The aim of this research was to assess Knowledge, Attitude and Practice of health care providers' towards radiation hazards at Adama Hospital and Medical College.

**Methods:** Institution based cross sectional study was employed. A total of 159 study subjects participated using stratified sampling technique and then simple random sampling technique was used. Data was collected by using a well-structured self-administered questionnaires and pre-test was performed before the actual data collection that was conducted at Modjo Hospital. The data was first checked manually for completeness and then coded and entered into Epi-info data version 3.1 and then analyzed using SPSS version 21.

**Results:** The mean age of participants was  $29.8 \pm 0.5$  years and ranged from 20 - 47 years. Sex wise Health care providers' (HCP) represented 64.2% and 35.8% Male and female respectively. The mean service year among participants was  $4.0503 \pm 0.3$  years; ranged from 0 – 25 years.

**Conclusion:** Finally, from 159 respondents 80% of them had inadequate knowledge, 70% of them had unsafe practice with regards to radiation hazards. Therefore, from the above findings the following conclusions and recommendations forwarded: the Federal Ministry of Health, Health sectors and Hospital administrators should work on the knowledge and practice of health care professionals with regards to radiation safety. In service training has to be given on radiation safety.

**Keywords:** Attitude, Health care provider, Knowledge, Practice, Radiation protection.

## Introduction

Everyone alive in this world is constantly being exposed to ionizing radiation, and about 18% of exposure is due to man-made sources(1). There is likely to be a risk to patients' health in investigations that involve ionizing radiation. The United States (US) National Council on Radiation Protection and Measurement had reported that medical x-rays and nuclear medicine account for only 15% of all radiation exposures (1). All health care professionals (HCPs) should be knowledgeable on radiation protection to properly protect themselves, the Patients and others around the patients. In the United Kingdom, 22% - 24% of all HCPs know the correct dose of a conventional adult chest radiograph (2). In Germany, 59% of participants in a survey, estimated the dose of adult chest radiograph correctly and only 5% underestimating it (3). In Turkey, a total of 41.4% of all participants and 46.3% of resident doctors underestimated the radiation doses (4).

Various studies had documented deficiency in knowledge of practice of radiation protection among medical students, General practitioners, Paramedics and other healthcare providers (19), (22). The use of radiation in medical practices has evolved since its beginning and 30% to 50% of medical decisions are based on radiological examinations. However, it is still limited by its relevant hazards to patients and healthcare providers (1).

According to the estimation of the Italian Agency for Environmental Protection (1), the effective dose of ionizing radiation from medical sources is about 1.2 mSv/ year, while the amount of ionizing radiation from other man-made sources is 0.0072 mSv/year. Therefore, medical exposure is the first anthropic source of ionizing radiation of the population. In recent years, the annual number of radiological procedures is exponentially increasing. This implies that the risk associated to ionizing radiation, although small at the

individual level, might lead to an increased number of cancer cases in the population(3).

Previous study that conducted in Northern Ireland and the United States of America reported that HCPs' Attitude towards radiation dose and hazard is negative, and radiation dose is not an important consideration for clinicians when they refer their patients for diagnostic radiological examinations (4-6). According to the previous study conducted in Ethiopia in 2012 and Egypt in 2015, training, experience, Material quality, and job category had influence HCP's knowledge, attitude and practice towards radiation hazards (7, 8).

There are few documented information regarding the extent of radiation risk and safety in Ethiopia. The study conducted in Black Lion concludes that the majority of medical doctors at Black Lion Specialized Teaching Hospital have very limited knowledge regarding radiation source, risk and essential protection. Therapeutic radiation to themselves as well as their patients. So that this study was aimed to assess knowledge, Attitude and Practice of health care providers towards radiation hazard at Adama Hospital and Medical College.

## Materials and Methods

This study was conducted at Adama Hospital and Medical College. The hospital is located at a distance of 99 km from the capital city of Ethiopia (Addis Ababa). The hospital has about 465 workers of which 257 are health professionals. This study was carried out from June to August 2019. This was a facility-based Cross-sectional study.

The source population of the study is all Health Care Providers who were the staff members of Adama Hospital and Medical College and currently working in the hospital. The study population was Health Care Providers who satisfied inclusion criteria and were selected from

the source population. All health care providers in AHMC who direct (request) the patients to the radiology department, and also radiology department staffs willing to participate in the study were included in the study. Health care providers of AHMC who were sick or took annual, study and maternity leave and also didn't have the willingness to participate in the study during data collection were excluded from the study.

The sample size for this particular study was calculated using a single population proportion formula considering the following assumptions. 95% confidence Interval, 0.05 margin of error p = 0.5%.

Therefore:-the sample size will be calculated by the following formula:

$$n = \frac{Z^2 P(1-P)}{d^2} = \frac{(1.96)^2 \cdot 0.37(1-0.37)}{(0.05)^2} = \frac{358 \cdot 1.5}{1} = 537$$

Where:

n- Sample size

Z- Confidence level = 95% (1.96)

P- Anticipated proportion = 50% (0.5) to allow maximum sample size D- Margin of errors = 5% (0.05)

$$n = \frac{Z^2 P(1-P)}{d^2} = \frac{(1.96)^2 \cdot 0.50(1-0.50)}{(0.05)^2} = \frac{384}{1}$$

Since the exact number of source population of respondents was less than 10,000, to determine the final sample size, the following standard correction formula (Sample size determination using the finite population correction factor was used)

Thus, the corrected sample size was calculated as:

$$n_f = \frac{n_0}{(1+n_0/N)}$$

$$n = 154$$

Non respondent rate of 10% = 0.1 \* 154

= 15.4

Finally, the total sample size of this study was 170 Health care providers.

The stratified sampling technique was employed and the 170 sample size was proportionally and then selected from the different departments using a simple random sampling technique.

Data was collected using a well-structured self-administered questionnaires was used before data collection which was prepared and compiled by the principal investigator. The questionnaire was developed after reviewing available scientific literatures and similar studies. The questionnaire was first prepared in the English version and then it was translated to Affan Oromo version.

The questionnaires were pretested on (5%) of the sample size at another adjacent hospital (Modjo Hospital) to assure the validity of the questionnaires. After the interview immediately the questionnaires were collected. Data collectors checked each questionnaire for completeness. Validity and reliability tests were run any inconsistency was cleared.

#### Study Variables

Dependent variables:

- ✓ Knowledge, Attitude and Practice of HCPs towards radiation

Independent variables

- ✓ Socio-demographic characteristics (age, sex, marital status, ethnicity, religion, education level...)
- ✓ Length of service year or Experience, radiation safety training, Quality of materials and availability

#### Data Analysis Procedures

First, data were checked for error, coded, edited and entered into Epi-Info version 7.1, and then exported to SPSS version 21 (SPSS Inc, Chicago, 2011) for statistical analysis. Descriptive statistical analysis such as frequencies and percentages; mean and standard deviation were carried out.

### **Operational definitions**

**Radiation:** Energy that is radiated or transmitted in the form of rays or waves or particles

**Radiation safety:** Those basic protection measures such as time distance, shielding.

**Radiation risk:** When radiation is absorbed within our bodies, it can damage molecular structures and potentially cause harm.

**Health care providers:** A person who provides any form of health care- eg, physician, nurse, dentist and so on.

**Personal protection:** Those measurements taken to protect staff from exposure to radiation.

**Knowledge:** those respondents who know the following critical issues such as radiation, radiation safety, radiation hazard and risk, radiation protection.

- Adequate Knowledge: if the respondents' score for knowledge related Questions were greater than or equal to 70%.

-Inadequate knowledge: if respondents score for knowledge related Questions was less than 70% (9, 10).

**Positive attitude:** If respondents score for attitude related questions is greater than 80%

**Neutral attitude:** If respondents score for attitude related questions is between 60-79%

**Negative attitude:** If respondents score for attitude related questions is below 60%

**Practice status:** The reported radiation handling practice among HCPs in terms of radiation safety (satisfactory and unsatisfactory).

**Satisfactory Practice:** if respondents score for radiation safety practice-related questions was greater than or equal to 70%.

**Unsatisfactory practice:** if respondents score for radiation safety practice-related questions was less than or equal to 70%.

Ethical clearance and letter of permission was obtained from Adama General Hospital & Medical College. The aim of the study had been explained to the respondents in their mother tongue. Consent format was provided to all participants for their willingness to participate on the study. Thus, the confidentiality was secured by avoiding personal identification, restriction of data access to the third party.

### **Results**

Out of 170 sample size, a total of 159 individuals were included in this study with the mean response rate of 93.5%. The study subjects included 38 specialists, 85 nurses, 6 technologists, 9 general practitioners and 32 interns (table1).

Regarding service year and training of HCP's, 17% of the participants received radiation safety training while the majority of HCPs (83%) did not receive any radiation safety training, and 63.5% of them did not use or read about radiation safety. Appropriate educational efforts combined with effective communication skills resolve errors in judgment that are linked to inadequate or inaccurate information (Table 2).

With regards to exposure and practice to radiation 21.4% of them were exposed to ionizing radiation less than once/ week, whereas 7.5% was exposed to ionizing radiation 1-3 times/week, While only 3.1% of them was exposed to radiation more than three times/week and amazingly 67.9% of HCP's never exposed to radiation (Table 3).

Totally among 159 respondents, 48 respondents or about (30%) of them had safe practice and the majority of them which accounts for about 111 respondents or about (70%) of them had unsafe practice (Table 4).

HCP's knowledge, 73.6% of them knew about radiation, 71.7% knew about radiation protection, 64.2% of HCP's have no idea about radiation.

About how a person exposed every year from natural background radiation only 10.1% of them knew it. And 90% of HCP's have no idea about the approximate radiation dose of chest x-ray and most of HCP's didn't order organ correctly (Table 5).

Regarding HCPs' attitude, 83.7% of the health Care providers' have positive attitude and 16.3% of them have negative attitude towards safe practice (Table 6).

## Discussion

Even though medical radiation technology is the backbone of medicine worldwide, it remains at an infant stage in Ethiopia. So, this study results align with previous national and international studies conducted on HCP's knowledge, attitude and practice toward radiation exposure. This study result showed that only 17.0% of HCPs received radiation safety training, similar study conducted in Europe showed that only 11.2% of physicians received radiation safety training and only 20.0% of them read about radiation safety (11). As regards to exposure frequency, the majority of participants at about 67.9% reported that they didn't expose to radiation, while only 7.5% of participants exposed more than three times/week this finding is nearly similar to that of study findings reported from Europe where 72.5% (12).

Regarding HCPs' knowledge, this study revealed that about 80% of HCPs' had inadequate knowledge, a similar study conducted in Egypt reported that about 76% of the health care providers had inadequate knowledge (8), which is almost close to this finding.

Regarding the practice, according to this study, the majority of health care providers had unsafe practice which is about 70% and 30% of them had safe practice, the same study conducted in Egypt reported that about 58% of HCP's had unsafe practice and about 42% of them had safe practice (8). This difference might be due to lack of HCP's

awareness towards radiation hazards, lack of training by Hospital and so on.

Regarding attitude of 83.7% HCP's of participants had positive attitude to radiation safety whereas 16.3% had negative attitude, but similar study conducted in Ethiopia on physicians suggested that majority of physicians had negative attitude ((7), the difference is maybe due to experience, training and hospital policy towards radiation hazard. All HCPs' should be knowledgeable about radiation protection to properly protect themselves, the Patients and others around the patients. This study has limitations in terms of generalization from a limited sample size. We have not stratified samples into categories to see the differences in the level of knowledge among categories of HCPs'. The limitation of this study comes from the fact that the data collection technique is self-administered. Self-reported information is subjected to reporting errors, missed values and biases.

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## Conflict of Interest

There is no conflict of interest.

**Table 1.** Socio-demographic characteristics of Health care providers' at Adama Hospital and Medical College, Adama, East Shoa Zone, Oromia Regional State, Ethiopia (N=159).

Variables		Frequency	Percent
<b>Sex</b>	Male	102	<b>64.2%</b>
	Female	57	<b>35.8%</b>
<b>Department</b>	Specialist	32	<b>20.1%</b>
	Intern	31	<b>19.5%</b>
	GP	10	<b>6.3%</b>
	MRT	6	<b>3.8%</b>
	Nurse	80	<b>50.3%</b>
<b>Religion</b>	Orthodox	87	<b>54.7%</b>
	Protestant	30	<b>18.9%</b>
	Muslim	31	<b>19.5%</b>
	Others*	11	<b>6.9%</b>
<b>Marital Status</b>	Married	64	<b>40.3%</b>
	Unmarried	61	<b>38.4%</b>
	Other**	34	<b>21.4%</b>
<b>Ethnicity</b>	Oromo	125	<b>78.6%</b>
	Amhara	24	<b>15.1%</b>
	Gurage	1	<b>0.6%</b>
	Other***	9	<b>5.7%</b>
<b>Age(year)</b>		<b>Mean ± SD</b>	
		<b>29.8 ± 0.5</b>	

**Others \*** Jehovah Witness, Wakefeta, Adventist

\*\* Divorce, Widowed & Separated.

\*\*\* Tigre, Wolayeta, Selete.

**Table 2.** Service year and training of Health care providers' at Adama Hospital and Medical College, Adama, East Shoa Zone, Oromia Regional State, Ethiopia (N=159).

Variable		Sex		Total (%)
		Male (%)	Female (%)	
Receiving radiation safety training				
	Yes	11(7%)	16(10%)	27(17%)
	No	102(64%)	30(19%)	128(83%)
Reading about radiation safety training				
	Yes	34(21.5%)	24(15%)	58(36.5%)
	No	66(41.5%)	35(22%)	101(63.5%)
Duration of current employment (year)	Mean $\pm$ SD	Range		
	4.0503 $\pm$ 0.3	0-25 years		



**Table 3.** Exposure and practice towards radiation of Health care providers' at Adama Hospital and Medical College, Adama, East Shoa Zone, Oromia Regional State, Ethiopia (N=159).

<b>Variables</b>		<b>Frequency</b>	<b>Percent</b>
Exposure frequency/week	<1/ week	34	21.4%
	1-3times/week	12	7.5%
	>3times/week	5	3.1%
	I don't expos to radiation	108	67.9%
Are all these materials available in your set up	Yes	32	20.1%
	No	127	79.9%
What do you think about their quality	Yes	107	67.3%
	No	52	32.7%
distance from radiological device without protection during the procedure(meter)	1.1meter 2.2meter 3.5meter	18	11.3%%
	4.I always use in operating room	33	20.8%
		86	54.1%%
		22	13.8%

<b>Variables</b>		<b>Frequency</b>	<b>Percent</b>
<b>How often you used the following equipment during procedure</b>			
1. Lead apron	Never	69	43.4%
	Sometimes	10	6.3%
	Always	15	9.4%
	No ideas	65	40.9%
2 Thyroid shield	Never	71	44.7%
	Sometimes	12	7.5%
	Always	3	1.9%
	No ideas	73	45.9%
3. Leaded glove	Never	75	47.2%
	Sometimes	2	1.3%
	Always	7	4.4%
	No ideas	75	47.2%
4. Eye glass	Never	70	44%
	Sometimes	9	5.7%
	Always	7	4.4%
	No ideas	73	45.9%

**Table 4.** Practice towards radiation of Health care providers' at Adama Hospital and Medical College, Adama, East Shoa Zone, Oromia Regional State, Ethiopia (N=159).

	Frequency	Percent
<b>Safe practice</b>	48	<b>30.0%</b>
<b>Un safe practice</b>	111	<b>70.0%</b>
<b>Total</b>	<b>159</b>	<b>100.0%</b>

**Table 5.** Knowledge towards radiation of Health care providers' at Adama Hospital and Medical College, Adama, East Shoa Zone, Oromia Regional State, Ethiopia (N=159).

		Frequency	Percent
Knowledge assessment			
Do you know anything about radiation?	Yes	117	73.6%
	No	42	26.4%
Do you know about radiation protection?	Yes	114	71.7%
	No	45	28.3%
How much radiation people expose annually in mSv?	0.24	10	6.3%
	2.4	16	10.1%
	24	6	3.8%
	240	25	15.7%
	No idea	102	64.2%
The approximate radiation dose of chest x-ray in mSv?	0.02	7	4.4%
	0.2	16	10.1%
	2	11	6.9%
	20	19	18.2%
	No idea	96	60.4%

**Table 6.** The Knowledge, Attitude and Practices towards radiation of Health care providers' at Adama Hospital and Medical College, Adama, East Shoa Zone, Oromia Regional State, Ethiopia (N=159).

Knowledge score	Frequency	Percent
Adequate	32	20%
In adequate	127	80%
Attitude Score		
-attitude	26	16.3%
+attitude	133	83.7%
Practices		
Safe practice	48	30%
Un safe practice	111	70%

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