

## **Knowledge of ionizing radiation risk and protection practice measure among radiological staff in Derna city health sector, Libya.**

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### **Abstract.**

Despite great advantage of uses of x-ray in the medical field as a diagnostic tool, no one suspected that ionizing radiation could have undesirable effect on living cells.

The aim of our study is to assess the knowledge and attitude of the radiology staff about the risk of ionizing radiation in Derna health sector. This cross-sectional study was conducted in Derna city of Libya over six months (from September 2018 to March 2019) at Derna health sector.

A validated questionnaire was used to assess the knowledge and attitude of the radiology staff about the risk of ionizing radiation. A total of 105 radiology staff were participant. They shows that the most common age groups of participants were 21- 30 years (41.9%), with (75.9%) of them had used incorrect safety radiation practice despite their high knowledge toward the risk of ionizing radiation (62%). Despite, the high knowledge of our participants regarding risk of ionizing radiation, most of them showed incorrect practice toward the risk of ionizing radiation.

**Keywords:** ionizing radiation, radiation protection, and radiological st

### **Introduction**

Wilhelm C. Roentgen discovered X-ray in 1895 and since then the applications of the x-ray have widely used not only in the medical field but also it spreads to others field like industry and agriculture. Moreover, in 1950 they used in USA at the shoes market to evaluate the alignment of foot with the shoe.

Despite of great advantage of uses of x-ray in medical field as a diagnostic radiation, no one suspected that ionizing radiation could have an undesirable effect on living cells (1). Some of these undesirable effects like hematological disorders, various dermatological disorders, cataract, and cancer diseases, which appears later on among pioneers of radiology when they expose to a large amount of radiation. The estimated absorbed doses by the first radiologists were 1 GY/year (2). The appearance of the undesirable effect of ionizing radiation gets great attention by scientific researchers toward the radiation protection. At the end, equipment of personal radiation protection with legislation rules that lead to protect the medical staff and patients from those undesirable effects of ionizing radiation were established (3-6).

During the examination procedures that involved in using ionizing radiation, the safety of patients and medical staff should be a priority.

Health workers who are in direct or indirect contact with ionizing radiation should follows the As low As reasonable Achievable (ALARA)

**Principles.** To the best of our knowledge there are very few of published studies related to the awareness of ionizing radiation risk and protection within the medical staff [2,3,7,8]. The risk of incorrect practice among a radiological staff that in contact with ionizing radiation lead us to assess their knowledge and attitude about the risk of ionizing radiation.

### **Materials and Methods.**

The following methods and material are followed

**Ethical consideration:** Verbal consent was obtained from the participants after they given information on the objectives of the study. Participation was voluntary, and no incentive was offered. During data collection, privacy and confidentiality were maintained.

**Study design:** This cross-sectional study was conducted in Derna city of Libya over six months (from September 2018 to March 2019) at Derna health sector.

**Sampling:** Every consecutive radiological staff that works at he radiology department was included in this study until the minimum sample size was achieved. A total of 105 radiological staff were participant.

**Data collection procedure:** Each participant was given instructions on the objective of the study, the methods to be used to collect the data and how to fill the forms. Data were collected by filling the questionnaire using a specially designed form. The questionnaire contains patient's demographic information such as age; gender; education level; experience level; occupational; and monthly allowance.

Safety radiation practice consisted of seven questions, which has been categorized into correct practice and incorrect practice. Responder who answers six questions correct has been categories into correct practice.

Knowledge regarding safety of radiation consisted of four questions, which has been categorized into high and low knowledge. Responders who answer three out of four questions have been categorized into high knowledge.

For assessing the good practice and knowledge regarding ionization radiation questions, the correct answer had given one mark. For an incorrect answer, I do not know or left blank answer no mark was given.

**Data analysis:** Collected data were analyzed using SPSS software version 22 and applying appropriate statistical tests, at a p-value of 0.05.

### **Result:**

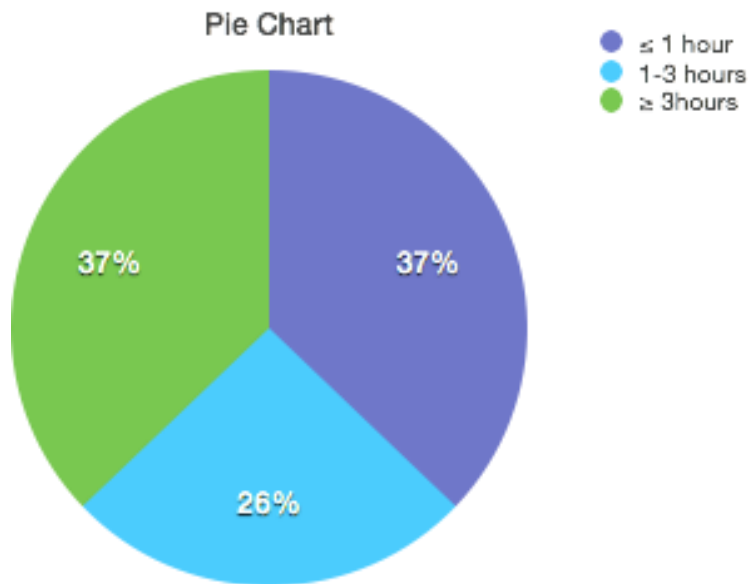
**Demographic variables:** The demographic variables of our patients are presented in Table (1). It shows that the most common age groups were 21- 30 years (41.9%), with male staffs 70(66.7%) had more exposure to radiation than the female staffs 35(33.3%). Most of our staff experience were less than 5years 39(37.1%) with monthly allowance range between 500-1000L.D (64(61.0%) including with incentive risk for (80%) of our staff. More than half of our study group 56(53.3%) had a high educational level (Bachelors degree). **Table 1** shows the Demographic variable.

For the questions regarding to the frequency of your daily contact with ionizing radiation, it showed that 39(37.1%) of our subjects had more than 3 hours in contact with ionizing radiation (Figure1.). The harmful effect of ionizing radiation had been known by 75.2%(79) of our

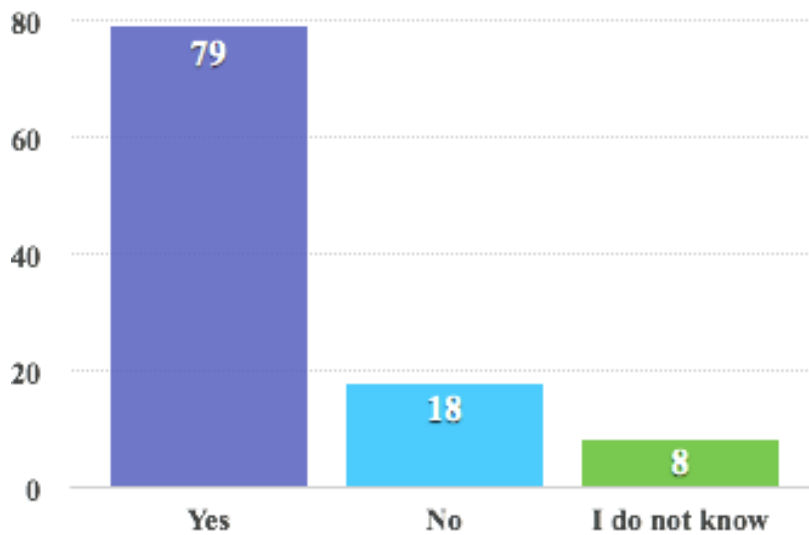
participants (Figure2). 65 (61.9%) of our subject had positive **response regarding use of protective measures during their daily practice.**

**Table1: Characteristics of study subjects.**

<b>Variables</b>	<b>Frequency</b>	<b>%</b>
<b>Age</b>		
≤20	1	1.0
21-30	44	41.9
31-35	33	31.4
<b>36-40</b>	21	20.0
>40	6	5.7
<b>Gender</b>		
Male	70	66.7
Female	35	33.3
<b>Level of education</b>		
Diploma	17	16.2
High Diploma	25	23.8
Bachelor degree	56	53.3
Post graduated degree	7	6.7
<b>Monthly salary</b>		
<500 L.D	13	12.4
<b>500-1000 L.D</b>	64	61.0
>1000	28	26.6
<b>Experience</b>		
<5years	39	37.1
5-10years	32	30.5
>10years	34	32.4
<b>Risk reimbursement</b>		
Yes	84	80.0
No	10	9.5
I Don't Know	11	10.5
<b>Total</b>	<b>105</b>	



**Figure 1.** Daily exposure to ionizing radiation



**Figure 2.** Knowledge of the harmful effect of the ionizing radiation

### Safety radiation practice

It was found that 61.9 % (65 Of 105) of the health workers used the protection preventive measures against the ionizing radiation, while 31.4% never used the protection preventive measures. The majority of our responders 76.2% reported the more frequent need to be at radiology department and only 6.7% reported they participates in lectures and conferences related to the radiology field. However, only 12.4% of our responders follow the international radiation measures (SOP). About 73.3% of our responders do not measure the level of their body exposure from radiation dosages, despite the absence of protection inspection inside the radiology department as answered by our responders (71.4%). Question regarding maintenance of x-rays machine in the radiology department at a regular base was absent too as answered by our responders (71.4%). Table 2.

This study showed that 75.9% (n=80) of responders had used incorrect safety radiation practices (incorrect practice), and 24.1% (n = 25) of responders had used correct safety radiation practices (correct practice) .

**Table 2:** Safety radiation practice among health worker in radiology department

	Frequency	Percentage (%)
<i>Do you use the radiation protection measures?</i>		
Yes	65	61.9
No	33	31.4
I do not know	7	6.7
<i>Do you engaged at any lectures or conference in radiation field?</i>		
Yes	7	6.6
No	71	67.6
I do not care	27	25.7
<i>Did you measure the level of your body exposure to the radiation in regular manner?</i>		
Yes	0	0.0
No	77	73.3
I Do not know	28	26.7
<i>Does their any enough monitor for the protection safety in the radiological department?</i>		
Yes	5	4.8
No	75	71.4
I do not know	25	23.8

<i>Does x-ray machine maintain do on regular bases?</i>		
Yes	7	6.7
No	45	42.9
I do not know	53	50.5
<i>Does your job required to be more frequent in the department?</i>		
Yes	80	76.2
No	21	20.0
I do not know	4	3.8
<i>How often do you follow the international measures(SOP)?</i>		
Yes	13	12.4
No	55	52.4
I do not know	37	35.2

### Safety radiation Knowledge

Among responders, only 75.2% had accurate knowledge concerning the harmful effects of ionizing radiation; 47.6% knows the most sensitive part of our body to the ionizing radiation.81.0% of them know that it is important to be working at radiology department for a short time in your life.. 43.8% of responder they have an idea for the international radiation protection requirement.

Regarding safety radiation knowledge, on the other hand, about 62.0% (n=65) of responders had high knowledge. Table 3.

**Table 3:** Safety radiation Knowledge among health worker in the radiology department

	Frequency	Percentage (%)
<i>Do you have knowledge about the harmful effects of ionizing radiation?</i>		
Yes	79	75.2
No	18	17.1
I do not know	8	7.6
<i>Which part of our body is more sensitive to x-ray?</i>		
Head	14	13.3
Neck	25	23.8
Chest	16	15.2
Pelvic	50	47.6
<i>Do you think that working in the radiology department should be for a short time?</i>		
Yes	85	81.0
No	16	15.2

I do not know	4	3.8
<i>Do you have an idea for the international radiation protection requirement?</i>		
Yes	15	14.3
No	76	72.4
I do not know	14	13.3

**Discussion:**

Our findings show information about the correct practice and knowledge of our medical staff regarding the awareness of the risk of ionizing radiation. The good knowledge of the risk of ionizing radiations among our subjects was expected due to the fact that most of them were graduated from radiology related school. However, it surprising that they showed bad practice toward ionizing radiation protection issues. Moreover, most of our subjects (62%) show good knowledge toward the risk of ionizing radiation and this finding is in agreement with another study carried out in Nigeria by Briggs-Kamara et al., which showed (58.7%) of their subjects had good knowledge related to the hazard effect of radiation (9). On the other hand, our finding is inconsistent with another study in Nigeria that demonstrated a poor level of knowledge toward the basic principle of radiation protection and patient exposure issues (10). Despite the high level of knowledge of our groups related to the dangers of ionizing radiation, only (24.1%) of our subject demonstrated a correct practice to protected their self and their patient from ionizing radiation.

**Conclusion:**

Our findings showed large proportions of our subject had incorrect practice toward the ionizing radiation despite their high knowledge of the danger of ionizing radiation which lead us to raise the awareness level of risk of ionizing radiation among the health office manager to monitor the people who work in contact with radiation.

**Recommendations**

- 1- Emphasis on the use of the equipment for protection against ionizing radiation (protective coat against ionizing radiation and the use of the personal device to measure the radiation dose)



2- Confirm to all employees in the diagnostic and therapeutic radiology departments are obligated to attend and participate in conferences and educational seminars in the field of radiation.

3- Interest in raising the level of income (salary) for all workers in the diagnostic and therapeutic radiology departments to encourage and motivate.

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