

Assessment of Knowledge and Practices of Health Team Toward Radiation Hazards and it's Safety Measures at Assuit University Hospitals

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Abstract

Radiation is a threat to health in work place and in general environment. Workers in radiation therapy department are exposed to a variety of occupational hazards. Health care and safety measures compliance may decrease the health sequences of hazards occurrence. The study aimed to assess knowledge and practice of health care team about radiation hazards and it's safety measures. A descriptive design was used in this study. It was conducted at the Main Assuit University hospital and South Egypt Cancer Institute. A convenient sample (300) from health team workers from the previous setting. Two tools was used (1) Self administrative and interview questionnaire. (2) Health team observation check list. **Results:** There were significant statistical differences in relation between health team knowledge and their performance. The study concluded that health team had poor knowledge about radiation hazards and most of them had satisfactory practice about safety measures. It recommend that hospitals must be provide radiation departments with adequate personal protective equipment to reduce exposure of health system from radiation hazards and establish plans for periodical safety training courses and educational programs for health team members in radiation setting to help in improving their practice and update their knowledge.

Keywords: *Radiation.Safety measures. Knowledge &Practice.*

Introduction

Since the end of the 19th Century, man has learned to use radiation for many beneficial purposes. Today, many sources of radiation, such as x-ray machines, linear accelerators and radionuclide are used in clinical and research applications. Such beneficial uses may at times create potentially hazardous situations for personnel who work within the hospital (**Radiation Protection Guidance, 2010**).

Radiation is generated by common sources like the sun, radioactive materials and electronic devices. It can be classified as ionizing and non-ionizing. Ionizing radiation is also produced by certain human activities, such as medicine and industry, and may result from accidents in nuclear facilities and nuclear bomb explosions. It includes x-rays and gamma rays under any condition; also it includes atomic particles and non-ionizing radiation under certain conditions (**Amirzadeh, 2007**).

Ionizing radiation is energy or particles (protons, electrons or neutrons) produced by unstable atoms of radioactive materials .It is present in the environment ,as a result of both naturally occurring radioactive minerals and cosmic radiation arriving from outer space. Although ionizing radiation is used for beneficial purposes in medicine and industry. IT can present health hazards if it's not properly monitored and controlled (**WHO_a, 2014**).

Non ionizing radiation is the term given to radiation in the part of the electromagnetic spectrum where there is insufficient energy to cause ionizing but it has sufficient energy only for excitation. It includes electric and magnetic fields, radio waves, microwaves, infrared ultraviolet and visible radiation (**WHO_b, 2014**).

Radiation therapy employs ionizing radiation to treat diseases. Although it can be used to treat specific benign diseases, such as hyperthyroidism and benign brain tumours, it is most commonly used to treat malignant tumours. Although caners are often considered a disease of aging, with the majority of cases (76%) were diagnosed as cancer over the age of 55years, it occurs in people of all ages. An estimated number of cancer 1.399,780 persons were diagnosed in2006 excluding skin cancer (more than 1 million are diagnosed annually) in USA (**Gates et al., 2008**).

To protect the works in radiation therapy departments from radiation hazards should wear monitoring devices (e.g a film badge) to measure commutative radiation exposure. On the other hand the workers are protected from radiation by environmental design and rules of activity and location which assure shielding and distance from the radiation source and the walls of therapy room are thick concrete, in addition to personal protective devices such as helmet for head

protection, goggles for eye protection, and ear plugs for ear protection. Mask for lung protections etc (Mojiri & Moghimbeigi, 2011).

Occupational radiation protective measures are necessary for all individuals who work in the diagnostic imaging departments. This includes not only technologists and nurses, but also individuals who may be in a radiation environment only occasionally. All of these individuals may be considered radiation workers, depending on their level of exposure and on national regulations. All workers require appropriate monitoring continuously by common personnel dosimeters like film badge. They must also receive education and training appropriate to their jobs and protect by tools and equipment (Rahman, 2008).

The occupational health nurse has special knowledge about understanding of the principles of safety, toxicology, industrial hygiene, epidemiology and environmental health, additionally, special skills in training in safety hazards, disaster planning for military with safety equipment, ability to plan and implement health and educational program. Occupational health nurse are also required to have up to date knowledge of current legal standards that affect the working population (Smith, 2013).

Significance of the study

Radiation is a threat to health in their work place and in general environment, the extent of danger depends on the dose and type of radiation. Prolonged exposure to radiation can cause skin ulcers, damage to cells, cancer, premature aging, kidney dysfunction, cataracts, and genetic disorders in the children of those cells have been damaged (Wiley, 2008). According to (Cardis et al., 2007) who found that a significant association was seen between radiation dose and all-cause of mortality.

According to (Mohammed et al., 2012) Who found that 20% of exposed personnel of radiation have history of skin disease, hypotension and suffering from symptoms such as headache, dizziness, and tiredness. There was statistically significant difference in history of illness condition to work such as myocardial infarction, gastritis, eczema, fainting attacks and irregular uterine bleeding among exposed and non-exposed person.

Aim of the study

Objective of the study

Assess knowledge and practice of health care team about radiation hazards and its safety measures.

Research question:-

- What is the health team know about radiation hazards and its safety measures?

- What is the current health team practices regarding radiation hazards and its safety measures?
- Is there relation between health team knowledge about radiation hazards and their practices?

Subjects & methods

Research design

A descriptive research design was used in this study.

Setting

This study was conducted at Assuit University hospitals including the target population in the Main Assuit University hospital and South Egypt Cancer Institute. The present study included the following department (Diagnostic radiation, oncology and nuclear medicine department).

Sample

A convenient sample was used to include all health team at the two previous setting. (224) from Main Assuit University hospital and (76) from South Egypt Cancer Institute. The total sample size was (300) it divided into (5)department; radiologists (32) oncologists (34) nurses (45) technicians (126) and cleaners (63) working in the radiation department (diagnostic radiation, oncology and nuclear medicine department).

Tools of the study

Two tools were used to collect data for this study

Tool I

Self-administrative questionnaire for all health team expect cleaners number (237), and interview questionnaire for cleaners their number (63) and sheet was developed by the researchers to collect information from the participants. It includes two parts:

Part (1)

Included questions regarding Socio demographic characteristics of health team such as name, sex, age, marital status, working department, educational level, years of experience and occupation.

Part (2)

Knowledge of health team regarding to radiation hazards and its safety measures such as: definition, types, causes, uses, and effect of radiation on cells. Questions about health safety measures of radiation unit, personal protective equipment and types of occupational hazards and the effect of radiation on health, how to protect them-selves from occupational hazards, sources of information, most common diseases associated with radiation. Question related to factors affecting using safety measures such as availability of safety measures, periodical checkup, attending training regarding using personal safety measures, lack of follow up supervision and punishment against un used personal safety measures.

Scoring system

A score of 1 degree was given for each correct answer and a score of zero was given for an incorrect answer. The score of each item summed-up and then converted into a percent score. Poor knowledge: score less than 50%, Fair knowledge: if score is from 50-70% and Good knowledge: if score more than 70% (Abd Elzaher et al., 2014).

Tool II:

Observation check list was developed by the researchers to collect data related to performance of health team members regarding to application of radiation safety measures during their work. It include health team compliance to different types of personal protective equipment usage, such as wearing gloves, gown, suitable mask, head cap, and eye protective glass. Health team compliance to safe work procedure such as time, distance, shielding and hand washing. Work setting compliance to radiation safety policy such as training, health education given to patients before and after procedures Posting, labeling and security such as warning and caution signs displayed at door and equipment. Cleaning as follow standers of infection control.

Scoring system

Regarding to total scoring for health team practice .A score of 1 degree was given for each done and a score of zero was given for not done. The score of each item summed-up and then converted into a percent score. Poor practice: score less than 50%, fair practice: if score is from 50-70% and Good practice: if score more than 70% (Abd Elzaher et al., 2014) .

Methodology:**• Administrative phase**

An official letter approval was obtains from the dean of the Faculty of Nursing at Assuit University was sent to director of the main Assuit University hospital and the dean of South Egypt Cancer Institute. This letter included a brief explanation of the objectives of the study and a permission to carry out this research .

• Pilot Study

A pilot study was carried out before starting data collection on 30 members of health team in the two setting of radiation department which represent the studied sample in order to test the clarity and applicability of questions and statement, content, feasibility and consistency of the tool to detect any ambiguity in the study tools. The pilot study has also served to estimate the time required to full fill the study tool.

Validity of tool: To evaluate the tool validity. It was reviewed by five experts in nursing sciences.

III- Data collection Phase**Ethical considerations**

Written consent taken from director of the place and oral consent should be taken from all members of health team who participate in the study. The purpose of the study was explained for the director and every interviewed member of health team. Members of health team have ethical right to participate or refuse participation in the study; the information that obtained is confidential and used only for the purpose of the study.

Field work

Data was collected in the period from 21st February, 2015 to 5th July, 2015 The researchers introduce themselves and explain the purpose of the study for the participants. The average of time taken for completing each sheet was around 15-20 minutes depending on the persons' response to questions. The data was collected at Saturday, Sunday, and Monday at morning shift /week. About (3- 6) sheet and observation check list was finished daily. Observation check list done by the researchers themselves to assess radiologist, oncologist, nurse, technician and cleaners performance before, during and after finishing the work toward radiation safety measures on the actual and clinical situation of their work setting.

Statistical analysis

The collected data were tabulated and analyzed by computer using the "Statistical Package for the Social Sciences" (SPSS) version 16. Descriptive statistics such as frequency, mean, and standard deviation were utilized to analyze data. Relevant statistical tests of significance were used to identify the relations among the study variables. Chi square and correlations were used to compare difference in the distribution of frequencies between different groups. It was considered significant when p- values were less than 0.05. And to identify the significance of the relations, associations, and interactions among variables.

Results:**Table (1): Distribution of the Studied Sample Regarding to Their Socio Demographic Characteristics at Assiut University Hospitals 2015 (N =300).**

Variables	No. (n= 300)	%
Age: (years)		
< 30	107	35.7
30 –40	122	40.6
> 40	71	23.7
Sex		
Male	203	67.7
Female	97	32.3
Marital status		
Single	82	27.4
Married	216	72.0
Divorced &Widow	2	0.6
Pregnant now		
	N=69	%
Yes	9	13.0
No	60	87.0
Have children		
Yes	59	85.5
No	10	14.5
Years of marriage		
	N=69	%
< 5 years	27	39.2
5 - 10 years	19	27.5
> 10 years	23	33.3
Level of education		
Illiterate	20	6.7
Basic education	42	14.0
Secondary	43	14.3
Technical Institute	126	42.0
University	31	10.3
Post graduate	38	12.7

Table (2): Distribution of the Studied Sample According to their Working Condition at Assiut University Hospitals 2015 (N =300).

Variables	No. (n= 300)	%
Work place		
Main Assiut University Hospital	224	74.7
South Egypt Assiut Institute	76	25.3
Department		
Diagnostic Radiation	196	65.3
Nuclear Medicine and Oncology Unit	104	34.7
Occupation		
Radiologist	32	10.7
Oncologist	34	11.3
Nurse	45	15.0
Technician	126	42.0
Cleaner	63	21.0
Years of experience		
< 5 years	95	31.7
5 - < 10 years	83	27.7
10 - < 15 years	54	18.0
≥ 15 years	68	22.7

What is the health team know about radiation hazards and it's safety measures? Table(3,4,5)

Table (3): Knowledge of the Studied Sample About Radiation at Assuit University Hospitals 2015. (N =300).

Variables	No. (n= 300)	%
Definition of radiation		
Incorrect	233	77.7
Correct	67	22.3
Types of radiation		
Incorrect	203	67.7
Correct	97	32.3
Causes of radiation pollution		
The survey meter is not used correctly	12	4.0
The film bad age is not used correctly	53	17.7
The alarm ratemeter is not used correctly	5	1.7
All of the above	75	25.0
Don't know	155	51.7
A symptom resulting from an overexposure to radiation		
Somatic effects	80	26.7
Biological effects	6	2.0
Latent effects	43	14.3
Genealogy effects	2	0.7
All of the above	143	47.7
Don't know	26	8.7

Table (4): Knowledge of the Studied Sample About Radiation Therapy at Assuit University Hospitals 2015. (N =300).

Variables	No. (n= 300)	%
Define of radiation therapy		
Incorrect	232	77.3
Correct	68	22.7
Uses of radiation therapy		
Incorrect	27	9.0
Correct	273	91.0
Mechanism of radiation therapy		
Incorrect	85	28.3
Correct	215	71.7
Effect of radiation therapy on cells		
Cancer cells only	75	25.0
Healthy cells only	1	.3
Cancer& Healthy cells	171	57.0
Do not know	53	17.7
Types of radiation therapy		
Internal radiation therapy only	12	4.0
External radiation therapy only	7	2.3
All of the above	210	70.0
Do not know	71	23.7
Factors determine the number and duration of radiation therapy sessions:#		
Type of tumor	136	45.3
Patient's age	38	12.7
Patient's weight	52	17.3
Patient's sex	12	4.0
Don't know	151	50.3

Variables	No. (n= 300)	%
Time of radiation therapy session		
Incorrect	78	26.0
Correct	222	74.0
Special precautions of radiation therapy		
Incorrect	111	37.0
Correct	189	63.0
Radiation used for all types of cancer treatment		
Yes	202	67.3
No	98	32.7

More than one answers according their responses

Table (5): Knowledge of the Studied Sample About Safety Measures at Assiut University Hospitals 2015. (N =300).

Variables	No. (n= 300)	%
Importance of safety tools		
Incorrect	25	8.3
Correct	275	91.7
Knowledge about personal measures for health team:#		
Gloves and suitable shoes	204	68.0
Gown	131	43.7
Apron from lead	121	40.3
Monitoring badges	103	34.3
Mask	74	24.7
Eye protective glass	68	22.7
Head cup	7	2.3
Do not know	69	23.0
Safety precaution for the unit of radiation		
Present	226	75.3
Not present	74	24.7
Safety characteristics for the unit of radiation:#		
	N=226	
Lead walls and glass	191	84.5
Ground floor easy to clean and not absorb radiation	135	59.7
Barrier	133	58.8
Good ventilation	88	38.9
Warning devices	50	22.1
Monitoring badges	47	20.8
Complete emergency equipment	4	1.8
Special containers for keeping radioactive materials	2	0.9
Do not know	20	8.8
Safety characteristics for radiation devices		
Have the ability to move easily	192	64.0
Have the ability to absorb radiation	67	22.3
Containing soft lighting	7	2.3
Other	7	2.3
Do not know	27	9.0

More than one answers according their responses

What is the current health team practices regarding radiation hazards and it's safety measures? Table (6)

Table (6): Distribution of the Studied Sample According to Radiation Safety Practices at Assiut University Hospitals 2015 (N =300)

Variables	Done		Not done	
	No.	%	No.	%
Health team compliance to personal protective equipment				
Wearing gloves at all time	159	53.0	141	47.0
Wearing gown at all time	115	38.3	185	61.7
Wearing suitable mask	60	20.0	240	80.0
Wearing appropriate monitoring badges	22	7.3	278	92.7
Wearing head cup	6	2.0	294	98.0
Wearing eye protective	10	3.3	290	96.7
Compliance to safe work procedure				
Safe work practice adapted to make appropriate use of time	221	73.7	79	26.3
Safe work practice with suitable distance	213	71.0	87	29.0
Safe work practice with shielding	174	58.0	126	42.0
Regular hand washing after each procedure	132	44.0	168	56.0
Eye washing	15	5.0	285	95.0
Training				
Were provided appropriate safety training before starting their work	22	7.3	278	92.7
Were given regular refresh radiation safety training	22	7.3	278	92.7
Do report	22	7.3	278	92.7
Record of training are keeping	22	7.3	278	92.7
Health education				
Give patient instructions before procedures	233	98.3	4	1.7
Give patient instructions after procedures	233	98.3	4	1.7
Posting, Labeling and Security				
Are radiation warning signs displayed at the door	299	99.7	1	.3
Are caution signs grinding equipment	297	99.0	3	1.0
Contamination areas and items labeled and proper decontamination procedures used	27	9.0	273	91.0
Cleaning				
Clean department every shift	44	69.8	19	30.2
Clean surface with antiseptic solution	63	100.0	0	0.0
Follow standers of infection control	63	100.0	0	0.0

Is there relation between health team knowledge about radiation hazards and their practices? Table (7,8).

Table (7): Relationship Between Total Score of Studied Sample knowledge About Radiation Hazards and | at Assiut University Hospitals 2015 (N =300).

Variables	Level of performance						P-value
	Poor (n= 114)		Fair (n= 157)		Good (n= 29)		
	No.	%	No.	%	No.	%	
Department							
Diagnostic Radiation	76	66.7	108	68.8	12	41.4	0.016*
Nuclear Medicine and Oncology Unit	38	33.3	49	31.2	17	58.6	
Age: (years)							
< 30	44	38.6	49	31.2	14	48.3	0.341

Variables	Level of performance						P-value
	Poor (n= 114)		Fair (n= 157)		Good (n= 29)		
	No.	%	No.	%	No.	%	
30 – 40	47	41.2	66	42.0	9	31.0	
> 40	23	20.2	42	26.8	6	20.7	
Sex							
Male	76	66.7	114	72.6	13	44.8	0.013*
Female	38	33.3	43	27.4	16	55.2	
Level of education							
Illiterate	14	12.3	6	3.8	0	0.0	0.000*
Basic education	27	23.7	15	9.6	0	0.0	
Secondary	13	11.4	22	14.0	8	27.6	
Technical Institute	10	8.8	102	65.0	14	48.3	
University	25	21.9	4	2.5	2	6.9	
Post graduate	9	7.9	18	11.5	11	37.9	
Occupation							
Radiologist	28	24.6	2	1.3	2	6.9	0.000*
Oncologist	20	17.5	10	6.4	4	13.8	
Nurse	14	12.3	22	14.0	9	31.0	
Technician	10	8.8	102	65.0	14	48.3	
Cleaner	42	36.8	21	13.4	0	0.0	
Attending training courses about radiation therapy							
Yes	2	1.8	12	7.6	9	31.0	0.000*
No	112	98.2	145	92.4	20	69.0	

Table (8): Relationship Between Total Score of Studied Sample Practices About Radiation Safety Measures and their Personal Characteristics at Assiut University Hospitals 2015 (N =300).

Variables	Level of performance						P-value
	Poor (n= 114)		Fair (n= 157)		Good (n= 29)		
	No.	%	No.	%	No.	%	
Department							
Diagnostic Radiation	76	66.7	108	68.8	12	41.4	0.016*
Nuclear Medicine and Oncology Unit	38	33.3	49	31.2	17	58.6	
Age: (years)							
< 30	44	38.6	49	31.2	14	48.3	0.341
30 – 40	47	41.2	66	42.0	9	31.0	
> 40	23	20.2	42	26.8	6	20.7	
Sex							
Male	76	66.7	114	72.6	13	44.8	0.013*
Female	38	33.3	43	27.4	16	55.2	
Level of education							
Illiterate	14	12.3	6	3.8	0	0.0	0.000*
Basic education	27	23.7	15	9.6	0	0.0	
Secondary	13	11.4	22	14.0	8	27.6	
Technical Institute	10	8.8	102	65.0	14	48.3	
University	25	21.9	4	2.5	2	6.9	
Post graduate	9	7.9	18	11.5	11	37.9	
Occupation							
Radiologist	28	24.6	2	1.3	2	6.9	0.000*
Oncologist	20	17.5	10	6.4	4	13.8	
Nurse	14	12.3	22	14.0	9	31.0	

Variables	Level of performance						P-value
	Poor (n= 114)		Fair (n= 157)		Good (n= 29)		
	No.	%	No.	%	No.	%	
Technician	10	8.8	102	65.0	14	48.3	0.000*
Cleaner	42	36.8	21	13.4	0	0.0	
Attending training courses about radiation therapy							
Yes	2	1.8	12	7.6	9	31.0	
No	112	98.2	145	92.4	20	69.0	

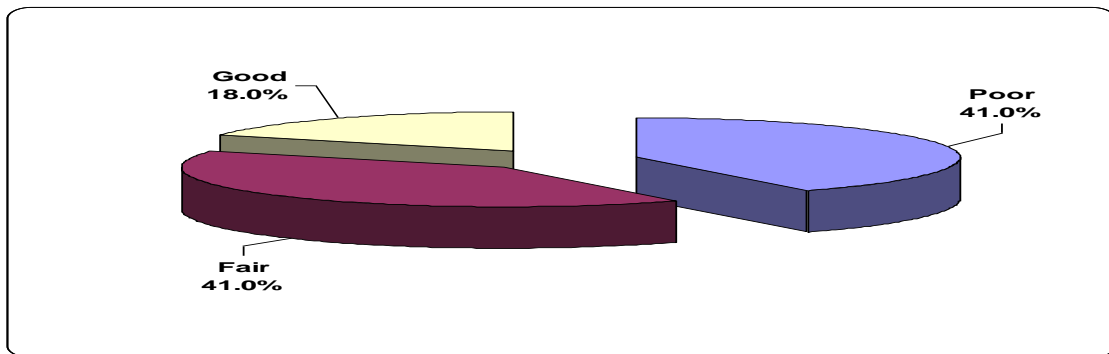


Fig. (1): Distribution of Studied Sample Regarding Their Total Score Of Knowledge About Radiation Hazards at Assiut University Hospitals 2015 (N=300)

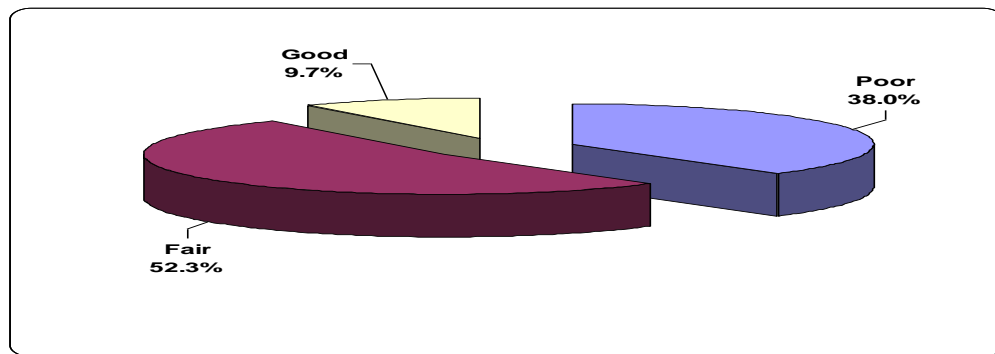


Fig. (2): Distribution of Studied Sample Regarding Their Practices Score About Radiation Safety Practice at Assiut University Hospitals 2015.(N=300)

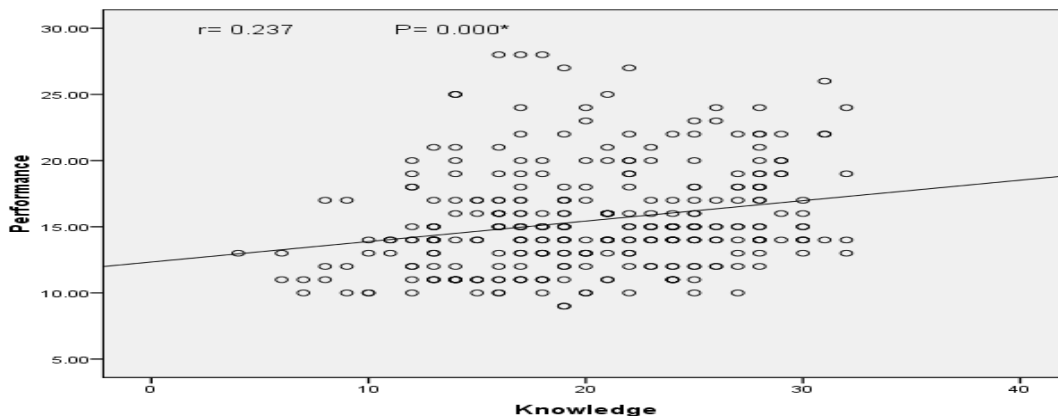


Fig. (3): Correlation Between Total Scores of Knowledge And Total Score Of Practice Among the Studied Sample Regarding Radiation Safety Measures at Assiut University Hospitals 2015.

Table (1): Distribution of the studied sample regarding to their socio demographic characteristics. Regarding their age it was noticed that 40.7 % of the workers aged between 30-40 years followed by 35.7% aged <30years. Regarding marital status it was observed that 72.0% were married and 42.0 % of the studied workers had technical institute. While only 6.7 % were illiterate.

Table (2): Shows distribution of the studied sample according to their working condition at Assuit university hospitals. It was noticed that 65.3% of study sample were working at diagnostic radiation and 34.7% of them were working at nuclear medicine and oncology unit. Concerning occupation, 42.0% of study sample was technician followed by 21.0% were cleaners and 15.0% were nurses. 31.7% had job experience less than 5years and 18.0% of them had job experience less than 15 years.

Table (3): Illustrates that knowledge of the studied sample about radiation. It revealed that 22.3% of studied sample defined radiation correctly. While 25.0% of them had right knowledge about the causes of radiation pollution. 47.7% of them had right knowledge about symptom resulting from an over exposure to radiation

Table (4): It reveals that 71.7 % of studied sample had right knowledge about the mechanism of radiation therapy. 57.0% of them had known the effect of radiation therapy on cancer and health cells. 70.0% of them mention types of radiation therapy. While 63.0% had knowledge about special precautions of radiation therapy.

Table (5): Illustrates knowledge of the studied sample regarding safety measures. 91.7% of studied sample mention the importance of safety tools correctly (Protected from exposure to radiation). It was observed that 68.0 % of the studied sample reported gloves and suitable shoes for safety tools of health team, while about 2.3 % of them reported head cap. Also 75.3% of studied sample said safety precaution for the unit of radiation was present. The results also revealed that 84.5 % of the studied sample stated that was lead walls and glass for safety characteristics of radiation unit, while about 1.8%, 0.9% stated that complete emergency equipment and special containers for keeping radioactive materials.

Table (6): Reveals the distribution of the studied sample according to radiation safety practice. It was observed that 53.0% of the studied sample were wearing gloves at all time .7.3% of them having personal monitoring badages. And 2.5% of them wearing head cap that they mentioned it was not enough in the unit. While 73.7% were made safe work practice adapted to make appropriate use of time. It was noticed that only 7.3% of the sample were given radiation safety training .Although 98.3%

of them were given patient instructions before and after producers. Concerning to radiation warning signs and caution signs grinding equipment observed that 99.7% of studied sample displayed at the door. Regarding the cleaning it was observed that 69.8% of cleaner was cleaned department every shift and all of them used antiseptic solution and follow standers of infection control.

Table (7): Represents relationship between total score of studied sample knowledge about radiation hazards and their personal characteristics . This table shows that there was statistical significant difference were found between studied sample level of education, occupation and their total score of knowledge about radiation hazard. P. value (0.000and 0.000) respectively.

Table (8): Reveals that Relationship between total score of studied sample practices about radiation safety measures and their personal characteristics at Assuit university hospitals. This table shows that there were statistical significant difference were found between studied sample department , sex ,level of education , occupation and attending training courses and their total score of studied sample practices about radiation safety measures. P. value (0.016, 0.013, 0.000 ,0.000and 0.000) respectively.

Fig. (1): Distribution of studied sample regarding their total score of knowledge about radiation hazards at Assuit university hospitals2015. (N=300)

Fig. (2): Show distribution of studied sample regarding their practices score about radiation safety practices at Assuit university hospitals 2015. (N=300)

Fig.(3): Illustrates that correlation between total scores of knowledge and total score of practices among the studied sample regarding to radiation safety measures .There was a positive correlation between total score of studied studied sample knowledge and total score of studied sample practices regarding radiation safety measures with high statistically significant difference ($r = 0.237$; $p = 0.000$).

Discussion

Radiation is a threat to health in work place and in general environment, the extent of danger depends on the dose and type of radiation. Prolonged exposure to radiation can cause skin ulcers, damage to cells, cancer, premature aging, and kidney dysfunction, cataracts, and genetic disorders in the children of those cells have been damaged (**Gawenda, 2008**).

The findings of the present study regarding to studied sample socio demographic characteristics and work condition revealed that more than one third of them were females .This is congruent with (**Alex, 2006**) who study high radiation exposure among female

radiologist and reported that there were significantly higher proportion of female off spring.

The findings of the present study showed that the range of the studied sample age more than two fifth were (30-40) year's old this age composition of workforce affects its health status as younger employees may be at increased risk of hazards due to limited job training and skills. This findings agreed with **(Ebrahim et al., 2011)** who study compliance to safety measures toward radiation hazards among heath.

Concerning studied sample educational level, the finding of the current study indicated that less than half were secondary level of education which was expected as technical workers .This findings agree with the report of **(Central Agency for Public Mobilization & statistics 2009)** about work hazards in Egypt revealed that majority of workers to be risk had secondary or technical level of education.

Regarding to years of experience at work in radiation therapy at the present study show that nearly one third of studied sample had 5 years of experience it was proved that young workers had higher risk due to different reasons such as having less experience, less training, curiosity risk taking. This results disagreed with **(Rahman, 2008)** who found that less than half of the studied sample had years of experience from (7-10) years.

Concerning studied sample knowledge about types of radiation therapy, time of radiation session, parts of body affected by radiation, the most affected age of radiation exposure, and importance of safety measure corresponding to nurses and clerk had un satisfactory awareness about radiation therapy .This congruent with **(Quhain et al., 2007)** who study knowledge and practice of radiation safety among non radiologist and found 22% of non-radiologist (nurses and clerk) had satisfactory knowledge about effect of radiation on the body system. This attributed to low education and they are not interested in improving their knowledge

As regard to studied sample knowledge about safety measures in radiation unit the findings of the present study revealed that the majority of studied sample had fair knowledge about safety measures. This was accordance with **(Quhain et al., 2007)** who reported that the majority of studied sample didn't receive adequate radiation protection teaching.

Radiation safety training at radiation department takes a different approach than the traditional methods and topics used at other facilities, where the more routine radiation users focused on standard of training topics of contamination control, area survey, and time, distance, and shielding, radiation safety measure must be centered on preventing accidents and hazards (**Rothmore, 2008**) .

In relation to PPE compliance in the present study was observed that more than half of health team was wearing gloves, less than quarter of them wearing mask, and 7.3% wearing monitor devices that causes of non compliance by insufficient or uncomfortable wearing of personal protective equipment. .This was accordance with **(Pak, 2008)** who found that less than one third of health team used radiation protective measures such as eye glasses and lead aprons, only 7% regularly utilized dose badge to monitor the exposure.

Robinson & Grainger, (2006) who reported that the triad of radiation protection actions comprise of 'time- distance- shielding reduction of exposure time, increasing distance from source, and shielding of patients and occupational workers have proven to great importance in protecting patient, personnel, and members of the potential risk of radiation. Poster and signs and periodical check up to work environment .This congruent with **(Wai, 2009)** who study in medical surveillance for radiation workers and the role of occupational physician and stated that the 82% of the workers had safety training course during the work.

In this study regarding to safe work procedures compliance it was observed that 58.0% and 71.0% of studied sample complained with safe shielding, and safe distance, 44.0% of them regularly hand washing, and 73.7% were complained with safe time this explained to a weariness of radiation polices . This contradicted with **(Reagan , 2010)** who study factors related to radiation safety practice in California and found compliance of employee to radiation safety practice were 77.1% compliance to safety practice and 70.5% compliance with personal safety measures.

In relation to work site safety measures policies the result of present study revealed that majority of studied sample had not attending training course about radiation safety they compliance by safety waste disposal, poster and signs and periodical check . In present study there were significant statistical differences between knowledge and personal characteristic this explained that age, years of experience, level of education and job training that all increasing awareness about radiation hazards. These findings agree with **(Wucher & Loose 2009)** who study occupational exposure to radiation and found significant relation between the knowledge and the socio demographic characteristics. Also agree with **(Sheyn et al., 2008)** in their research about efficacy of radiation safety education initiative in reducing radiation exposure.

This result indicated that a positive association between education and safety awareness. High educated workers recorded the best awareness on

safety they indicated the highest level of job satisfaction were the most compliance with safety procedure and the most awareness to radiation hazards.

In the present study there were significant statistical differences between studied sample performance and their type of occupation. Regarding radiation safety measures the radiographer (Technician) had best level of performance than the rest of studied sample members due to specialization of them. This was agree with the findings of (Rothmore, 2008) who was found that radiographer had a highest level of performance of the staff about radiation safety measures.

In present study found that there was significance statistical difference in relation between studied sample gender and their performance. That the females had best performance than males due to their follow the instructions and they afraid from infertility. This contradict with (Niklson et al, 2006) who study the avoidance of radiation injures from medical interaction procedures; they found that there were no relation between compliance and gender.

In the present study it was observed that there was a significant statistical difference in relation between studied sample education level and their practices of safety measures p value=0.000. Also there was a significant statistical difference in relation between studied sample practices and there experience it means that more years of experience lead to best level of performance .This result agree with (Reagan, 2010) who found that years of employment in radiological were significantly to adherence with safety practices.

This study finding that there were significant statistical differences between studied sample knowledge and their performance. This attributed that more knowledge of radiation hazards lead to more compliance.

Conclusion

The study concluded that less than half of the studied sample (41%) having poor knowledge regarding radiation hazards. There was statistical significant difference were found between studied sample work place, level of education ,occupation and years of experience and their total score of knowledge about radiation hazard P. value (0.029,0.000, 0.000and0.005) respectively. More than half of them having satisfactory practice. Also there were statistical significant difference were found between studied sample department , sex ,level of education , occupation ,years of experience and attending training courses and their total score of studied

sample practices P. value (0.016, 0.013, 0.000, 0.000,0.000and 0.000) respectively .

There was a significant difference was found between score of knowledge and practice. There was a positive correlation between knowledge and practice of the studied sample regarding radiation safety measures

Recommendations

Based on the previous findings of the present study, the following recommendations are suggested

- The hospitals must be provide radiation departments with adequate personal protective equipment to reduce exposure of the studied sample from radiation hazards.
- Develop a plans for periodical safety measures training courses and educational programs for the studied sample member in radiation setting to help in improving their practice and update their knowledge.

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