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Assessment of Radiation Exposure among Healthcare Providers

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ABSTRACT

Background: Radiation exposure poses a danger to both patients and healthcare personnel (HCFs). Radiographic imaging is an invaluable Although ionizing radiation and computed tomography (CT) scans are useful diagnostic tools in medicine, there are well-known risks associated with them, as do other imaging techniques. The monitoring of radiation and radiation safety for radiography professionals is an essential safety measure.

AIMS: Assess health status of healthcare providers who work in radiation departments., and to find out the differences between radiation exposure and health status of health care providers.

Methodology: Cross-sectional study was undertaken over the duration of the study period (May 10th to August 25th, 2021) to assess of radiation exposure among healthcare providers. Purposive sample of (120) healthcare providers were selected from five hospitals in medical city complex the sample is distributed as (44) healthcare providers from Baghdad teaching Hospital, (36) healthcare providers from Ghazi AL-Hariri Hospital, (10) healthcare providers from Tumor Teaching Hospital, (20) healthcare providers from Children's protection Hospital, (10) healthcare providers from Radiology institute. The sample was obtained by use of two-part instruments: Th Part 1: General facts about healthcare providers in this section, you will find a self-administered questions sheet for measuring radiation exposure on healthcare providers. validity of the questionnaire to ensure its validity, the instrument was shown to sixteen nursing specialists from various specialties. The internal consist reliability determine by Cronbach Alpha correlation which was 0.79 for exposure to radiation. Descriptive statistics are used to examine the data, including frequencies, percentages, means, and standard deviations; inferential statistics include ANOVA and independent t-tests, among others.

Results: The result showed measurement of exposure to radiation indicates that 20% (n=24) are ate moderate risk and 80% (n=96) are at low risk due to exposure, that there is significant difference in exposure to radiation with regard to male healthcare providers at p-value=0.0.029.

conclusion: The study found that majority of Healthcare Providers are at a low level of acute exposure to radiation, majority of healthcare Providers are at low risk due to exposure to radiation.

Key words: Assessment, Radiation exposure, Health care providers

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INTRODUCTION

Medical diagnosis has benefited from technological improvements. With instruments like radiation imaging, A patient's illness or injury can now be represented visually by a healthcare professional. a result of these breakthroughs. In the sphere of medicine, radiation imaging has become a regular procedure [1,2]. Radioactivity is defined as the emission of ionizing radiations by radioactive atoms. Electromagnetic radiation (gamma or X-rays) and particulate radiation are the two forms of energy that make up ionizing radiation (neutrons, beta or alpha particles). In medical practice, 20% of the population is exposed to radiation, and this number is expected to rise around the world. Radiological examinations, nuclear medicine procedures and radiation treatments total more than 3600,000,000 diagnostic radiological examinations worldwide annually [3].

Over 90% of human anthropogenic radiation exposure comes from ionizing radiation through medical exposure. Fluoroscopic procedures account for ten percent of medical exposure. Fluoroscopy is a diagnostic and therapeutic imaging technology that employs x-rays to produce real-time continuous pictures. Fluoroscopy is

being used to execute increasingly complicated medical procedures without the need for invasive surgery, resulting in improved patient safety and shorter hospital stays. The radiation dose provided to the patient as well as to medical workers is a trade-off when employing fluoroscopy. A net positive benefit to the patient should be used to justify the trade-offs. "Justification of Medical Exposure in Diagnostic Imaging," International Atomic Energy Agency" [4].

METHODOLOGY

Study design

The assessment method was employed in a cross-sectional study of healthcare providers in the Baghdad medical city complex. The present study is carried out to assessment of radiation exposure among health care providers from (May 10th to August 25th,2021).

The study samples

By using a non-probability sampling strategy, a simple purposive sample of (200) people were selected. Those who work in Baghdad's medical city complex are included in the study's sample.

Study instrument: The instrument includes two parts:

Part 1: Healthcare providers' general information:

This part was designed to measure the healthcare provider's demographic characteristics which include gender, age, occupation, work place, years of experience, are all self-administered variables.

Part 2: Self-administered questions sheet related to measure radiation exposure upon healthcare providers that consists of:

1. Measurement of the level of the type of radiation exposure dose which consist of:

1.a. Acute exposure (13) items.

1.b. Chronic exposure (14) items.

Validity and reliability

The instrument's content validity was tested by 16 nursing professionals from various specialties, and the items' reliability was determined by the internal consistency of the Exposure to radiation=0.79.

Statistical analysis

Data acquired from the study sample was statistically analyzed using SPSS version (26.0) and Microsoft Excel (2010) by the researcher, who then dealt with the statistically significant findings. to find the difference between the variables and obtain the final results of the research based on a set of statistical tests.

RESULTS

Table 1 reveals that measurement of exposure to radiation indicates that 20% (n=24) are ate moderate risk and 80% (n=96) are at low risk due to exposure. Table 2 indicates that level of acute exposure to radiation is low among healthcare providers as seem among 89.2% while chronic exposure to radiation is moderate as seen among 82.5% of them. Table 3 reveals that there is high significant relationship between exposure to radiation and age group among healthcare providers at p-value=0.001. Table 4 depicts that there is significant difference in exposure to radiation with regard to male healthcare providers at p-value=0.0.029. Table 5 shows that there is no significant relationship between exposure to radiation and occupation of healthcare providers. Table 6 reveals that there is high significant relationship between exposure to radiation and workplace department of healthcare providers at p-value=0.001. Table 7 shows that there is no significant relationship between exposure to radiation and years of service for healthcare providers.

Table 1: Measurement of exposure to radiation among healthcare providers.

Exposure	F	%	M	SD
Low risk	96	80	1.2	0.42
Moderately risk	24	20		
Highly risky	0	0		
Total	120	100		
f: Frequency, %: Percentage, M: Mean, SD: Standard Deviation				
"Low=0 – 0.33, Moderate=0.34 – 0.67, High=0.68 – 1"				

Table 3: Analysis of variance for exposure to radiation with regard to age of healthcare providers (N=120).

Exposure/ Variable	Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	2.53	3	0.843	5.869	0.001
	Within Groups	16.67	116	0.144		
	Total	19.2	119			
df: Degree of freedom, F: F-statistic, Sig: Significance						

Table 2: Measurement the levels of the type of radiation exposure dose among healthcare providers.

Levels	Acute exposure*		Chronic exposure**	
	F	%	F	%
Low	107	89.2	12	10
Moderate	9	7.5	99	82.5
High	4	3.3	9	7.5
Total	120	100	120	100
M ± SD	2.50 ± 2.106		7.53 ± 1.749	
"f: Frequency, %: Percentage, M: Mean of total score, SD Standard deviation"				
* "Low=0 – 4.3, Moderate=4.4 – 8.7, High=8.8 – 13"				
** Low=0 – 4.6, "Moderate"=4.7 – 9.3, High=9.4-14				

Table 4: Independent sample test for exposure to radiation about gender of healthcare providers (N=120).

Gender/Exposure		M	SD	T	Df	p≤ 0.05	Sig
Exposure to radiation	Male	1.26	0.05	2.216	4	0.029	S
	Female	1.09	0.294				

Table 5: Analysis of variance for exposure to radiation about occupation of healthcare providers (N=120).

Exposure /variable	Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Occupation	Between Groups	0.747	3	0.249	1.566	0.201
	Within Groups	18.453	116	0.159		
	Total	19.2	119			
df: Degree of freedom, F: F-statistic, Sig: Significance						

Table 6: Analysis of variance for exposure to radiation with regard to workplace department of healthcare providers (N=120).

Exposure/Varible	Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Department	Between Groups	3.665	2	1.832	13.801	0.001
	Within Groups	15.535	117	0.133		
	Total	19.2	119			
df: Degree of freedom, F: F-statistic, Sig: Significance						

Table 7: Analysis of variance for exposure to radiation about years of service among healthcare providers (N=120).

Exposure /Variable	Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Years of services	Between Groups	6.01	27	0.223	1.553	0.064
	Within Groups	13.19	92	0.143		
	Total	19.2	119			
df: Degree of freedom, F: F-statistic, Sig: Significance						

DISCUSSION

Part 1: Discussion of measurement of exposure to radiation among healthcare providers

With respect to measurement of exposure to radiation, the findings indicate that majority of participants are at low risk due to exposure. These results congruent with "Occupational radiation exposure of health professionals and cancer risk assessment for Lithuanian nuclear medicine workers", who reported that there was no increase in doses to nuclear medicine staff following the installation of two new PET/CT machines, indicating an increased radiation protection culture and the application of relevant technical and protective measures by the staff [5].

Part 2: Discussion of measurement the levels of the type of radiation exposure dose among healthcare providers

Regarding Measurement, the Levels of the Type of Radiation Exposure Dose among Healthcare Providers, the findings indicates that level of acute exposure to radiation is low among majority of healthcare providers while chronic exposure to radiation is moderate among majority of healthcare providers. This result at least concurs with study (Medical professionals are exposed to low levels of ionizing radiation in several diagnostic and therapeutic procedures), according to a study conducted by the National Institutes of Health. It is vital to use protective gear in order to minimize exposure to radiation. Wearing lead apron and thyroid shield during imaging procedures is mandatory; however, wearing lead gloves and headgear is optional [6].

Part 3: A. Analysis of Variance for Exposure to Radiation about Age of Healthcare Providers (N=120)

Analysis of Variance for Exposure to Radiation about Age of Healthcare Providers, the findings reveals that there is high significant difference between exposure to radiation and age group among healthcare providers at p-value=0.001.

This result agrees with study that reported People who are younger when they are exposed to the carcinogen have a greater chance of dying from it. Younger people have more stem cells, which may one day evolve into cancer cells, and their cells divide more rapidly and actively than do older people [7].

While, inconsistent with study "Assessment of DNA Damage in Medical Radiation Workers Using the Alkaline Comet Assay and the Chromosome Aberration", which reported that not significantly different between the age-related effects of medical radiation exposure on those who were exposed [8].

B. Independent Sample Test for Exposure to Radiation with regard to Gender of Healthcare Providers (N=120) Independent Sample Test for Exposure to Radiation with regard to Gender of Healthcare Providers, depicts that there is significant difference in exposure to radiation with regard to male healthcare providers at p-value=0.0.029. This finding agree with study, that found Residential radon exposure was associated with a greater risk of brain cancer mortality among women than men, and the link was more pronounced in females. For males, Spearman's Rho of 0.286 and for females, Spearman's Rho of 0.509 (p-value 0.001) were found

when the study was confined to municipalities with more than five observations of the radon concentration [9].

C: Analysis of variance for exposure to radiation about occupation of healthcare providers (N=120)

Analysis of Variance for Exposure to Radiation about Occupation of Healthcare Providers, illustrations that there is no significant difference between exposure to radiation and occupation of healthcare providers. this finding harmonizing with study which found that the link between breast cancer and occupational exposure to ionizing radiation is not statistically significant (OR =1.16; 95 percent confidence interval, 0.86 to 1.57) [10].

D: Analysis of variance for exposure to radiation about workplace department of healthcare providers (N=120)

Analysis of Variance for Exposure to Radiation about Workplace Department of Healthcare Providers, the findings reveals that there is high significant difference between exposure to radiation and workplace department of healthcare providers at p-value=0.001.

These results compatible with study which show that considerable disparities across departments and the radiation protection training obtained by the workers, according to the findings [11].

E: Analysis of variance for exposure to radiation about years of service among healthcare providers (N=120)

Analysis of Variance for Exposure to Radiation about Years of Service among Healthcare Providers, the findings demonstrations that there is no significant difference between exposure to radiation and years of service for healthcare providers. This findings in line with cohort study that conducted to assess the risk of radiation cataract genesis in interventionists and employees performing various operations in various interventional laboratories, who indicated that there was a substantial positive association between the years of working experience and the effective dose in the lens (P 0.001) [12].

CONCLUSION

The study found that majority of Healthcare Providers are at a low level of acute exposure to radiation, majority of healthcare Providers are at low risk due to exposure to radiation, Age, gender, and workplace have affected exposure to radiation among health care providers, and Occupation and years of services have not affected exposure to radiation among health care providers.

RECOMMENDATION

The study suggests the following based on its findings and conclusions.

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