Knowledge, Attitude and Practice of Radiology Technicians in Ain-Shams University Hospitals regarding Ionizing Radiation Health Hazards

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LIST OF ABBREVIATIONS

&	And
AAED	Annual Average Effective Dose
ABCC	Atomic Bomb Casualty Commission
AIP	American Institute of Physics
ALARA	As Low As Reasonably Achievable
ATSDR	Agency for Toxic Substances and Disease Registry
BEIR	Biological Effects of Ionizing Radiation
Bq	Becquerel
CAs	Chromosome Aberration
CCOHS	Canadian Center For Occupational Health And Safety
CDC	Center Of Disease Control
CI	Confidence Interval
Ci	Curie
CNSC	Canadian Nuclear Safety Commission
Cm	Centimeter
CT	Computerized topography scan
DNA	Deoxyribonucleic Acid
DTPA	Diethylenetriamine Penta-acetate
DR	Dose Response
EAEA	Egyptian Atomic Energy Authority
e.g.	Example
eV	Electronvolts
F	ANOVA (Analysis of variance) test
FAO	Food & Agriculture Organization
GBq	Giga Becquerel
GI	Gastrointestinal
GM	Geiger Mueller
Gy	Gray
I-131	Iodine-131
IAEA	International atomic energy agency

ICRP	International Commission On Radiological Protection
ILO	International Labour Organization
IR	Infrared
KBq	Kilo Becquerel
KI	Potassium Iodide
LD50	50% Lethal Dose
LD50 / 60	50% Lethal Dose In 60 Days.
Li F	Lithium Florid
LNT	Linear Non Threshold
LSS	Life Span Study
MBq	Mega Becquerel
MCH	Mean Corpuscular Hemoglobin
MCHC	Mean Corpuscular Hemoglobin Concentration
MeV	Mega Electronvolts
Mm	Millimeter
MOHP	The Ministry Of Health And Population
MRI	Magnetic Resonance Imaging
mSv	Millisievert
MW	Microwaves
NA	Not Applicable
NAS	National Academy Of Sciences
NCEH	National Center for Environmental Health
NCIPC	National Center for Injury Prevention and Control
No.	Number
Obs. & Gyna.	Obstetrics & gynecology
OR	Operation Room
ORP	Occupational Radiation Protection
OSHA	Occupational Safety Health Administration
OSLDs	Optically Stimulated Luminescence Dosimeters
PET scan	Positron emission topography scan
PME	Periodic Medical Examination
PNRA	Pakistan Nuclear Regulatory Authority

PPD	Personal protective device
PPE	Personal Protective Equipment
R	Roentgen
(r)	Pearson correlation co-efficient
Rad	Radiation absorbed dose
RERF	Radiation Effects Research Foundation
RF	Radiofrequency
RPII	Radiological Protection Institute of Ireland
SIT	The Sterile Insect Technique
SPECT	Single Photon Emission Computed Tomography
Sv	Sievert
TLDs	Thermoluminscent Dosimeters
t test	Student t test
UN	United Nations
UNSCEAR	UN Scientific Committee On The Effects Of Atomic Radiation
US EPA	United States Environmental Protection Agency
US NRC	United States Nuclear Regulatory Commission
UV	Ultraviolet
WHO	World Health Organization
WNA	World Nuclear Association
$\chi 2$	Chi-square test

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ABSTRACT

Radiation exposure in hospitals account for the largest number of workers occupationally exposed to radiation.

The study aim was to measure the knowledge, attitude and practice of radiology technicians regarding radiation health hazards and radiation safety measures. The study included 61 radiology technicians working in Ain-Shams university Hospitals. An interview Arabic questionnaire and an observational checklist was used to collect the data.

Result of this study showed that 23 (37.7%) technicians scored less than 50% in the radiation knowledge score and 55 (90.2%) technicians scored 50% or more in radiation safety attitude score. However a defect in adopting radiation safety practices was found as 56 (91.8) technicians scored less than 50 % in radiation safety practice score. There was a statistically significant association between technicians' usage of leaded aprons and technicians' age and duration of experience in radiology. A statistically significant association was found between using dosimeters and gender and attending radiation safety courses. A statistically significant association between gender and performing periodic medical examination was found. And between the hospitals were technicians worked and performing periodic medical examination.

It was also found from the observational checklist that all observed radiology units hospitals had radiation warning signs posted. However it was observed that none of the radiology units had a label for the last machine maintainace nor had any radiation safety manual available and none of the radiology units had an emergency protocol posted.

It is recommended to provide radiation safety course and revise the content of already available courses.

Keywords: Radiation safety, knowledge, Attitude, Practice, Radiation health hazards

INTRODUCTION

Wilhelm C. Roentgen discovered X-rays on 8 November 1895 and since then X-rays has been used in different areas of everyday life, such as medicine, agriculture, geology, mining, industry, scientific applications and Nuclear power (***Szarmach et al, 2015).***

Radiation exposure can cause severe health hazards. The extent and severity of these health hazards differ according to the radiation dose, dose rate; whether acute or chronic exposure rate and surface of the exposed body part; whether localized or generalized radiation exposure ***(CDC, 2015).***

Awareness of ionizing radiation health hazards began early in 1902 as skin cancer occurrence in radiologists raised questions about radiologists' safety and health hazards due to radiation exposure ***(Frieben, 1902).*** In 1940, it was noticed that there are increase in mortality rates due to leukemia among radiologists ***(Henshaw & Hawkins, 1944), (Ulrich, 1946)*** and ***(Lewis, 1957)***

A study in 1958, to investigate mortality rates among British health care workers found that, there was an increase in deaths due to cancer among radiologists who practiced before1921 (as 1921 is the year when it was first advised to adopt radiation protection and a committee was established) ***(Court Brown & Doll , 1956)***.

In 1956, the United States National Academy stated in its report that American radiologists' average age of death is five years less than non-radiologists physicians ***(National Academy of Sciences, 1956).***

Radiation is used in medicine for diagnostic and therapeutic purposes; radiation is used in diagnostic techniques as X- rays, CT scan, single photon emission computed tomography (SPECT)" diagnostic techniques use radioisotope" and also in positron emission tomography (PET). Radiation is used in Nuclear Medicine, interventional radiology and Radiotherapy in Oncology as well ***(United States nuclear regulatory commission US NRC, 2014).***

Radiation protection is mandatory; especially with the growing widespread use of radiation in different medical procedures. Radiation exposure in hospitals accounts for the largest number of workers occupationally exposed to radiation ***(Holmberg et al, 2010).***

Sometimes when radiology technicians are busy in performing procedures they may neglect that radiation can cause health hazards and forget the radiation safety practices especially that radiation is invisible and odorless; they forget to use radiation protection equipment resulting in exposing themselves to un-necessarily higher levels of radiation. One of the fundamental

reasons of excessive radiation exposure is the fact that many of the healthcare workers involved with radiation have received only basic radiation training and their knowledge about radiation safety measures may be insufficient ***(Kiah and Stueve, 2012).***

According to Egyptian labor law of Occupational Safety and Health and work environment security, sections 216,217 and 218, Workers have a right to a safe workplace and to know about all potential hazards in the workplace and to know how to protect themselves ***(Egyptian Labour Law, 2016)***, workers have the right to know what hazards are present in the workplace, its effect on their health and how to protect themselves.

Awareness of workers occupationally exposed to ionizing radiation regarding radiation induced health hazards and radiation safety guidelines is important, previous studies shows that there was lack of radiation safety knowledge among radiation exposed workers in hospitals ***(Kiah and Stueve, 2012).***

A study was conducted in Oxford and South Wales specialized hospitals and 130 physicians and radiologists were included. None of the participants knew the unit of measurement of radiation, 97% of the participants under-estimated the actual dose in each of radiological investigations. Moreover some physicians thought that ultrasound and magnetic resonance imaging (MRI) investigation uses ionizing radiation (5% and 8% respectively) ***(Shiralkar et al, 2003).***