

# Evaluation of Ionizing Radiation Protection among Radiation Workers in X-ray departments in Erbil City

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**Abstract:**

**Background:** Ionizing radiations are hazardous agents in the workplace, since all forms of ionizing radiation produce some type of injury that is incurable. Therefore, protection against ionizing radiation exposure can play an important role in the health of workers.

**Objectives:** is to evaluate the application of radiation protection among radiation workers at X-ray department in Erbil hospitals.

**Patients and methods:** Six hospitals (General and Private) were visited. Samples of 110 were randomly selected among 135 radiation workers, 47 (42.3%) female and 63 (57.3%) male. Data was collected through structured questionnaires. The surveyed data was coded and analyzed by using MS Excel software, and SPSS 18 for analysis. Analysis was performed by means of frequency distributions and cross tabulations.

**Results:** The results showed that there are majority of the workers 51 (46.4%) aged between 21 - 30 years, and Diploma holders 68 (61.8%). Only 49 (44.5%) undergone primary examination while 47 (42.7%) never done periodical examination. According to international commotion of radiation protection regulation of radiation protection, it is mandatory for radiation workers to wear personal detective devices during work. But a large numbers 89 (80.9%) have not supplied with such devices. The study also revealed that the majority of workers were engaged in work beyond 40 hours per week. Calibration of the X-rays machine and radiation survey of the work place have not been regularly done. Only 30 of the sample have no awareness and knowledge about the ionizing radiation, while 95 (86.4%) have no healthy advice.

**Conclusion:** It can be suggested that the level of workers education must be increased and short courses be implemented such as dosimetry and radiation protection performance.

**Keywords:** Radiation workers, Radiographers, Radiation protection.

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**Introduction:**

Ionizing radiations are hazardous agents in the workplace and all forms of ionizing radiation produce some type of injury that is incurable. Therefore, application of protection against ionizing radiation exposure can play an important role in the health of workers (1). Radiation is a process resulting in the emission of energy in the form of particles or electromagnetic waves (2)

Ionizing Radiation is an integral part of our lives and has been found since the beginning of creation (1), because we live always in the center of radiant and exposed to the radiation from the sun and outer space, radioactive elements in the earth, as well as industrial sources of ionizing radiation, such as medical X-ray (diagnostic), therapeutic Radiology, and resources of operation of nuclear facilities (3, 4).

Radiation workers are at risk of greater radiation exposures

especially due to their intimate contact and exposures. The X-ray workers is need to establish rules for security, safety and methods of measurement of radiation and the prevention of the dangers of ionizing radiation (5)

The importance of this study to evaluate procedures for the prevention of occupational and environmental risks of ionizing radiation for workers in the Departments of Diagnostic Radiology, as stipulated in the instructions issued by the international organizations.

Previous studies have shown that conducted to measure annual equivalent doses for radiation workers, which was read at specified intervals and in various countries, (1950 -2003 in Lithuania (6) .1986 to 2000 in China (7) .1982 to 1998 in India (8)) the doses recorded in a steady decline, especially in recent years. The reason for this is may be due to the application of the international regulations for the radiation protection.

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**Materials & Methods:**

This study was conducted at six hospitals (general & private) in Erbil. A cross sectional study was conducted with the sample

of 110 randomly selected among 135 radiation workers derived from the above six hospitals. Data was collected through structured questionnaires. Analysis was performed by means of frequency distributions and cross tabulations.

**Results:**

The study included six hospitals and specifications for each hospital, such as the number of workers and sex were shown in fig-1.

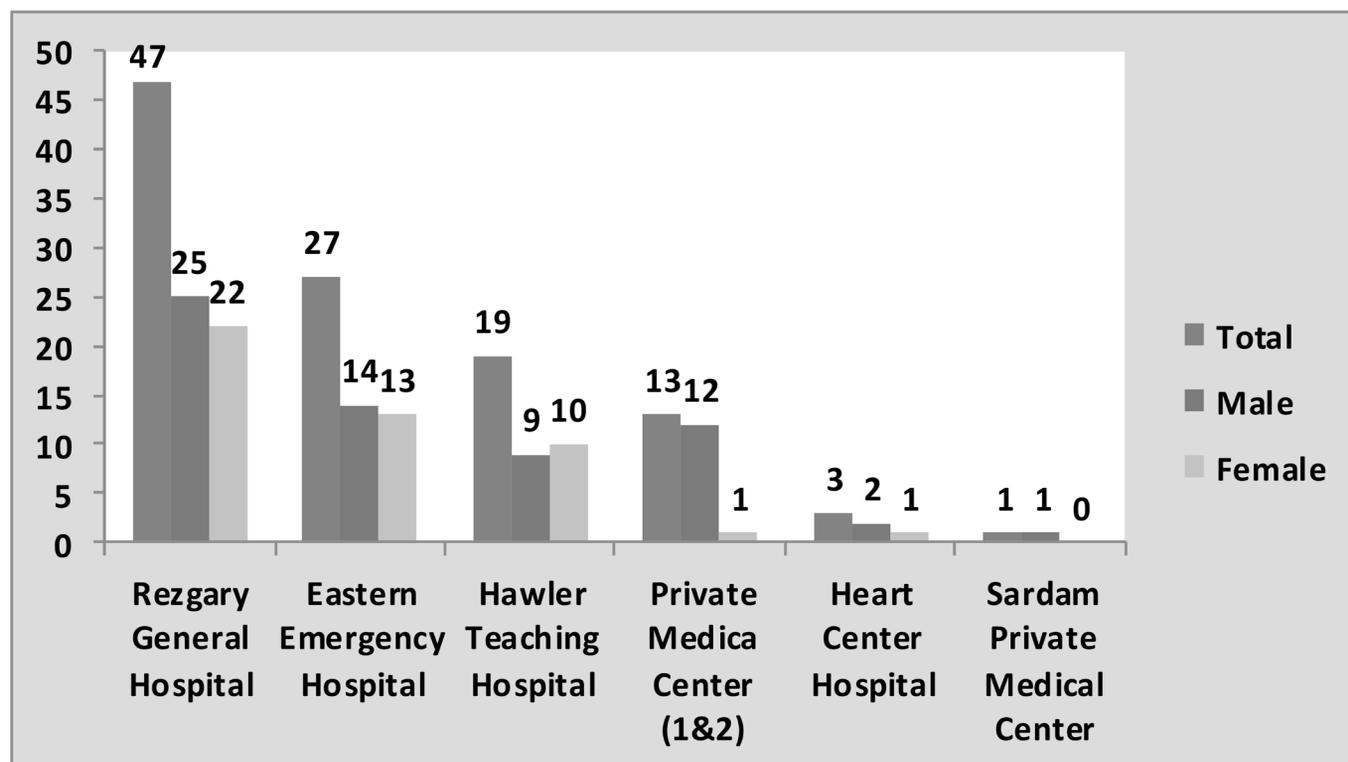


Fig-1 Specifications of each hospital

**Profile of sample**

The results showed that there were 47 (42.3%) female and 63 (57.3%) male, fig -2

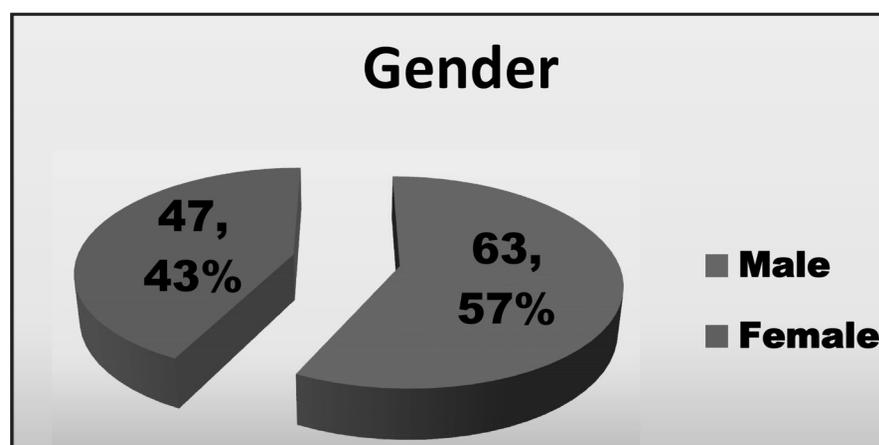


Fig-2- Distributions of workers

A large majority of them 51 (46.4%) were aged between 21 - 30 years (28 male, 23 female) and Diploma holders 68 (61.8%) (35 male, 33 female) as presented in Table -1.

Table -1: Profile of sample Age, Gender Qualification

Gender	Age	Qualifications										Total	
		Mediatory school		Secondary School		Institute (Diploma)		University		High Degree		No.	%
		No.	%	No.	%	No.	%	No.	%	No.	%		
Male	21-30	3	60.0	2	100.0	13	37.1	10	50.0	0	0.0	28	44.4
	31-40	2	40.0	0	0.0	5	14.3	7	35.0	1	100.0	15	23.8
	41-50	0	0.0	0	0.0	14	40.0	2	10.0	0	0.0	16	25.4
	50-60	0	0.0	0	0.0	3	8.6	1	5.0	0	0.0	4	6.3
	Total	5	100.0	2	100.0	35	100.0	20	100.0	1	100.0	63	100.0
Female	21-30	-	-	0	0.0	15	45.5	8	66.7	-	-	23	48.9
	31-40	-	-	1	50.0	6	18.2	4	33.3	-	-	11	23.4
	41-50	-	-	1	50.0	12	36.4	0	.0	-	-	13	27.7
	Total	-	-	2	100.0	33	100.0	12	100.0	-	-	47	100.0

It was found that 58(34 male, 24 female) (52.7%) of the respondents sample their working years, ranging between 1-5 years, and 21(11 male, 10 female)(19.1%) had years of work more than 20 Table -2.

Table-2: Gender& working years

Gender	Working years										Total	
	1-5 years		6-10 Years		11-15 years		16-20 years		More than 20 years		No.	%
	No.	%	No.	%	No.	%	No.	%	No.	%		
Male	34	58.6	8	53.3	4	57.1	6	66.7	11	52.4	63	57.3
Female	24	41.4	7	46.7	3	42.9	3	33.3	10	47.6	47	42.7
Total	58	100.0	15	100.0	7	100.0	9	100.0	21	100.0	110	100.0

**Radiation Protection**

49 (44.5%) of the sample completed the primitive medical examinations before starting work, while 47 (42.7%) of them did not conduct periodic medical examinations for the duration of their work. 95 (86.4%) answered that there is no radiation protection Specialist (Health physicist) and 89(80.9%) are not equipped with personal dosimeter to measure the level of radiation exposure, Table -3.

Table -3: primitive and periodic examination, radiation responsible, and dosimeter supply

<b>primitive Medical Examination</b>		<b>No.</b>	<b>%</b>
Yes		49	44.5
No		61	55.5
<b>Total</b>		<b>110</b>	<b>100</b>
<b>periodic Examination</b>			
2-6 months		10	9.1
7-12 months		19	17.3
1-2 years		31	28.2
2-5 years		3	2.7
Never Done		47	42.7
<b>Total</b>		<b>110</b>	<b>100</b>
<b>Radiation protection Responsible</b>			
Yes		15	13.6
No		95	86.4
<b>Total</b>		<b>110</b>	<b>100</b>
<b>Supply radiation dosimeter</b>			
Yes		21	19.1
No		89	80.9
<b>Total</b>		<b>110</b>	<b>100</b>

It is well known that, radiation survey and calibration of x-ray machines are necessary to protect workers from radiation exposure. But found that 73(66.4%) of the sample answered that there was no radiation survey while 42 (38.2%) remarked that all radiation devices were not calibrated Table -4.

**Table-4: periodic radiation survey & calibration**

Done periodic radiation Survey	No.	%
Yes	37	33.6
No	73	66.4
<b>Total</b>	<b>110</b>	<b>100</b>
Done X-ray machine Calibration		
Once monthly	6	5.5
1-6 months	21	19.1
6-12 months	13	11.8
1-5 years	28	25.5
Never done	42	38.2
<b>Total</b>	<b>110</b>	<b>100</b>

**Discussion:**

According to the Recommendations of the International Commission on Radiological Protection(ICRP)(9) , the medical surveillance of workers exposed to radiation should be based on the general principles of occupational medicine, which aim “to assess workers’ health, to help in ensuring initial and continuing compatibility between the health of the workers and the conditions of their work; and to provide a baseline of information useful in the case of accidental exposure or occupational disease. The medical surveillance programmed should be related to the job nature and the health conditions required of the worker for the effective performance of the task (10). In that hospitals the study survey the measurement of radiation exposure for workers was not recorded, since all workers have no protective equipment. Medical examinations of workers was not done, and no warning sign of radiation in radiation place. It is known that increasing exposure to ionizing radiation at the low dose rates, cause increase in the excess relative rate of cancer mortality (11, 12) Medical workers exposed to low doses of  $\gamma$ -rays or X-rays. required accurate historical dosimetry provides estimating of leukaemia risk . (13) All parties, including patients and families need to ensure that CT scans are limited to situations where there is a definite clinical indication, and to provide a diagnostic image at the lowest possible radiation dose. (14)

**Conclusion:**

During the study analysis data, concluded that the ionizing radiation workers protection (X-ray workers) and the medical management of exposure are complex. A good occupational

health programmed for radiation workers should include medical surveillance, personal dosimeter monitoring, accident investigation, and medical intervention was necessary. This requires a coordinated approach by work safety professional, health physicist, occupational physician other health workers, and the radiation workers themselves. So the employees need to have a short-term education about ionizing radiation hazards and should establish training courses on radiation protection to follow the recommendation of international commission on radiation protection (ICRP).

**Authors contributions:**

Qasim Ahmad Ali : Study design, Collecting samples ,analysis data and writing manuscript

Dr.Safaa Mustafa Hameed: Collecting samples and writing manuscript

Dr.Runak T.Ali: Collecting samples and revision of the writing

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