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Knowledge, Attitudes and Practices Regarding Radiation Protection Among Radiotechnologists in Governmental Hospitals in Gaza Governorates

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Knowledge, Attitudes and Practices Regarding Radiation Protection Among Radiotechnologists in Governmental Hospitals in Gaza Governorates

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Dedication

To my father and brother spirits,

To my lovely mother,

To my brothers and sisters,

To my friends and colleagues,

To every one wants to be better

I dedicate this work

Safaa Abu Draz

Declaration:

I certify that this thesis submitted for the Degree of Master, is the result of my own research, except where otherwise acknowledged, and that this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Signed……………………………

Safaa Mohammed Abu Draz

Date: June 2009

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Abstract

For over a century, radiation has been used in medicine. It is also considered as a hazardous agent in the workplace. Therefore, the application of protection guidelines is very important to minimize the health risks from radiation.

This descriptive cross sectional study aimed to evaluate the radiotechnologists knowledge, attitudes and practices about radiation protection in the eleven governmental hospitals which provide radiological services in Gaza Strip. Close ended structured questionnaire containing 69 questions had been distributed among 135 radiotechnologists through face to face interview, with a response rate was 91.2%. The validity of this questionnaire was confirmed by six experts. A pilot study was carried out to test the applicability of the study instrument and the Statistical Package for Social Science (SPSS) version 13 was used for the data entry and analysis including frequency for each item, descriptive, independent-t test and one-way analysis of variance (ANOVA).

The study showed that, the mean of knowledge was 9.5 (out of 20) while the mean attitude was 16.5 (total scores 20) and that of practice was 5.6 (total scores 18). Of studied radiotechnologists only 4.5% obtained high knowledge scores and about 87.9% have high attitude scores while none of the study participants achieved a high practice scores. The study has indicated that, the radiotechnologists have high concern toward radiation protection, but they have inadequate knowledge while their proper practices were not adequate toward radiation health hazards. According to the study results the major recommendations include performing continuous training, an educational courses and more efforts should be exerted to improve the current situation of radiation protection among the radiotechnologists in Gaza governmental hospitals. Also, reviewing radiation protection educational materials applied in Gaza universities curricula is highly recommended.

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List of Abbreviations

ALARA	As Low As Reasonably Achievable
ANOVA	0ne Way Analysis of Variance
DNA	Deoxyribo Nucleic Acid
EPA	Environmental Protection Agency
ICRP	International Commission on Radiological Protection
IAEA	International Atomic Energy Agency
KAP	Knowledge, Attitude, Practice
MOH	Ministry Of Health
NAS	National Academy of Sciences
NCRP	National Council on Radiation Protection
NIOSH	National Institute of Occupational Safety and Health
NOHSC	National Occupational Health and Safety Commission
RSNA	Radiological Society of North America
SPSS	Statistical Package for Social Science
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation

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Chapter (1)

Introduction

Chapter One

Introduction

1.1 Research background

Radiation is a form of energy traveling through space or matters, emitted by unstable atom, which have an excess energy released as particles or waves to become more stable (Martin and Sutton, 2002). It can be ionizing radiation, which has enough energy to damage the material it interacts with, as alpha, beta particles, x-ray and gamma rays, or it may not have enough energy to ionize atom and this type is called non-ionizing radiation as radio waves, TV waves, visible light and micro waves (Martin and Sutton, 2002).

Nowadays, radiation is playing an important role in different fields as industries, generation of electrical power, sterilization of food, in diagnosing many diseases and therapy of cancer cases (National Academy of Sciences (NAS), 2006). In spite of these great benefits, radiation exposures have adverse effects on our health, where the exposure to large doses can cause death within a few days or months, while exposure to lower doses over long periods of time lead to increase the risk of cancer and genetic mutations which appear in the future generations of the exposed persons (NAS, 2006; Zakora, 2001; Bashore, 2001).

Awareness and application of protection guidelines against radiation is very necessary, especially among the occupational staff (Amirzadeh and Tabatabaee, 2005). Awareness can be increased by training that should be as a part of an integral radiation protection program (Soye and Paterson, 2008; National Institute of Occupational Safety and Health (NIOSH), 2005; European Commission, 2000).

1.2 Research problem

In Gaza strip, there is no radiation protection programs, where the radiotechnologists do not have training, educational courses or clear protection guidelines, and they have no regular monitoring of their occupational doses (Abbas, October 2008, Personal interview).

All the above mentioned actions result in great problems to the general health of the radiotechnologists, patients and the public as a whole and make the radiotechnologists under the occupational health hazards. The level of radiotechnologists knowledge, attitudes and practices (KAP) is unknown, so this study is a modest trial to highlight the level of KAP regarding radiation protection among the radiotechnologists in the presence of the previous mentioned situations.

1.3 Justifications of the study

The evaluation of KAP among the radiotechnologists can be considered as an indicator to the radiation protection awareness status. It may be help the planners and decision makers to modify the future plans regarding protection to be more effective and valuable in improving the radiation protection knowledge among the radiotechnologists and the actions that should be taken to reduce the ionizing radiation health hazards. This study is an attempt to highlight the radiation protection situation in the radiological departments at Gaza governorates, and to address the radiotechnologists occupational hazards.

1.4 Study objectives

1.4.1. General objective:

The general objective of this study is to evaluate the level of knowledge and attitudes toward radiation protection and the practices among radiotechnologists in Gaza governmental hospitals.

1.4.2. Specific objectives:

- To identify the level of knowledge about radiation risks and protection among the radiotechnologists in Gaza governmental hospitals.
- To determine the radiotechnologists attitude towards radiation risks and protection.
- To describe the actual practices of the radiotechnologists on radiation protection.
- To examine the effects of socio demographic factors such as radiotechnologists age, gender, marital status, work region, educational level, second work at private centers and the years of experience on their KAP levels about radiation protection.
- To assess the relationship between the radiation protection knowledge, attitude and practice among the radiotechnologists.

- To suggest recommendations that may help in improving the radiation protection status among the radiotechnologists.

1.5 Research hypotheses

- The radiotechnologists have low level of knowledge about radiation protection.

- The radiotechnologists have low attitudes toward radiation protection.

- There is a low practices' level among the radiotechnologists regarding radiation protection.

- There is a statistically significant relationship between the radiotechnologists knowledge about radiation protection and their age, gender, education, experience, marital status, workplace and second work in private centers.

- The radiotechnologists attitudes differ according to their age, gender, education, experience, marital status, workplace and second work in private centers.

- Statistically significant differences in practices are present among the radiotechnologists due to their age, gender, education, experience, marital status, workplace and second work in private centers.

1.6 Radiation services in Gaza governorates

Gaza Strip is a narrow land, located on the south of Palestine on the coast of Mediterranean Sea, it is a high crowded area, where approximately 1.5 million live only in 365 sq. km, estimated density is 4,000 people per square kilometer (Ministry of health (MOH), 2006).

In Gaza governorates, there are 11 governmental hospitals (out of 13) that provide radiological services, which range between routine X-ray, Fluoroscopy procedures, Computer Tomography, Mammography, Panorama, Ultrasonography and Magnetic Resonance Imaging, while the remaining radiotherapy and nuclear medicine services not provided due to the Israel obstacles in provide the isotopes materials which needed in these types of medicine applications (Abbas, October 2008, Personal interview).

1.7 Operational definitions

- **Attitude** is a concept in psychology. Attitudes are positive, negative or neutral views of an "attitude object" as a person, behavior or event (Jung, 1966).

- **Collimator** a device used for limiting the size and shape of the primary radiation beam (Atomic Energy Regulatory Board (AERB), 2001).

- **Filter** a radiation attenuating material incorporated in the path of the radiation beam to absorb preferentially the less penetrating components of the useful beam. It may consist of a permanent filter which is an integral part of the X-ray tube housing and which cannot be removed by the user, and/or an added filter which is intended to increase the total filter thickness (AERB, 2001).

- **Grid** a device composed of alternate strips of lead and radiolucent material encased and suitably placed between the patient and X-ray film to absorb scattered radiation(AERB, 2001).

- **Knowledge** is the capacity to aquire, retain and use information; a mixture of comprehension, experience, discernment and skill (Badran, 1995).

- **Occupational exposure** refer to the exposure of a worker that is received during a period of work (International Atomic Energy Agency (IAEA), 2007).

- **Practice** means the application of rules and knowledge that leads to action. Good practice is an art that is linked to the progress of knowledge and technology and it's executed in an ethical manner (Badran, 1995).

- **Radiation** electromagnetic waves or particles, propagated through space or through a material medium (NOHSC, 2002).

- **Radiation protection** is the science concerned with the protection of the personnel, patient and the public from unnecessary radiation (Martin and Sutton, 2002).

1.8 General review of the study

The researcher will present her study about radiation protection KAP among radiotechnologists in governmental hospitals in Gaza governorates in five chapters, starting with chapter one which includes background about the radiation, problem statement, justification of implementing this study, study objectives and hypothesis.

In chapter two, the researcher will highlight the conceptual framework of the study, radiation sources, uses of radiation in medicine, types of exposure. Also the researcher will clarify the biological effects of the radiation, and then the meaning of radiation protection, principles and actions are presented. Finally studies regarding radiation health risks and protection aimed to evaluate the KAP level are presented in this chapter.

In chapter three the researcher will describe the main methodology parts of the study, which include; study design, study population, ethical considerations, study instrument, pilot study, data collection, processing and analyzing the data, and limitation of the study.

Through chapter four, the researcher will present the main study results based on the outcomes of the statistical analyses. It includes distribution of the study participants according to their socio demographic characteristics, and then the answers of the study hypotheses will be clarified.

In the last chapter (chapter five), the suggested recommendations and further researches are mentioned in order to improve the situation of radiation protection status among the radiotechnologists in radiography departments, at the Gaza strip.

Chapter (2)

Literature review

Chapter Two

Literature Review

2.1 Introduction

In this chapter the researcher presents the conceptual framework to the study, then a discussion of the different issues about radiation risks and protection such as radiation sources, types of individuals' exposure, and applications of radiation in the medicine fields, biological effects of radiation, radiation protection principles and actions. In the last section of this chapter, the researcher presents many studies that confirm the relationship between the radiation exposure and cancer, then other studies about the KAP levels regarding radiation risks and protection are presented.

2.2 Conceptual framework

This descriptive cross sectional study aimed to evaluate the KAP level among the radiotechnologists regarding radiation protection in Governmental hospitals in Gaza governments, also to assess the possible relationships between the socio demographic factors and the radiation protection KAP, and to clarify the correlation relationship among the KAP of radiation protection. The tools of the present work included close ended structured questionnaire. A schematic representation of the framework of the present study is mentioned in Fig 2.1.

- **Knowledge** Is the capacity to aquire, retain and use information; a mixture of comprehension, experience, discernment and skill (Badran, 1995).

- **Attitude** is a concept in psychology. Attitudes are positive, negative or neutral views of an "attitude object" as a person, behavior or event (Jung, 1966).

- **Practice** means the application of rules and knowledge that leads to action. Good practice is an art that is linked to the progress of knowledge and technology and it's executed in an ethical manner (Badran, 1995).

- **Radiation** electromagnetic waves or particles, propagated through space or through a material medium (National Occupational Health and Safety Commission (NOHSC), 2002).

- **Radiation protection** is the science concerned with the protection of the personnel, patient and the public from unnecessary radiation (Martin and Sutton, 2002).

Many studies were performed to evaluate the KAP regarding radiation protection, and the possible factors influencing the KAP levels. Results revealed that, the socio demographic factors such as age, gender, education and experience affect the KAP level of the radiation protection (Chuan Su *et al* n.d ; Amirzadeh and Tabatabaee, 2005; Tavakoli, Seilanian and Saadatjou, 2003; Svenson, Soderfeldt and Grondahl,1997).

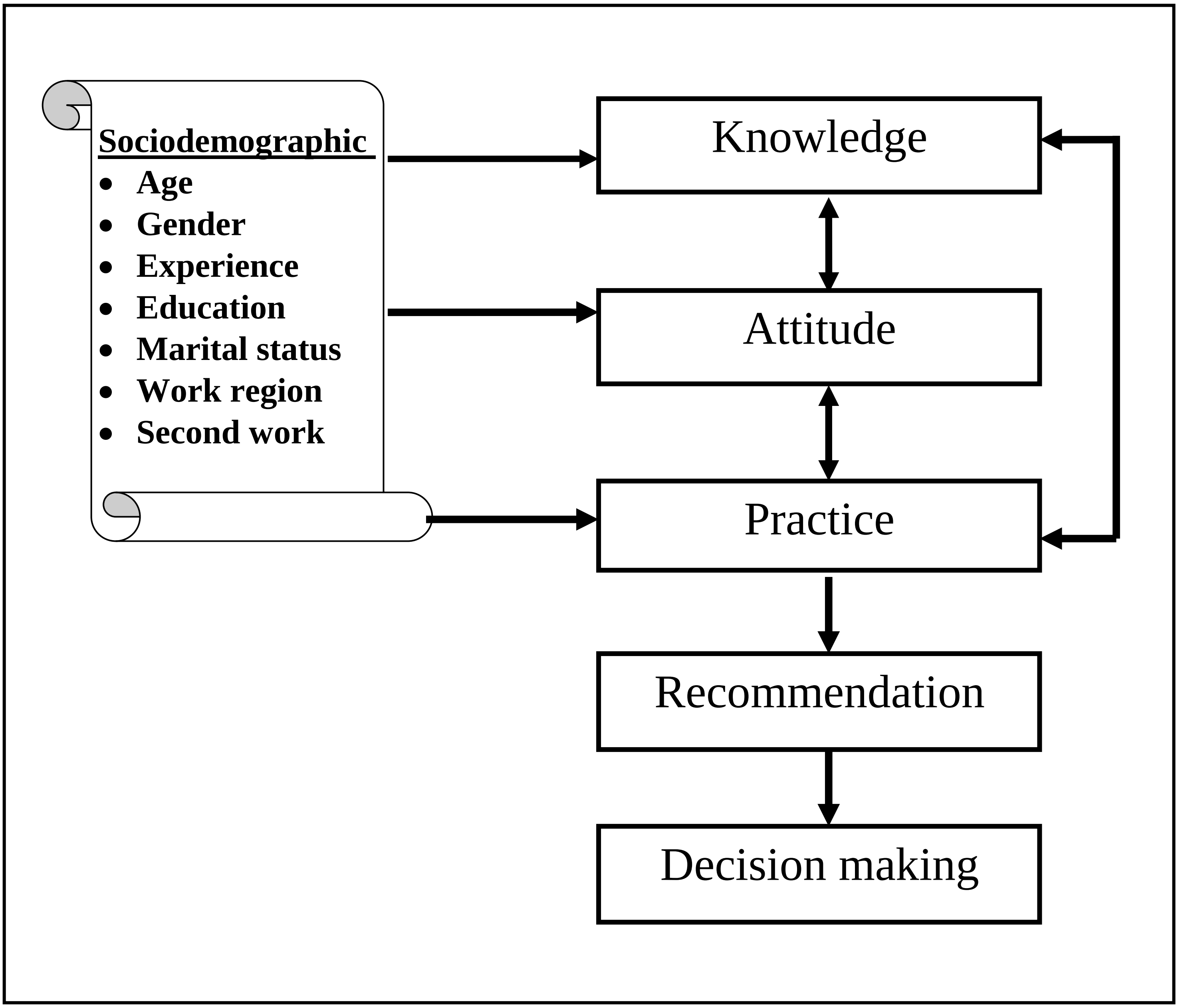

Figure 2.1: Schematic Representation of the Study Framework.

2.3 Radiation sources

Radiation exposure cannot be seen or felt, so the fact is that people are constantly exposed to radiation which is not usually apparent. Radiation is all around us and every day we are exposed to some form of radiation emanating from natural or man made sources.

2.3.1. Natural sources:

Natural background radiation normally comes from three sources: cosmic rays which are emitted from the sun and stars and it directly varies with the altitude, where it is doubled every two kilometer above the sea level; terrestrial radiation "earth radiation" which includes radiation from the soil, rocks, and building materials such as radionuclides in granite, stones, sandstone, limestone, where its amount varies geographically (NAS, 2006). Particular concerns are given to radiation exposure from radon gas, which is the major exposure source to the general public (Radiological Society of North American (RSNA), 2007). Finally, endogenous radiation which refers to the radiation produced within the human body, it comes from radioactive isotopes in food, water and from the human body itself, which makes each and every one of us as a source of radiation (Bury, 2002). Our life style can play an important role in the amount of the background radiation we receive, so, we must be more careful from our action such as types pf our foods, drinks and homes (RSNA, 2007; Campeau, 1999).

2.3.2. Man made sources:

Man made radiation sources were discovered at the end of the nineteenth century, it includes those arising from industries as mining, nuclear power plants and consumer products which are considered as radiation sources such as smoke alarm, television, video, and clock that feature luminous dials and numbers (United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR, 2006). The second source of man made radiation is fallout radiation sources which are emitted from nuclear testing and chemical explosions in the nuclear facilities as the radiation emitted from Chernobyl accident (UNSCEAR, 2006). Finally, the medical exposures radiation sources, which have been used since 1895 when William Roentgen began taking X-rays of his wife's hand (UNSCEAR, 2006). The amount and type of exposure due to medical application varies by the type of test or treatment needed (Centers of Disease Control and Prevention, 2008; Burnham, 2001).

2.4 Radiation applications in medicine

Over the last 100 years, radiation has been increasingly applied in medicine and is now firmly established as an essential tool for diagnosis and therapy, it includes many types of applications as; diagnostic procedures, in particular the widespread use of x-rays, are the most common application of radiation in medicine and the range of x-ray techniques used, such as radiography, fluoroscopy, computed tomography, interventional radiology, and bone densitometry (UNSCEAR, 2006). The diagnostic procedures are considered the largest population exposure from the man made sources, where the number of the diagnostic x-ray procedures in the United States per year equals their total population

(UNSCEAR, 2006). The second application of radiation in medicine is called Nuclear medicine, which may be used for diagnosis or therapy purposes, through giving the patient a radioactive substance which is taken by a body organ through different methods such as injection, ingestion or may be by inhalation, they provide information that is impossible to know from x-rays such as how blood is flowing or how bones or tumors are growing, this application is typically five to ten times higher than exposures from the x- ray machines, where the patient is radioactive for a few days to a few weeks after the material is administered (IAEA, n.d). The third application is radiotherapy which involves significantly higher doses given in purpose to destroy the cancer tissues with more attention to avoid affecting the healthy tissues (UNSCEAR, 2006). There are other applications of radiation such as Magnetic Resonance Imaging and Ultrasound which have many uses in medicine with less biological effects than the previous applications of radiation (Environmental Health and Safety, 2006; Burnham, 2001).

2.5 Types of individual exposure

Individuals are exposed to various types of radiation; it may be occupational exposure which occurs during their work in a radiology department; medical exposure of individuals as a part of their own medical diagnosis or treatment, and public exposure which include all exposures rather than occupational and medical exposures (International Commission on Radiological Protection (ICRP), 2007); NOHSC, 2002; Environmental Protection Agency (EPA), 2000)

Exposure to radiation can be acute, which indicates receiving a large dose in a short time within hours or days that induces adverse health effects such as erythema, sterility and death within a few weeks (NOHSC, 2002). While chronic exposure is one that is delivered over long period of time within years like occupational exposures of radiotechnologists, this type of radiation exposure may cause cataractogenesis, carcinogenesis, and mutagenesis effects (NOHSC, 2002). Health hazards from radiation exposures are directly proportional to radiation doses, which mean that there is no safe dose in radiation exposures (EPA, 2009).

2.6 Biological effects of radiation

Hazards from ionizing radiation can be attributed to its capacity to ionize the target atom, this mechanism can occur indirectly, when the ionization takes place away from the Deoxyribonucleic Acid (DNA) molecule as the radiolysis of water, also ionization can occur directly through interacting of the ionizing radiation with DNA molecule, due to this action the critical molecule become chemically unstable, which leads to cell killing, mutagenesis, and carcinogenesis (Andreassi *et al*, 2005; Saisa, 2003).

Biological effects which occur due to radiation exposures can be classified into two categories; Somatic effects, those effects that appear in the individual who was exposed to radiation; genetic effects, those which occur in the future generations of the exposed individuals (Martin and Sutton, 2002; Seeram, 1997; ICRP, 1991).

Also the biological effects can be placed into either of two groups; non stochastic effects "deterministic effects", are those effects for which the severity of radiation effect in the exposed individual increases as the dose increases, and for which there is a threshold dose (UNSCEAR, 2006). The second class is stochastic effects; are those in which the probability of the effect occurring depends on the amount of radiation dose, this type of effects increases as a radiation dose increases, so, there is no threshold dose for the stochastic effect (EPA, 2009; NOHSC, 2002).   This direction in understandings of the dose –response relationship has lead to the increase of the focus on the effects of low doses of radiation, especially on occupational exposures.

Various studies have been conducted on the population who are exposed to low doses. The results revealed that the cancer cases among these studies populations are attributed to medical ionizing radiation exposures. The study of Dickie and Fitchew, (2004) in Australia, revealed that 431 cases of cancer per year could be attributed to diagnostic x-ray. While in the United Kingdom there were 700 cases of cancer per year that could be attributed to diagnostic x-rays. The study of Sigurdson *et al* (2003), in their study, which was conducted in United State, revealed that the radiotechnologists had an elevated risk for cancer as breast, melanoma and thyroid cancers. It may be attributed to their occupational radiation exposures.

The risk of cancer increases among the radiotechnologists with long duration in their work in radiation fields, so, it is important to continue monitoring the health status of the medical radiation workers (Agency for Toxic Substances and Disease Registry, 2007; Kleinerman, 2006; NIOSH, 2005; Bianca, 2005).

X-ray technicians are exposed to various hazards rather than cancer due to their occupational exposure; they are prone to develop immune system, thyroid and cardiovascular diseases (Meo *et al* 2006; Linet, 2006; Volzke *et al*, 2005; Dukie, *et al* 2005).

2.7 Radiation protection

In spite of its dangerous exposure effects, radiation has an important role in diagnosis purposes. The balance of risk versus benefit in diagnostic radiology should be strongly weighted toward benefit, but the risk is there. So, the worker in the radiation field should take all protection methods in order to reduce the health hazards from occupational radiation exposure as much as possible.

Radiation protection in radiology departments is concerned with the physical, technical and procedural factors involved in protection of staff, patient and public from unnecessary radiation exposure (Nuclear Energy Agency, 1994).

2.7.1. Principles of radiation protection:

Radiation protection is based on the following three principles: The first is a justification principle which is one of the basic principles of radiation protection. It contains benefit-risk analysis, so, when people are exposed to radiation, its use must be justified by ensuring that it dose more benefit than harm (ICRP, 2007; Corbett and Faulkner, 1998).

The second principle of radiation protection is optimization, which means keeping the radiation dose As Low As Reasonably Achievable (ALARA), this principle is concerned with obtaining maximum diagnostic information with minimum risk of exposing the patient (Prasad *et al* 2004; Suhova *et al* 2003; National Council on Radiation Protection (NCRP), 2001). To perform this radiation protection principle, the radiotechnologists should apply the protection means to reduce the patient doses without affecting the quality of diagnostic image. There are many factors which help the radiation worker to obtain ALARA principle as the uses of high kilovolt technique and the shortest exposure time, also by using the beam collimation which helps in reducing the exposed surface of the patient, beam filtration and anti-scatter grids which help in improving the radiograph quality and reducing the chance of patient to receive repeated doses (Brateman, n.d; Grover, Kumar, Gupta and Khanna, 2002).

The third principle of radiation protection is dose limitation, which deals with doses that are received by occupational staff and public per year, this dose should not exceed the international recommendation which is based on epidemiological studies performed by the various concerned parties regarding biological effects of radiation exposure (ICRP, 2007; UNSCEAR, 2006; Martin and Sutton, 2002; NCRP, 2001).

2.7.2. Radiation protection actions:

Radiation protection is concerned with reducing the doses received by the staff, patients and the public. Three actions can be of help to achieve this protection target: the first is the exposure time, which plays a vital role in the received dose, when the radiotechnologists reduces the time of exposure, he actually minimizes the radiation exposure; the second radiation protection action relates to the distance between the source of radiation and the exposed individual, where the exposure decreases inversely the square of the distance, this is known as the inverse square low, so when the distance between the source of radiation and the exposed individual is doubled, the exposure is reduced by a factor of four; the third action which helps in reducing the received dose for both patient and the staff is the shielding, which is a material, as lead, that attenuates radiation when it is placed between the source of radiation and the exposed individual (Hargreaves, 2007; Occupational Safety and Health council, 2006; Bhargara, 2001; Campean, 1999; Cullinan, 1994).

2.8 Studies regarding radiation health risks and protection

Many international organizations concerned with the safety of workers in the workplaces have developed various guidelines to minimize the hazards of radiation through the reduction of exposures to the occupational staff and the patients, such as a wearing of lead apparels (aprons, gloves, glasses and thyroid protectors), monitoring the radiotechnologists occupational doses by using a special monitors, taking a recommended distance from the radiation sources, using a shield to isolate the non exposed organs of the patient, reducing the exposure as much as possible with guarantee the maximum quality of radiographs, determining the field of radiation through the use of collimation and many other standards that should be present in an integrated radiation programs (American Dental Association, 2008; ICRP, 2007).

The occupational staff in the radiation field is responsible for the safety of the exposed patients. The problems in the radiation protection applications are due to the lack of education and knowledge among the staff (ICRP, 2006; Mettler, n.d). Many researchers around the world are concerned about the evaluation of the KAP among radiotechnologists regarding ionizing radiation effects and radiation protection, and they suggest recommendations that may help in improving the awareness and practices in order to reduce the medical radiation dose to the population.

Rassin, Grant, Berger and Silner (2005), in their study "Attitude and Knowledge of Physicians and Nurses About Ionizing Radiation" which was conducted in Israel, aimed to describe physicians' and nurses' knowledge and attitude about the radiation risks and protection. Their study has revealed that, it is necessity to improve the knowledge of the physicians' and nurses' about the protection from the exposure to radiation.

In their study " Radiation Safety Knowledge of Medical Center Radiological Technologist in Taiwan" Chuan Su, Fong Huang, Chung Chen and Chang, n.d, in Taiwan, indicated that there is no significant relationship between radiation safety knowledge and gender or work place, while there are significant relationships between knowledge and education level, age and career periods. The researchers concluded that the radiation safety knowledge for radiotechnologists is considered as a critical factor in order to reduce the population dose, and recommended applying continuous training courses to improve the radiation safety knowledge of radiotechnologists.

A survey of Amirzadeh and Tabatabaee, 2005, was conducted in Shiraz hospitals in Iran to evaluate the awareness of radiation worker regarding radiation and their practice. The results revealed that, the study participants have no proper knowledge about radiation protection issues, and there was a statistically significant relationship between the radiation workers knowledge and their education. The researchers suggested that the radiation employees education must be strengthened and short courses to the worker should be mandatory, while an issue as the protection performance should be discussed with the radiation employees.

In London, 1997, Quinn, Taylor, Sabharwal and Sikdar, aimed to assess the knowledge about radiation protection among non radiologists by the use of 120 questionnaire that were distributed in two teaching hospitals and a district general hospital. The results revealed that the majority of responders have low knowledge regarding radiation protection; they underestimated the radiation risks, did not recognize the ALARA principle, didn't know the correct choice of the radio-sensitivity of different organs and most of them were not aware that the patients have no annual dose limit. The researchers recommended formal compulsory teaching at undergraduate level in medical school in order to improve the knowledge about radiation protection.

A cross sectional study conducted in Pakistan by Mubeen, Abbas and Nisar, 2008, aimed to assess the knowledge of ionizing and non ionizing radiation and their hazards among medical student in Karachi Medical College. This study concluded that the majority of medical students in Karachi College have a limited knowledge about the various aspects of radiation sources, risks and protection. The study recommended better teaching methods and programs for medical students are required to improve their knowledge, and further studies to highlight the radiation harm and the importance of radiation protection.

In their study "Knowledge of Medical Students on Hazards of Ionizing Radiation" Tavakoli, Seilanian and Saadatju, 2003, Iran, aimed to evaluate the knowledge of medical students in Birjand University of Medical Sciences who are passing the internship and clerkship courses on hazards of ionizing radiation and radiation protection. The results revealed that, both groups had good scores in the radiobiology items, while no group had good knowledge about radiation protection and practical aspects of radiation protection. The researchers concluded that the study participants have not adequate knowledge about radiation protection and they have not good practices. They strongly suggested that medical curricula and effective education courses should be revised.

A survey conducted by Winder, Hossain and Reddy, 1994, to determine the public health directors knowledge about radiation risks, their attitudes toward that risk, and their practices designed to reduce the risk. The study results showed that the public health directors have low knowledge, attitude and not proper practice regarding radiation hazards and protection. The survey recommended that the state should perform a training program for public health directors on the health effects of ionizing radiation.

Mutyabule and Whites, 2002, evaluated the dentists' knowledge regarding radiation protection in Uganda. The results of that study showed that the level of knowledge regarding radiation protection among dentists and health officers was low and it could be strengthened through undergraduate training and post graduate courses. The same results were reported in the study of Salti and Whaites (2002), in Syria.

In their study "Dentists Attitudes Toward Risks in Oral Radiology" Svenson, Soderfeldt and Grondahl (1996), in Sweden, aimed to measure dentists attitude toward radiation hazards. The study revealed that the dentists showed high concern toward radiation hazards.

Jacobs, Vanderstappen, Bogaerts and Gijbels in their study "Attitude of the Belgian Dentist Population toward Radiation Protection" which was conducted in Belgium, 2004, aimed to identify knowledge and attitude of Belgium dentists toward radiation protection. The study results showed that the knowledge and attitude was low among the Belgium dentists toward radiation protection and recommended an elaborate educational program with more efforts to change the dentists attitudes and to provide their knowledge about radiation protection.

The study of Dilguy, Milguy, Dincer and Bayirli (2005), in turkey, aimed to determine the dentists' knowledge about radiation protection. The study revealed that the dentists' knowledge was limited. The researchers concluded that for minimizing any unnecessary radiation, more efforts should be exerted to improve dentists' knowledge. The same results were reported in the study of Goren, Sciubba, Friedman and Malamud (1989) in New York.

The study of Svenson, Soderfeldt and Grandhl (1997), in Sweden, aimed to measure dentist's knowledge and attitude toward risks of radiation. The results showed that the dentist's attitude to risk is related to their knowledge; there is an association between knowledge and practice about protection techniques.

All the previous studies revealed the importance of assessing the KAP of the radiotechnologists regarding radiation risks and protection, and this assessment is considered as an indicator that may help the decision makers in the improvement process of radiation risk prevention, and staff, patient and public protection.

Chapter (3)

Methodology

Chapter three

Methodology

3.1 Introduction

The aim of this study is to evaluate the level of knowledge and attitudes toward radiation protection and its practices among radiotechnologists in governmental hospitals in Gaza governorates and possible factors influencing the KAP such as, the technologists age, gender, marital status, education, experience, work region and the presence of second work. Also the correlations between technicians' KAP will be studied and evaluated.

To implement this study, the researcher followed the appropriated steps of the methodology mentioned in the thesis preparing guideline for student of high studies in Al Quds University, which includes the study design, the study sample, the study instrument, pilot study, data collection, processing and analysis. A pilot test was carried out before starting the data collection to check for any ambiguity or confusion in the instrument questions statement. Sixteen subjects were selected from the study population by using a convenient sample. The pilot sample was excluded from the study sample.

The researcher applied the study questionnaire after receiving an official approval letter from "Helsinki committee" and another official letter obtained from the MOH in Gaza strip allowing the researcher to carry out the study on radiotechnologists in governmental hospitals in Gaza Strip governorates (Annex 1 and 2).

3.2 Study design

This study utilized a descriptive analytical cross sectional design, based on the analysis of data collected from the radiotechnologists working at the radiological departments in the governmental hospitals in Gaza governorates, to describe the KAP regarding radiation protection among the radiotechnologists. This design has been selected because it is simple, time saving, less expensive, and useful for descriptive and evaluative purposes (Burn and Grone, 1997). Furthermore, cross sectional studies are relatively quick and economic processes to conduct where the researcher's time and resources are limited (Polit and Hungles, 1999).

3.3 Study population:

The study population included all radiotechnologists who are working in governmental radiological departments in Gaza governorates, approximately 164 technicians distributed at eleven governmental hospitals according to the MOH records (Ibrahim Abbas, October 2008, Personal interview).

3.4 Ethical considerations

An official letter was obtained from "Helsinki committee" at MOH on 15 of August 2008 which permitted the researcher to carry out the study among radiotechnologists in the government hospitals in Gaza strip (Annex 1). Also, an official letter has been obtained from the MOH to facilitate the process of data collection (Annex 2).

The subjects received an instrument in Arabic language (Annex 4), and a cover page was added to each questionnaire to explain the study objectives and the study participants' rights to withdraw or to stop answering any question, with full guarantee of participants' confidentiality (Annex 5). The participation in this study was voluntary and participants were free to write their names or not. The researcher presented verbal explanation about the procedure of completing the questionnaire to all technicians before responding to the questions.

3.5 Study instrument

The research instrument was face to face interview through close-ended structured questionnaire, where leading questions have been avoided. The questionnaire has been modified to be more simple and short, where difficult or unclear questions have been explained.

3.6 Questionnaire design

The questionnaire of the study was designed to cover the areas of research topic, KAP among radiotechnologists toward radiation protection, radiation health risk and to meet the study objectives. The questionnaire was constructed and prepared in Arabic and consisted of four parts. The first part of the questionnaire is personal information about the technicians including their age, gender, marital status, education level, years of experience, work region, and if they have second work in other organization or not. The information was used in the study to examine the relationships among KAP as dependent variables and socio demographic factors as independent variables. The second part of the questionnaire consisted of twenty questions to measure the radiotechnologists' knowledge regarding radiation health risks (first 6 questions) and radiation protection (later 14 questions). For each question, Yes answer took 2 marks; don't know 1 mark and no mark for No answer. The third part of the questionnaire (20 questions) includes an attitude measurement scale rated on a Likert type about radiation health hazards (first 7 questions) and attitude toward radiation protection (later 13 questions). The responses to each statement are scaled into three possible responses, agree (positive) =2, uncertain=1, disagree (negative) =0. The fourth part of the questionnaire is twenty two questions testing the subjects' practices about radiation protection. (Annex 4).

The questionnaire was completed through face to face interviews between the researcher and the technicians in order to avoid misunderstanding and difficulties of interpreting the questions. The questionnaire form has been examined for content validity with the help of many experts, and then prepared, organized, and serially numbered to minimize errors.

3.7 Content validity

The validity of the study questionnaire has been examined by sending the constructed questionnaire with enclosed cover letter about the objective of the study to eight experts from different backgrounds including radiologists, public health practitioners, radiology academics and researchers in order to give their views on the dimensions of the questionnaire statement (Annex 3) .

Experts rated the content of each item using a three point rated scale:

1= very relevant and no modification is needed; 2 = relevant but needs more modification; 3= not relevant item and should be omitted (Annex 6).

Six of the experts have responded and sent their suggestions and comments. According to their suggestions and advice, the researcher added, modified, excluded and changed some of the questions to be more suitable for achieving the objectives of the study (Annex 7).

3.8 Pilot study

To measure the applicability of the questionnaire and the clearness of the questions, the elaborated questionnaire was tested in the preliminary study. To fulfill this study, sixteen radiotechnologists (10% of the study sample) were chosen by using convenient sample. Data were analyzed and in accordance with the result of the preliminary study, the final correction of the research instruments was made to make the questions more clear. The questionnaire took 15-20 minutes for each participant to finish and these questionnaires were excluded and not considered in the final results.

3.9 Data collection

Data collection was accomplished by using a study questionnaire which was designed to measure KAP among radiotechnologists through face to face interview between the researcher and the subject. The respondents were told that all the data obtained will only be used for research purposes, and they were asked to answer the questionnaire as honestly as possible. According to the pilot study, the interview took 15 minutes. Data collection process took three weeks from the first of September 2008.

3.10 Data entry and analysis

Data were carefully checked to screen out any incompletely answered questions. One hundred thirty five questionnaires were processed and entered by the researcher after designing an entery model using the computer software Statistical Package for the Social Science (SPSS) version 13.

In reporting the results of the study, population frequency distribution for each item, descriptive statistics in terms of mean and the percentage were measured for each dependent and independent variable. Further to this, tables and bar chart were used to present the data in an organized way and easier for readers to understand. The researcher conducted independent sample t test to test differences between knowledge, attitude and practice as dependant variables, and gender, marital status, work region, second job and education as independent variables. One-way analysis of variance (ANOVA) was used to test the difference between KAP as dependant variables and age, years of experience as independent variables. A Pearson's correlation coefficient was used to investigate the correlation between radiation protection KAP.

3.11 Radiation protection KAP categorization

The researcher classified the respondents' KAP into three categories according to their scores reflecting their radiation protection KAP level. From the total scores, there are radiotechnologists who have high level of KAP (more than 70%), the second category are the participants who have medium level of KAP (50-70%) and the third category are those who have a low level of KAP (less than 50%).

3.12 Limitation of the study

During the implementation of the study the researcher faced some limitations such as:

1. This study conducted only in governmental hospitals in Gaza governorates, not UNRWA or private centers, so the results can only be generalized on this sector only.

2. Shortage in the related previous studies has prevented the researcher to discuss and compare the results with those of other studies.

3. Collection of the questionnaires has collide with a strike by the workers of the Ministry of health which has impacted the data collection.

Chapter (4)

Results and discussion

Chapter four

Results and discussion

4.1 Introduction

In this chapter, the researcher presents the main results of the study based on the outcomes of the statistical analyses. The first part of the results includes the distribution of the study participants according to their demographic characteristics as age, gender, marital status, education level, work region, years of experience and the other work in a private center. The second part of the results consists of the frequency distribution of the items. The descriptive statistics was used to present the data on KAP level of the study participants toward radiation risk and radiation protection. The third part of the results relates to the study hypotheses.

The researcher conducted an independent sample t test and ANOVA to test the difference between the KAP as dependent variables and the demographic factors as independent variables. Pearson's correlation was used to explain the relationship among the KAP of radiotechnologists.

4.2 Demographic characteristics of the study participants

The number of participants in this study was 135 radiotechnologists who are working in the governmental hospitals in Gaza governorates, with a response rate was 91.2%. The study subjects differ among each other in the demographic characteristic; most of the sample is males, which account for about 80.7% of the study participants, while the female number consists about 19.3% of the study participants.

The participants from Gaza city and North governorates are the larger group of the study. About 73 radiotechnologists account approximately 54.1%, while 62 of the participants were from the south and mid-zone region, which account for 45.9% of the participants.

The largest age group is 26-35 years, which accounts for 41.5%, followed by age group 25 years and less (31.1%). And the 36 years and more forms the smaller group of the participants of about 27.4%.

Most of the participants (80% of the sample) were technologists who have bachelor degrees, while 20% of the participants have diploma certificates. About 71.9% of the radiotechnologists who shared in the study were married, while 28.1% were single. Most of the sample which accounts for 64.4% was technicians with 5 years of experience and less; while 24.4% of the participants have more than 10 years of experience. The radiotechnologists with 6 to 10 years of experience represent about 11.1% of the study participants. About 65.2% of the participants do not have a second work in private centers, while 34.8 participants do have a second work in private centers.

Table 4.1: The Demographic Characteristics of the Study Subjects.

Items	Number	Percent
1. Age		
25 Years and less	42	31.1
26 to 35 Years	56	41.5
36 Years and higher	37	27.4
Total	135	100
2. Sex		
Female	26	19.3
Male	109	80.7
Total	135	100
3. Experience		
5 Years and less	87	64.4
6 to 10 Years	15	11.1
More than 10 Years	33	24.4
Total	135	100
4. Region of work		
South and mid-zone	62	45.9
Gaza and North	73	54.1
Total	135	100
5. Marital status		
Married	97	71.9
Single	38	28.1
Total	135	100
6. Education		
Diploma	27	20
Bachelor	108	80
Total	135	100
7. Working in other organizations		
Yes	47	34.8
No	88	65.2
Total	135	100

4.3 Level of knowledge among the study participants

4.3.1. Knowledge about radiation risks:

To determine the level of radiation risks knowledge among radiotechnologists in governmental hospitals in Gaza governorates, descriptive statistics including mean, standard deviation and percentage of Yes answers scores reflecting the level of radiotechnologists knowledge were developed. The results indicates that, the mean of score was 2.87 (total scores is 6) with a standard deviation of 1.12 and the percentage of radiotechnologists scores of correct answers which reflects their level of radiation risk knowledge was 47.8%. This mathematical figure indicates that the majority of subjects have high knowledge regarding radiation health hazards compared to the not correct subjects, but the fact is that the study participants have only knowledge on two items, while they are unknowledgeable about four items from the six items which reflect the knowledge regarding radiation risks (Table 4.2). According to this result, it is clear that the radiotechnologists in Gaza governorates have inadequate knowledge toward the risks of radiation on the human health.

Table (4.2) shows that 20% of the technicians know about the long term effects of radiation, while 60.7% have the knowledge about the short term effects of radiation. About 27.4% of the participants know the degree of sensitivity of human body organs to radiation, while 41.5% have the knowledge about the strength of radiation effects related to the exposure time. In spite of the largest percentage (99.3) of the study participants who know that the first trimester of fetus age is the most radiosensitive period, only 37.8% of them have the knowledge about the effects which can occur due to radiation exposure in this period of the fetus life.

Table 4.2: Distribution of Study Participants' Responses about Radiation Risks Knowledge According to the Answer of Each Item.

Items	Yes		Don't know		No	
	No.	**%**	**No.**	**%**	**No.**	**%**
Strength of radiation effects related to the exposure time.	56	41.5	8	5.9	71	52.6
Long term effects of radiation.	27	20.0	30	22.2	78	57.8
Short term effects of radiation.	82	60.7	23	17.0	30	22.2
Radio sensitivity of human organs.	37	27.4	33	24.4	65	48.1
More radiosensitive period of fetus.	134	99.3	0	0.0	1	0.7
Radiation effects on the first trimester of fetus life.	51	37.8	16	11.9	68	50.4
Average		47.8		13.6		38.6

The results from the above table indicate that the Yes answers percent was 47.8, while don't know answers percent was 13.6, and the No answers percent was 38.6. These results was offset by the answer percent of the question number five which ask the study participants about the more radiosensitive period of the fetus. If this question is excluded, the Yes percent becomes 37.48, while don't know percent is 16.3, and the No percent is 46.22. These findings revealed that the radiotechnologists in governmental hospitals in Gaza governorates have limited knowledge about the health hazards from the radiation exposures.

The outcomes from this part of data analysis indicate that, the radiotechnologists in Gaza governorates have low knowledge about radiation risks. These results agree with the study of Mubeen, Abbas, and Nisar, 2008, which was conducted in Pakistan, where their results revealed that the majority of medical college students in Karachi have limited knowledge about various aspects of radiation sources and risks. Also there is an agreement with the study of Amirzadeh, and Tabatabaee, 2005, which was conducted in hospitals of Shiraz in Iran, and its results revealed that the radiation risks awareness among radiation employees was insufficient level. In addition, the study results agree with the study conducted in Birjand university of medical science in Iran, which had reported that the medical students have inadequate knowledge regarding radiation risks (Tavakoli, Seilanian, and Saadatjou, 2003). Similar results were found in the study of Winder, Hossain, and Reddy, 1994, which was conducted in New England and New York, and its results revealed that the knowledge about health effects of radiation was very little among the public health officials.

4.3.2. Knowledge about radiation protection:

Descriptive statistics including mean, standard deviation and percentage of Yes answers scores reflecting the level of radiotechnologists knowledge were developed to show the current level of radiation protection knowledge of the radiotechnologists. The study found that, the mean of knowledge scores was 6.6 (total scores is 14) with standard deviation of 2.2, and the percentage of radiotechnologists scores of Yes answers which reflects their level of radiation protection knowledge was 47.41%. This mathematical result indicates that the majority of technicians have high knowledge regarding radiation protection, but the fact is that the respondents have only knowledge on five items from the all fourteen items which is considered as an indicator to the radiotechnologists knowledge regarding radiation protection, while the participants lack enough knowledge about nine items from the total items (Table 4.3). On the basis of these results, it is clear that the radiotechnologists in Gaza governorates have limited knowledge regarding protection in spite of their work in a radiation field.

Table 4.3: Distribution of the Participants Responses about Radiation Protection Knowledge According to the Answer for Each Item.

Items	Correct		Don't know		Not correct	
	No.	%	No.	%	No.	%
Missible permissive dose to the radiotechnologists.	50	37.0	24	17.8	61	45.2
Annual dose limit to the patient.	40	29.6	9	6.7	86	63.7
Total equivalent dose for the fetus.	24	17.8	54	40.0	57	42.2
Radiotechnologists responsibility in a patient protection.	76	56.3	0	0.0	59	43.7
Effect of used high kilovolt on the patient dose.	83	61.5	3	2.2	49	36.3
Effect of the low exposure time on the patient dose.	116	85.9	2	1.5	17	12.6
Effect of increase the distance on the receive dose.	51	37.8	6	4.4	78	57.8
Recommended distance between radiation sources and the workers.	97	71.9	2	1.5	36	26.7
Importance of collimation in reduced patient dose.	133	98.5	0	0.0	2	1.5
Safety period for the lead apron	19	14.1	5	3.7	111	82.2
Height of primary radiation barrier.	51	37.8	20	14.8	64	47.4
Lead thickness in the primary barrier.	52	38.5	28	20.7	55	40.7
Correct wearing method of the dosimeter.	58	43.0	9	6.7	68	50.4
Correct places of the dosimeters for the pregnant worker.	46	34.1	30	22.2	59	43.7
Average		47.41		10.15		42.44

As shown in Table (4.3), about 37% of the study participants know the missible permissive dose for the radiotechnologists, while 29.6% know that there is no annual dose limit for the patient. Only 17.8% from the radiotechnologists who shared in this study have the knowledge about the total equivalent dose for the fetus, 56.3% of respondents know about the responsibility of radiotechnologists in patient protection. About 61.5% of the participants know the effects of kilovolt factor on changing patient dose, while 85.9% know that the exposure time affects the patient dose. In spite of 71.9% from the respondents know about the recommended distance between radiation source and the radiotechnologists, only 37.8% have the knowledge about the effect of the distance on their received dose. About 98.5% of the participants have the knowledge about the collimation importance in reduced patient dose, 14.1% know the safety period of lead apron, 37.8% know the height of primary radiation barrier; while 38.5% know the lead thickness in the primary radiation barrier. About 43% of participants know the correct method of wearing the dosimeter, while 34.1% have the knowledge about the correct putting place of the dosimeter for the pregnant worker in a radiation field.

The results from the above table indicate that the average of Yes answers was 47.41, while don't know answers average was 10.15, and the No answers average was 42.44. These results were offset by the answer percent of question number nine which ask the study participants about the importance of collimation in reduced patient dose. So, when this question is excluded the Yes average becomes 43.48, while don't know and No answers averages are 10.94 and 45.58 respectively. These findings revealed that the radiotechnologists in governmental hospitals in Gaza governorates have limited knowledge about the radiation protection.

From the above results, it can be concluded that the radiotechnologists in Gaza governorates have low knowledge about radiation protection. This finding is in agreement with the study of Chan Su, Fong hang, Chung chen, and Shu chang, (n.d), which was

conducted in Taiwan among radiological technologists in medical centers. Their results revealed that the study population lacks enough knowledge toward radiation safety.
The study of Quinn, Taylor, Sabharwal, and Sikdar, 1997, which was conducted in London, revealed that the non radiologists' clinicians have inadequate knowledge about radiation protection. The same results have been reported in Mutyabule, and Whaites, 2002, in Uganda, and in that of Salti, and Whaites, 2002, in Syria.

Tavakoli, Seilanian, and Saadatjou, 2003, in their study in Iran, revealed that the medical students in Birjand University have low scores of knowledge about radiation protection. The study of Jacobs, Vanderstappen, Bogaerts, and Gijbels, 2004, in Belgium, revealed that dentists' knowledge about radiation protection during oral radiography was poor.

The same results have been reported in the study of Amirzadeh, and Tabatabaee, 2005, in Iran which was conducted to evaluate the awareness of employees about radiation protection in Shiraz hospitals. Dilguy, Milguy, Dincer, and Bayirl, 2005, in Turkey, revealed that the dentists have limited knowledge about radiation safety procedure. Mubeen, Abbas, and Nisar, 2008, in Pakistan, revealed that the medical college students in Karachi have limited knowledge about radiation protection.

4.3.3. Total knowledge:

The first part of the questionnaire contained twenty questions to measure the knowledge of radiotechnologists. For each Yes answer 2 point, don’t know 1 point and No answer zero, after that the researcher took score of Yes answer.

To determine the level of total knowledge among radiotechnologists, descriptive statistics including measures of mean, standard deviation and percentage of Yes answer scores reflecting the level of radiotechnologists knowledge were developed to show the current level of total knowledge of those technologists. The results indicate that, out of twenty points reflecting the level of knowledge among radiotechnologists, the mean of knowledge scores was 9.5 with standard deviation of 2.57 and percentage of radiotechnologists scores of Yes answers which reflected their level of knowledge was 47.52%, while the summation of No and don't know percentages was 52.48%. This indicates that the majority of subjects who participated in this study have low knowledge. So, the alternative hypothesis "the radiotechnologists in governmental hospitals in Gaza governorates have low knowledge about radiation protection" is accepted.

4.3.4. Knowledge categories:

From the total scores of knowledge, the radiotechnologists were classified into three categories, radiotechnologists with high level of knowledge are those who have more than 70%, radiotechnologists with medium level of knowledge are those who got between 50-70% and the low level of knowledge is a radiotechnologists who have less than 50%.

Table 4.4: Distribution of the Study Participants According to Knowledge Categories.

Item	Categories	Frequency	Percent
Knowledge	High	6	4.5
	Medium	62	45.9
	Low	67	49.6
	Total	135	100

As shown in Table (4.4), the number of radiotechnologists who have low knowledge level was 67 of 135 (49.6%), while there were 62 of 135 radiotechnologists with a percentage of 45.9 medium level. In addition, about 6 of 135 radiotechnologists with a percentage of 4.5 got high knowledge level. These results indicate that, according to the above mentioned categorization, the number of radiotechnologists who have got low scores in the level of knowledge were more than those who got medium and high scores.

4.4 Radiotechnologists attitudes

4.4.1. Attitude regarding radiation risks:

Descriptive statistics including means, standard deviation and percentage of agree answers scores reflecting the level of participants attitudes were performed to show the level of attitudes regarding radiation risks among radiotechnologists. The results indicates that, the mean of agree scores was 5.4 (total scores 7) with standard deviation of 1.2 and the percentage of participant scores of agrees responses that reflected their attitude about radiation risks which was 72 %. This result indicates that the majority of participants have positive attitudes regarding radiation risks.

Table (4.5) shows that about 97.8% of the radiotechnologists who participated in this study believe that there are dangerous effects on their health due to exposure to the radiation, 71.1% of the study participants think that the exposure to radiation have risky effects on their future generation. About 80.7% of the subjects believe that there is a relationship between radiation exposures and cancer, 76.3% believe that there is a threshold dose in radiation exposures, while 40% believe that there is a dangerous effect from the low radiation dose. Approximately 42.2% of respondents believe that there is a risk from the patient toward radiological technologists, while 95.6% believe that the exposure to radiation is more dangerous on the fetus.

Table 4.5: Distribution of the Participants Attitudes about Radiation Risk According to the Responses for Each Item.

Items	Agree		Disagree		Uncertain	
	No.	%	No.	%	No.	%
Dangerous effects of radiation exposures on our health.	132	97.8	2	1.5	1	0.7
Relations between the radiation exposures and cancer cases.	109	80.7	8	5.9	18	13.3
Radiation effects on our future generations.	96	71.1	12	8.9	27	20.0
Low radiation doses effects.	54	40.0	62	45.9	19	14.1
The presence of threshold dose in a radiation exposures.	103	76.3	17	12.6	15	11.1
Risk from the patient toward radiotechnologists.	57	42.2	60	44.4	18	13.3
Dangerous risk from radiation exposures on the fetus.	129	95.6	5	3.7	1	0.7
Average		72		17.55		10.45

The results of this study indicate that, the radiotechnologists in Gaza governorates have high attitude regarding radiation health hazards. These results agree with the study of Svenson, Soderfeldt, and Grondahi, 1996, in Sweden, which revealed that the dentists have high attitude toward radiation risks.

4.4.2. Attitude regarding radiation protection:

Descriptive statistics include mean, standard deviation and percentage of agree answers scores reflecting the participants attitudes were developed to show the attitudes regarding radiation among radiotechnologists in governmental hospitals in Gaza governorate. The results indicate that, the mean of scores was 11.5 (total scores is 13) with standard deviation 1.3 and the percentage of participants scores of agree responses which reflects the attitude about radiation protection was 88.3%. This result indicates that the majority of the study participants have positive attitudes regarding radiation protection.

From the Table (4.6) we can see that, about 97.8% of the study participants believe that there is an importance in following the radiation protection guidelines to reduce radiotechnologists received doses, 95.6% believe that the continuous training program is necessary to improve their awareness about radiation protection. About 98.5% believe that occupational doses of radiotechnologists should be under periodical monitoring and 97.8% believe that the use of collimation during radiography is very important in reducing the exposed surface, while about 87.4% believe that the evacuation of patient relatives from radiograph room is necessary before give the radiation dose. About 96.3% of the study participants believe that there is an importance of introducing the counsels to the patient to protect them from additional radiation doses, 74.1% of the participants believe that the pregnant worker should be kept away from the radiation field.

Table 4.6: Distribution of the Participants Attitudes Regarding Radiation Protection According to the Response for Each Item.

Items	Agree		Disagree		Uncertain	
	No.	%	No.	%	No.	%
Keeping the pregnant worker away from the radiation field.	100	74.1	26	19.3	9	6.7
Concerns of the radiation protection programs.	101	74.8	24	17.8	10	7.4
Importance of following the radiation protection guidelines.	132	97.8	2	1.5	1	0.7
Lectures important in improving their knowledge and practices about radiation protection.	127	94.1	2	1.5	6	4.4
Training acts to improve the awareness regarding radiation protection.	129	95.6	1	0.7	5	3.7
Periodical monitoring of the occupational doses for the radiotechnologists.	133	98.5	0	0.0	2	1.5
Prevent the patient being fixed by radiotechnologists.	115	85.2	16	11.9	4	3.0
Importance of counsels in patient protection.	130	96.3	1	0.7	4	3.0
Evacuation of the patient relatives from the radiation room.	118	87.4	9	6.7	8	5.9
Importance of collimation in a radiography.	132	97.8	1	0.7	2	1.5
increasing the distance as a method of protection.	78	57.8	40	29.6	17	12.6
Continuous monitoring of the lead apparels.	129	95.6	3	2.2	3	2.2
Importance of radiation protection methods in reducing the radiation hazards.	125	92.6	3	2.2	7	5.2
Average		88.3		7.3		4.4

4.4.3.Total attitude:

The second part of the questionnaire included twenty questions that reflect the radiotechnologists attitudes. Likert scale, agree 2, uncertain 1, disagree 0 was used to measure the attitude of the study participants. After that the researcher took the score of agree response for each item.

To measure the attitudes, descriptive statistics including mean, standard deviation and the percentage of agree answers which reflect the attitudes of participants were performed to show the radiotechnologists attitudes. Out of twenty points reflecting the attitudes among radiotechnologists, the mean of scores was 16.5 with standard deviation of 1.8 and the percentage of scores for agree answers was 82.6%. This indicates that the majority of radiotechnologists have positive attitudes regarding radiation protection. So, the null hypothesis that the radiotechnologists in governmental hospital in Gaza governorates have high attitudes about radiation protection is accepted and the researcher's hypothesis is rejected.

4.4.4. Attitude categories:

From the total scores of the attitudes, the radiotechnologists were classified into three categories, radiotechnologists with high level of attitude are those who have more than 70%, radiotechnologists with medium level of the attitude are those who got between 50-70% and the third category is those who have less than 50%; they are classified as low level of attitude.

Table 4.7: Distribution of the Study Participants According to the Attitude Categories.

Item	Categories	Frequency	percent
Attitude	High	118	87.4
	Medium	17	12.6
	Low	0	0
	Total	135	100

As shown in Table (4.7), the number of radiotechnologists who have high attitude level was 118 of 135 radiotechnologists with a percentage of 87.4. There were 17 of 135 radiotechnologists with a percentage of 12.6 who got medium level, while there is no one of radiotechnologists got low attitude level. These results indicate that, according to the above mentioned categorization, the number of radiotechnologists who got high scores in the level of attitude were more than those who got medium scores.

4.5 Practices of the study participants regarding radiation protection

Descriptive statistics including mean, standard deviation and the percentage of yes responses which reflects the practices were developed. Out of eighteen questions reflecting the level of actual practices among radiotechnologists, the mean of scores was 5.6 with standard deviation of 2.3 and the percentage of scores for yes answers was 45. When the yes percent (45%) is compared with the no and sometimes percents (47.2% and 7.8% respectively) as table (4.8) show, it is found that the majority of radiotechnologists have low practice levels regarding radiation protection. So, the alternative hypothesis "the radiotechnologists in governmental hospitals in Gaza governorates have low level of practices regarding radiation protection” is accepted.

Table 4.8: Distribution of Study Participants Responses about Radiation Protection Practice Items According to the Answers for Each Item.

Items	No		Yes		Sometimes	
	No.	%	No.	%	No.	%
Participation in radiation protection course.	96	71.1	39	28.9	0	0
Reading the radiation request before radiograph the patient.	75	55.6	41	30.4	19	14
Produced counsels to the patient.	60	44.4	44	32.6	31	23
Assure suitable position.	67	49.6	60	44.4	8	5.9
Uses the collimation.	77	57.0	38	28.1	20	14.8
Evacuation of the patient relatives.	68	50.4	61	45.2	6	4.4
Stand behind lead barrier.	1	0.7	129	95.6	5	3.7
Uses of gonadal shield.	103	76.3	11	8.1	21	15.6
Keep the recommended distance from the radiation source.	61	45.2	42	31.1	32	23.7
Avoid Fixed the child during radiography.	35	25.9	70	51.9	30	22.2
Wear the protection tool to protect him self.	21	60	12	34.3	2	5.7
Protect the person who fixes the child during the radiography.	63	49.6	23	18.1	41	32.3
Own the dosimeter.	73	54.1	62	45.9	0	0
Put the dosimeter during the work in a radiation field.	29	46.8	25	40.3	8	12.9
Keep the dosimeter as personnel device.	6	9.7	48	77.4	8	12.9
Don't uses the personal dosimeter in other work place.	1	1.6	61	98.4	0	0
Presence of scientific design place for keeping the dosimeter.	62	100	0	0	0	0
Put the dosimeter in the deign place.	0	0	0	0	0	0
Periodically reading the dosimeter from the concerned party.	58	93.5	4	6.5	0	0
Worried about irregular check of the dosimeter from the concern party.	3	5.2	55	94.8	0	0
Stop working in a radiation field in case of not own dosimeter.	73	100	0	0	0	0
Average		47.2		45		7.8

Table (4.8) shows the following results:

About 71.1% of subjects do not participate in a radiation protection course, while 28.9% participated. When subjects were asked if they read the radiation request before radiographing the patient, the majority answered no (55.6%). When the participants were asked if they assure the suitable position for the patient before given a radiation dose, the responses were 49.6% answered no, while 44.4% answered yes and 5.9% answered sometimes. Only 28.1% of radiotechnologists used the collimation during the radiography in order to reduce the exposed surface. About 50.4% of participants not evacuate the radiological room from the patient relatives before give the radiation dose. The majority of the study participants stand behind lead barrier when give the radiation dose. About 76.3% of radiotechnologists didn't use the gonad shield to protect the patient, while 8.1% did use it. When the participant were asked if they keep the recommended distance from the radiation source, 45.2% answered no, while 31.1% answered yes and 23.7% answered sometimes. When the radiotechnologists were asked if they avoid fixing the child patient during the radiography, 51.9% answered yes. About 18.1% of radiotechnologists used the lead apron to protect the person who fixed the child during the radiological procedures,. About 60% of study participants didn't worn the lead apparels to protect them selves from the radiation doses. Most of the study participants didn't own the dosimeter device, about 40.3% of the radiotechnologists who have a dosimeter put it during the work in a radiation field, while 46.8% didn't and 12.9% answered sometimes. All radiotechnologists who have a dosimeter don't keep it on a scientifically designed box or place and all of those who don't own the dosimeter work in the radiation field without any type of occupational doses monitoring. About 93.5% of periodical dosimeter reading didn't occur by the concerned party; most radiotechnologists are worried about this negligence.

4.5.1. Practices categories:

From the total scores of practices, the radiotechnologists were classified into three categories; radiotechnologists with high level of practice are those who have a score more than 70%, radiotechnologists with medium level of the practice are those who got between 50-70% and the third category are those who have less than 50%, they are classified as low level of practice.

Table 4.9: Distribution of the Study Participants According to the Practice Categories.

Item	Categories	Frequency	Percent
Practice	High	0	0
	Medium	19	14
	Low	116	86
	Total	135	100

As shown in Table (4.9), the number of radiotechnologists who have low practice level was 116 of 135 radiotechnologists with a percentage of 86, while 19 of 135 radiotechnologists (14%) have medium level of practice, and there is no one of the radiotechnologists have high level of practice. These results indicated that, according to the above mentioned categorization, the number of radiotechnologists who have low scores of practice were more than those who got medium scores.

The researcher findings indicate that, the radiotechnologists in governmental hospitals in Gaza governorates have low level of practices regarding radiation protection. These results are an agreement with the study of Tavakoli, Seilanian, and Saadatjou, 2003, in Iran, which revealed that the medical students in Birjand university of medical sciences have low level of practices regarding radiation protection.

4.6 Relationships between the independent variables and the subjects' KAP

4.6.1. Gender effect on the level of KAP:

To test the hypothesis "there is a statistically significant relationship between the levels of KAP among radiotechnologists due to their gender regarding radiation protection" independent t test, mean and the standard deviation were used.

Table 4.10: The KAP of Radiotechnologists According to Their Gender.

Item	Gender	N	Mean	Standard deviation	T	P
Knowledge	**Female**	26	9.12	2	-0.856	0.311
	Male	109	9.6	2.7		
Attitude	**Female**	26	16.23	1.7	-0.935	0.355
	Male	109	16.58	1.8		
Practice	**Female**	26	5.8	2.519	0.363	0.717
	Male	109	5.6	2.241		

As shown in Table (4.10), the mean of knowledge among males radiotechnologists is higher than that among females. According to independent t test results, t value = -0.8566 and p-value = 0.311 which is not a statistically significant difference. This means that there are no statistically significant differences in the knowledge of radiotechnologists regarding radiation protection due to their gender. So, the null hypothesis that there is no relationship between the knowledge of radiotechnologists about radiation protection and their gender is accepted and the researcher's hypothesis is rejected. These results are in an agreement with the study of Chuan Su, Frong Hang, Chung Chen, and Shu Chang, n.d., which was conducted in Taiwan, and revealed that there is no relationship between the radiation safety knowledge and the gender of radiotechnologists in medical centers. The same results were reported in the study of Tavakoli, Seilanian, and Saadatjou, 2003, which was conducted in Iran.

As show in Table (4.10), the mean of attitudes among males radiotechnologists is slightly more than that among females, according to independent t test results, t value = -0.935 and p-value = 0.355 which is not a statistically significant difference. This means that there is no relationship between the attitude of radiotechnologists regarding radiation protection and their gender. So, the null hypothesis that there is no relationship between the radiotechnologists attitudes and their gender is accepted and the researcher's hypothesis is rejected

From the Table (4.10) it is clear that, the practice mean among females is higher than among males, where t value =0.363 and p-value = 0.717, which indicates a non-statistically significant difference. This means that there is no relationship between the practices regarding radiation protection and the gender of radiotechnologists. So, the null hypothesis that there is no statistically significant relationship between the radiotechnologists practices and their gender is accepted and the researcher’s hypothesis is rejected. The researcher study disagree with the results of Tavakoli, Seilanian, and Saadatjou, 2003, where their study had revealed that there are statistically significant differences between radiation protection practices among medical students in Iran and their gender toward female. This disagreement may be due to the difference in the cultures among various communities.

4.6.2. Level of KAP and radiotechnologists age:

The mean, standard deviation and one-way ANOVA test were used to explore if the level of KAP towards radiation protection among radiotechnologists in governmental hospitals differ due to their age.

Table 4.11: The KAP among Radiotechnologists According to Their Age.

Item	Age group	N	Mean	Standard deviation	F	P
Knowledge	**25 yrs and less**	42	9	2.5	1.543	0.218
	26-35 yrs	56	9.6	2.6		
	36 yrs and higher	37	9.9	2.6		
	Total	135	9.5	2.6		
Attitude	**25 yrs and less**	42	16.1	1.8	2.092	0.128
	26-35 yrs	56	16.6	1.8		
	36 yrs and higher	37	16.9	1.6		
	Total	135	16.5	1.8		
Practice	**25 yrs and less**	42	3.9	1.3	34.19	0.000
	26-35 yrs	56	5.8	2.1		
	36 yrs and higher	37	7.4	2.0		
	Total	135	5.6	2.3		

The results from Table (4.11) reflect the difference in the knowledge mean among the radiotechnologists according to their age. The highest (9.9) was for age group 36 years and above while the lowest (9) was for age group 25 years and less. According to the results of one-way ANOVA, where F=1.543 and the p-value = 0.218, there is no statistically significant difference in the knowledge level among radiotechnologists due to their age. This indicates that, there is no relationship between the radiotechnologists knowledge about radiation protection and their age. So, the null hypothesis "there is no relationship between the knowledge of radiotechnologists about radiation protection and their age" is accepted and the researcher's hypothesis is rejected.

The results from the Table (4.11) reflect differences in the attitudes' mean among the radiotechnologists according to their age. The highest (16.9) was for age group 36 years and above, while the lowest (16.1) was for age group 25 years and less. According to the results of one-way ANOVA, were F=2.092 and the p-value =0.128, there are no statistically significant differences in the radiotechnologists attitudes due to their age. This indicates that, there is no relationship between radiotechnologists attitudes toward radiation protection and their age. So, the null hypothesis "there is no relationship between the radiotechnologists attitudes and their age" is accepted and the researcher's hypothesis is rejected.

Table (4.11) show that, the differences in practice means among radiotechnologists according to their age, where the age group 36 years and above has the highest mean (7.4), and the age group 25 years and less has the lowest one (3.9). According to the results of one-way ANOVA, F =34.19 and the p-value = 0.000, there are statistically significant differences among radiotechnologists practices due to their age. This indicates that, there is a statistically significant relationship between radiotechnologists practices toward radiation protection due to their age. So, the alternative hypothesis that there is a statistically significant relationship between the radiotechnologists practices regarding radiation protection and their age is accepted.

To support this result, Post hoc multiple comparisons (Scheffe test) was performed to identify the mean differences among the different age groups.

Table 4.12: Scheffe Post Test for KAP and Age Groups.

Dependent variable	(I) Age	(J) Age	Mean difference (I-J)	Sig.
Knowledge	**25 yrs and less**	26 -35 yrs	-.690	.420
		36 and higher	-.967	.250
	26-35 yrs	25 and less	.690	.420
		36 and higher	-.276	.879
	36 and higher	25 and less	.967	.250
		26 -35 yrs	.276	.879
Attitude	**25 yrs and less**	26 -35 yrs	-.476	.414
		36 and higher	-.797	.135
	26-35 yrs	25 and less	.476	.414
		36 and higher	-.320	.689
	36 and higher	25 and less	.797	.135
		26 -35 yrs	.320	.689
Practice	**25 yrs and less**	26 -35 yrs	-1.905(*)	.000
		36 and higher	-3.470(*)	.000
	26-35 yrs	25 and less	1.905(*)	.000
		36 and higher	-1.566(*)	.001
	36 and higher	25 and less	3.470(*)	.000
		26 -35 yrs	1.566(*)	.001

From Table (4.12), Scheffe post test clarifies that there are no statistically significant differences among the radiotechnologists age groups and their knowledge regarding radiation protection. These findings disagree with the study of Chuan Su, Frong Hang, Chung Chen, and Shu Chang, n.d, in Taiwan, which revealed that there are differences in radiation safety knowledge among the radiotechnologists in medical centers due to their age. These variations can be attributed to culture differences among the different communities.

Table (4.12) clarifies that, there are no statistically significant differences among the radiotechnologists age groups and their attitudes toward radiation protection. From Table (4.12), scheffe post test clarifies that there are statistically significant differences in the practices between the radiotechnologists who have 36 years and higher and the two other age groups. Also there is a statistically significant difference between the practices of radiotechnologists who have 26-35 years and those who have 25 years and less or 36 years and higher. Finally there are a statistical significant difference in the practices of radiotechnologists who have 25 years and less and the other two age groups.

From the above findings, it is clear that there is a statistically significant difference in the radiotechnologists practices according to their age, and this difference was the highest among radiotechnologists with age 36 years and higher followed by 26-35 years age group and the lowest was among 25 year and less age group. On researcher's opinion this result might be because the older age employees are more careful about their health, while the younger radiotechnologists are careless.

4.6.3. Education effect on the level of KAP:

To explore the effects of radiotechnologists educational level on the KAP level about radiation protection, mean and standard deviation and independent t test were used.

Table 4.13: The KAP According to The Radiotechnologists Education.

Item	Education	N	Mean	Standard deviation	T	P
Knowledge	**Diploma**	27	9.9	2.92	0.864	0.393
	Bachelor	108	9.4	2.48		
Attitude	**Diploma**	27	16.5	1.6	0.026	0.972
	Bachelor	108	16.6	1.8		
Practice	**Diploma**	27	6.9	2.3	3.548	0.001
	Bachelor	108	5.3	2.2		

As show in Table (4.13), the mean of knowledge among radiotechnologists who have diploma certificate is higher than that for those who have bachelor degrees. According to independent t test results, t value = 0.864) and p-value = 0.393, there is no statistically significant difference in knowledge level due to the educational level of radiotechnologists. This means that there is no effect of education on the knowledge level among radiotechnologists. So, the null hypothesis that there is no relationship between the knowledge level among radiotechnologists and their educational level is accepted and the researcher's hypothesis is rejected.

These findings contradict those of Chuan Su, Frong Hang, Chung Chen, and Shu Chang, n.d, in Taiwan, which revealed that there is a statistically significant relationship between the radiation safety knowledge among the radiotechnologists in medical centers due to their educational level. Amirzadeh, and Tabatabaee, (2005), in their study which was performed in Iran, reported that there is a statistically significant difference between the radiology employees due to their educational level, which is in disagreement with the current results. Our study findings disagree with the study of Tavakoli, Seilanian, and Saadatjou, (2003), which was conducted on 100 medical students from Birjand University of medical science in Iran; its results revealed that there is a statistically significant difference in the students knowledge scores according to their educational level. Svenson, Soderfeldt, and Grondahi, 1997, in Sweden, revealed that the educational level of the dentists affects their knowledge about radiation protection during oral radiography. These variations can be attributed to the differences in cultures and to the radiation protection education materials applied in universities curricula in different communities.

As show in Table (4.13), the results demonstrate that there was a slight difference in the mean of radiotechnologists attitudes between those who have bachelor and diploma degrees. By performing independent t test, t value = 0.026 and p-value = 0.972, which indicates that there is no statistical significant differences in the radiotechnologists attitudes due to their educational level. This means that there is no effect of the educational level of the radiotechnologists on their attitudes regarding radiation protection. So, the null hypothesis "there is no relationship between the radiotechnologists attitudes and their educational level" is accepted and the researcher's hypothesis is rejected.

As show in Table (4.13), the practices' mean among radiotechnologists who have diploma degrees is higher than those who have bachelor degrees. According to independent, t test results, t value = 3.548 and p-value = 0.001, there is a highly statistically significant difference in the practices due to the educational level of radiotechnologists. This means that there is an effect of education on the practices of radiotechnologists. So, the alternative hypothesis "there is a statistically significant relationship between the radiotechnologists practices and their educational level" is accepted. According to the researcher's opinion the causes of these differences in the radiotechnologists practices, favoring those who have diploma degrees, are related to the quality of education materials and curriculum given to the two different groups at during their higher education studies.

These findings are in contrast with the study of Tavakoli, Seilanian, and Saadatjou, 2003, in Iran, revealed that there is no statistically significant difference in radiation protection practices among medical students due to their educational level. These variations can be attributed to the different cultures and educational materials which applied in different communities.

4.6.4. Level of KAP and marital status:

To test the hypothesis "there is a statistically significant relationship between the KAP level among radiotechnologists due to their marital status" mean and standard deviation and independent T test were performed.

Table 4.14: The KAP of Radiotechnologists According to Their Marital Status.

Item	Marital status	N	Mean	Standard deviation	T	P
Knowledge	**Married**	97	9.5	2.7	-0.224	0.823
	Single	38	9.6	2.3		
Attitude	**Married**	97	16.7	1.8	1.818	0.073
	Single	38	16.1	1.7		
Practice	**Married**	97	6.08	2.3	3.930	0.000
	Single	38	4.45	1.9		

Table (4.14) reflects a slight difference between the means of knowledge according to the marital status for radiotechnologists. According to independent t test results, t value = -0.224 and p-value =0.823, there is no statistically significant difference. This indicates that there is no difference in the knowledge level due to the marital status of the radiotechnologists. This means that there is no relationship between radiotechnologists knowledge regarding radiation protection and their marital status. So, the null hypothesis "there is no relationship between the knowledge of radiotechnologists about radiation protection and their marital status" is accepted and the researcher's hypothesis is rejected.

The results in Table (4.14) reflect some differences between the means of attitudes according to the radiotechnologists marital status. Independent t test results clarifies that the t value = 1.818 and p-value = 0.073, there are no statistically significant differences. This indicates that there is no difference in the attitudes due to the marital status of the radiotechnologists. This means that there is no relationship between radiotechnologists attitudes regarding radiation protection and their marital status. So, the null hypothesis that there is no relationship between the attitudes among radiotechnologists and their marital status is accepted and the researcher's hypothesis is rejected.

Table (4.14) shows clear differences between the radiotechnologists practices means according to their marital status toward married. According to independent t test results, t value = 3.930 and p-value = 0.000 there very highly statistically significant differences. This means that there is a statistically significant relationship between the radiotechnologists practices regarding radiation protection and their marital status toward female. So, the alternative hypothesis that there is statistically significant relationship between the radiotechnologists practices and their marital status is accepted. On researcher's opinion these variations in the radiotechnologists practices due to their marital status toward married are related to their fear from transmitting the risk of radiation to their future generations, so they applied the protective procedures more than the single radiotechnologists who may not have the same concern.

4.6.5. Experience effect on the level of KAP:

Is there any relationship between the level of KAP among radiotechnologists in governmental hospitals in Gaza governorates and the experience years in their work? To answer this question, the mean, standard deviation and one-way ANOVA test were used.

Table 4.15: The KAP of Radiotechnologists According to Their Experience Years.

Item	Experience group	N	Mean	Standard deviation	F	P
Knowledge	**5 yrs and less**	87	9.2	2.4	2.371	0.097
	6-10 yrs	15	10.1	2.7		
	More than 10 yrs	33	10.2	2.8		
	Total	135	9.5	2.6		
Attitude	**5 yrs and less**	87	16.4	1.9	1.094	0.338
	6-10 yrs	15	17	1.2		
	More than 10 yrs	33	16.7	1.6		
	Total	135	16.5	1.8		
Practice	**5 yrs and less**	87	4.8	1.9	24.49	0.000
	6-10 yrs	15	6.9	2.5		
	More than 10 yrs	33	7.4	2.0		
	Total	135	5.6	2.3		

From Table (4.15), the mean of knowledge differs according to the radiotechnologists years of experience. The highest (10.2) was for technologists who have more than 10 years of experience, while the lowest (9.2) was for those who have 5 years and less. According to the one-way ANOVA test results, F=2.371 and the p-value =0.097, there is no statistically significant differences in the level of knowledge due to the radiotechnologists experience years. This indicates that, there is no relationship between level of knowledge among radiotechnologists and their experience years. So, the null hypothesis that there is no relationship between the knowledge level among the radiotechnologists and their years of experience is accepted and the researcher's hypothesis is rejected.

From Table (4.15), the mean of attitudes differ according to the experience years of the radiotechnologists. The highest (17) was for technologists who have 6 to 10 experience years, while the lowest (16.4) was for those who have 5 experience years and less. According to the one-way ANOVA test results, F=1.094 and p-value =0.338, there are no statistically significant differences in the radiotechnologists attitudes due to their years of experience. This means that, there is no relationship between the attitudes of radiotechnologists and their experience years. So, the null hypothesis that there is no relationship between the radiotechnologists attitude and their years of experience is accepted and the researcher's hypothesis is rejected.

From Table (4.15), it is shown that the practices means were different according to the experience years of the radiotechnologists. The highest (7.4) was for technologists who have more than 10 years of experience, while the lowest (4.8) was for those who have 5 years and less. According to the one-way ANOVA test results, F = 24.49 and the p-value = 0.000, there is a statistically significant difference in the radiotechnologists practices due to their experience years. So, the alternative hypothesis that there is a statistically significant relationship between the radiotechnologists practices regarding radiation protection and their years of experience is accepted. The researcher attributed these variations between the radiotechnologists practices to increasing the occupational radiation doses among those who have more years of work. So, this group of radiotechnologists has become more concerned about the health impacts from radiation exposures than those who have less period of experience. Hence, they applied the protection procedures more carefully to decrease the probability of radiation risks on their health.

To support these results, Post hoc multiple comparisons (Scheffe test) was performed to see the mean differences among the different groups of experience.

Table 4.16: Scheffe Post Test for KAP and Radiotechnologists Experience Groups.

Dependent variable	(I) Experience	(J) Experience	Mean difference (I-J)	Sig.
Knowledge	**5 yrs and less**	6-10 yrs	-.984	.387
		More 10 yrs	-1.002	.161
	6-10 yrs	5 yrs and less	.984	.387
		More 10 yrs	-.018	1.00
	More 10 yrs	5 yrs and less	1.002	.161
		6-10 yrs	.018	1.00
Attitude	**5 yrs and less**	6-10 yrs	-0.644	0.429
		More 10 yrs	-0.341	0.641
	6-10 yrs	5 yrs and less	0.644	0.429
		More 10 yrs	0.303	0.859
	More 10 yrs	5 yrs and less	0.341	0.641
		6-10 yrs	-0.303	0.859
Practice	**5 yrs and less**	6-10 yrs	-2.120(*)	.001
		More 10 yrs	-2.617(*)	.000
	6-10 yrs	5 yrs and less	2.120(*)	.001
		More 10 yrs	-0.497	.721
	More 10 yrs	5 yrs and less	2.617(*)	.000
		6-10 yrs	0.497	.721

From the Table (4.16), Scheffe post test clarifies that there are no statistically significant differences between the radiotechnologists experience groups and their knowledge regarding radiation protection. These findings is in contrast to the study of Svenson, Soderfeldt, and Grondahi, 1997, in Sweden, revealed that the experience of the dentists affect their knowledge about radiation protection during oral radiography. These variations may be due to the different cultures between the different study populations.

From the Table (4.16), Scheffe post test clarifies that there are no statistically significant differences among the radiotechnologists experience groups and their attitudes toward radiation protection. Scheffe post test clarifies that there are statistically significant differences in the practices between the radiotechnologists who have 5 years of experience and less and the other two groups. Also there is a statistically significant difference between those who have experience from 6 to10 years and those who have 5 years and less, while there is no statistically significant difference with those who have more than 10 years of experience. Finally there is a statistically significant difference between those who have an experience of more than 10 years and those with 5 years and less, while there is no statistically significant with those who have 6 to 10 years of experience.

From the above findings, it is clear that there are statistically significant differences in the radiotechnologists practices according to their experience, and this difference was the highest in radiological technologists who have more than 10 years of experience, followed by those who have 6 to 10 years, and the lowest was among those who have 5 years of experience and less.

4.6.6. Level of KAP and the region of work:

The independent t test, mean and the standard deviation were developed in order to answer the following question:

Is there any relationship between the level of KAP among radiotechnologists in governmental hospitals and their work region?

Table 4.17: The KAP among Radiotechnologists According to Their Work Regions.

Item	Work region	N	Mean	Standard deviation	T	P
Knowledge	**South and mid**	62	9.3	2.4	-1.031	0.304
	Gaza and north	73	9.7	2.7		
Attitude	**South and mid**	62	16.7	1.8	1.006	0.316
	Gaza and north	73	16.4	1.7		
Practice	**South and mid**	62	5.87	2.43	1.165	0.246
	Gaza and north	73	5.41	2.2		

As show in Table (4.17), the mean of knowledge among the radiotechnologists in Gaza city and north region is higher than that for those in south and mid zone regions. According to independent t test results, t-value = -1.031 and p-value = 0.304, so, there is no statistically significant differences. This means that there is no relationship between the level of knowledge regarding radiation protection and radiotechnologists work regions. So, the null hypothesis "there is no relation between the radiotechnologists knowledge and their work regions" is accepted and the researcher's hypothesis is rejected.

Table (4.17) show that, the mean of radiotechnologists attitudes in south and mid zone is higher than that in Gaza city and north region. According to independent t test results, t value =1.006 and p-value =0.316, which is no a statistically significant difference. This means that there is no relationship between the attitudes of radiotechnologists regarding radiation protection and their work regions. So, the null hypothesis that there is no relationship between the radiotechnologists attitudes and their work regions is accepted and the researcher's hypothesis is rejected. The practices' mean among the radiotechnologists in south and mid zone regions is higher than that for radiotechnologists in Gaza city and north region. According to independent t test results, t value = 1.165 and p-value = 0.246, there is no statistically significant difference. This means that there is no relationship between the practices regarding radiation protection and the radiotechnologists work regions. So, the null hypothesis “there is no relationship between the radiotechnologists practices and their work regions" is accepted and the researcher's hypothesis is rejected.

4.6.7. Second work effect on the level of KAP:

To test the hypothesis "there is a statistically significant relationship between the level of KAP among radiotechnologists due to their work in second job regarding radiation protection" independent t test, mean and the standard deviation were used.

Table 4.18: The Level of KAP According to Working in Second Places.

Item	Other work	N	Mean	Standard deviation	T	P
Knowledge	**No**	88	9.3	2.4	-1.089	0.279
	Yes	47	9.9	2.9		
Attitude	**No**	88	16.2	1.8	-2.614	0.010
	Yes	47	17	1.6		
Practice	**No**	88	5.7	2.43	0.570	0.569
	Yes	47	5.5	2		

As show in Table (4.18), the mean of knowledge among radiotechnologists who have second work is higher than of those who haven't. According to independent t test results, t value = -1.089 and p-value =0.279, there is no statistically significant difference. This means that there is no relationship between the radiotechnologists knowledge regarding radiation protection and their work in a second organization. So, the null hypothesis "there is no relationship between the knowledge among radiotechnologists and their work in a second job" is accepted and the researcher's hypothesis is rejected. As show in above table, the mean of attitudes among radiotechnologists who have a second work is higher than those who haven't. According to independent t test results, t value = -2.614 and p-value = 0.010, there are statistically significant differences. This means that there is a relationship between attitudes regarding radiation protection among radiotechnologists due to having a second job. So, the study alternative hypothesis "there is a statistically significant differences between the radiotechnologists attitudes and their work in a second job is accepted. This result on researcher's opinion may be due to increase the radiotechnologists doses as a result of more exposure from the work in the second organization. So, the probability of radiation risks becomes larger than that of those who haven’t other work. This effect on the radiotechnologists lead to increase the concerns toward radiation protection.

As shown in Table (4.18), according to independent t test results, t value =0.570 and p-value =0.569 which indicates no statistically significant difference. This means that there is no relationship between the practices regarding radiation protection among radiotechnologists and their work in a second job. So, the null hypothesis that there is no relationship between the radiotechnologists practices and their working in second job is accepted and the researcher's hypothesis is rejected.

4.7 Correlation between radiation protection KAP among the study population

This part of analysis is to identify if there is a correlation between radiation protection KAP among radiotechnologists in governmental hospitals in Gaza governorates. The Pearson correlation coefficient was calculated, and Table (4.19) shows the results.

Table 4.19: Correlation between Radiation Protection KAP among the Study Population.

		Knowledge	**Attitude**	**Practice**
Knowledge	Pearson correlation	1	-0.113	0.060
	Sig.(2- tailed)		0.192	0.486
	N	135	135	135
Attitude	Pearson correlation	-0.113	1	0.183*
	Sig.(2 -tailed)	0.192		0.034
	N	135	135	135
Practice	Pearson correlation	0.060	0.183*	1
	Sig.(2- tailed)	0.486	0.034	
	N	135	135	135

As shown in Table (4.19), Pearson correlation coefficient results between radiation protection KAP indicate that there is a weak negative correlation between radiation protection knowledge and attitude among the radiotechnologists, where $r = -0.113$ and $p = 0.192$. This correlation didn't reach a statistically significant level. Correlation between radiation protection knowledge and practice was of a very weak positive correlation, where $r = 0.060$ and $p = 0.486$. This correlation also didn't reach a statistically significant level.

The correlation between the radiation protection attitude and practice was a weak positive one, where $r = 0.183$ and $p = 0.034$. This correlation reached to a statistically significant level, which means that radiotechnologists with high attitude toward radiation protection are likely to have high radiation protection practice.

Chapter (5)

Conclusion and recommendation

Chapter five

Conclusion and recommendations

In this chapter the major outcomes of the study will be reviewed and the answers of research questions will be given. Also recommendations and suggestions for further investigation will be provided. The study findings may help the decision makers in developing future plans and programs in order to improve the knowledge, attitude, and radiotechnologists practices regarding radiation protection.

5.1 Conclusion

5.1.1. Radiotechnologists knowledge:

The mean scores of knowledge about radiation risks among radiotechnologists was 2.87 (total score is 6), with percentage 47.8. According to the mathematical figure these results indicate that the radiotechnologists have high knowledge about radiation health hazards, but in fact they have inadequate knowledge, where they have knowledge about two items only from the six items which measured the radiation risks knowledge. These outcomes indicate that the radiotechnologists have an insufficient knowledge about radiation health impacts. So, the concerned party should pay more efforts to improve the knowledge of radiotechnologists about radiation health hazards.

The mean scores of radiation protection knowledge among the study participants was 6.6 (total score is 14), with a percentage of 47.41. From this mathematical percent we can say that, the radiotechnologists have high knowledge about radiation protection, but in fact they lack enough knowledge, where they have knowledge about five items only from the fourteen items which reflect the radiotechnologists knowledge regarding radiation protection. These investigations revealed that the radiotechnologists in Gaza governorates have a limited knowledge about radiation protection. So, continuous training and more courses are suggested to increase the study participants' knowledge toward radiation protection.

The total knowledge mean for the 135 radiotechnologists was 9.5 (total score is 20), with percentage 47.52. About 4.5% (N=6) of radiotechnologists have high level of knowledge, while 45.9% (N=62) have medium knowledge level, and 49.6% (N= 67) of study participants have low level of knowledge, , which means that the number of radiotechnologists who have got low and medium level of knowledge is more than those who have high level of knowledge. These outcomes revealed that the radiotechnologists in governmental hospitals in Gaza governorates have low level of knowledge regarding radiation protection.

5.1.2. Study participants attitude:

The mean scores of the study participants attitudes regarding radiation health risks was 5.4 (total score is 7), with a percentage of 72. This indicates that the study subjects have a positive attitude towards radiation risks.

The mean scores of the radiotechnologists attitudes toward radiation protection was 11.5 (total score is 13), with a percentage of 88.3. These outcomes indicate that the study subjects have positive attitude toward radiation risks.

The mean scores of the total attitude among radiotechnologists was 16.5 (total score is 20), with a percentage of 82.6. About 87.4% (N=118) of radiotechnologists have high attitude, while 12.6% (N= 17) of them have medium level, and no one of the respondents have low level of attitude toward radiation protection, which means that the number of radiotechnologists who have got high attitude level is more than those who have medium level of attitude. These findings revealed that the radiotechnologists in Gaza governorates have high attitude toward radiation protection.

5.1.3. Responders practices:

The mean scores of the practices regarding radiation protection among 135 radiotechnologists from governmental hospitals in Gaza governorates was 5.6 (total score is 18), with a percentage of "yes" answers equals 45, while the percentage of "no" answers equals about 47.2. About 86% (N= 116) of the participants were found to have low level of practice, while 14% (N=19) have medium level, and no one of the study participants have high level of the practice regarding radiation protection, which means that the number of radiotechnologists who have got low practice level is more than those who have medium level of practice. From the study results, it is clear that the radiotechnologists in governmental hospitals face a problem in applying the radiation protection instructions in order to protect the patient, the public, and them selves from the hazardous radiation. So, the responsible actors will introduce more efforts to solve this dangerous problem.

Training, holding periodical sessions about occupational radiation health hazards, and providing the protection tools in all radiology departments in Gaza hospitals may play an important role in improving the radiotechnologists practices toward the uses of prevention instructions in their work.

5.1.4. Relationships between the radiotechnologists KAP with independent variables of the study:

No significant differences were found in the level of knowledge regarding radiation protection and the different independent variables of the study as radiotechnologists age, gender, marital status, educational level, and years of experience, work zones, and the working in other private organizations.

There is a relationship between the radiotechnologists attitudes toward radiation protection and their working in other institutions, where the respondents who have second work are more concerned toward radiation protection than those who haven't other work. In other aspect there were no significant differences found in the level of radiotechnologists attitudes with the remaining independent variables.

There were statistically significant relationships between practices regarding radiation protection and age, years of experience, educational level, and the marital status of the radiotechnologists. These relations can be attributed to the increase of the period of work in radiation fields, where radiation exposures become larger than that for those who have less years of experience. Also, the educational materials and curricula given to the radiotechnologists during their study play an important role in their practices, and the fear from transmitting the radiation health impacts to the future generations make the married radiotechnologists more careful about applying the prevention instructions and measures for radiation exposures.

5.1.5. Correlation between radiation protection KAP:

There is a weak negative correlation between radiation protection knowledge and attitude among the study radiotechnologists. This correlation didn't reach to a statistically significant level. The correlation between radiation protection knowledge and practice was a very weak positive correlation and also didn't reach to a statistically significant level.

There is a positive significant relationship between radiation protection attitude and practice among the radiotechnologists in Gaza governmental hospitals. This result revealed that the positive attitude toward radiation protection has lead to a high level of practice among the radiotechnologists.

5.2 Recommendations

- Radiation protection program are needed in Gaza in order to strengthen the basic knowledge and concepts of radiotechnologists.

- Establishing radiation protection guidelines that should be clear and available to all radiotechnologists.

- Conducting continuous training programs for the radiotechnologists that may help in improving their awareness about radiation protection.

- Organizing regular seminars by the directors of the radiology departments at the workplace to refresh and update the radiotechnologists of protection acts and guidelines.

- Supervising the use of the occupational dose monitors by the radiotechnologists, and this act should be a routine daily inspection program of radiation departments' directors.

- Putting more efforts to increase the radiotechnologists awareness on occupational health hazards.

- Subjects as radiation protection performance will discuss with the radiotechnologists.

- Establishing a center for the dosimeter measurement in the Gaza Strip in order to ensure the regular monitoring of x-ray technicians occupational doses.

- Ministry of health should provide the protective apparels in all radiological departments in Gaza governorates.

- Responsibility actors should provide the occupational dose monitors for all radiotechnologists in Gaza governmental hospitals.

- Designing the radiology departments according to the internationally accepted scientific standards for the protection of the workforce, the patients and the public.

- Strengthening the institutions system more enough in order to force the radiotechnologists toward applying the safety practices during their working.

5.3 Further researches recommendation

According to the study results, and limitations, the researcher recommends the following suggested further researcher:

- As the researcher conducted the study on the governmental hospitals only, further researches are recommended to include UNRWA, and private radiology centers to assess the level of knowledge, attitudes, and practices among their radiotechnologists.

- As this study has evaluate the knowledge, attitudes, and practices of the radiotechnologists regarding radiation protection in Gaza strip only, the researcher recommends that further similar researches in the West Bank governorates.

- Evaluation of the radiation protection curricula that are given to the students of radiology at studying in Gaza Strip universities.

- Further studies are required to highlight the occupational health hazards that radiotechnologists are exposed to.

- This study was a quantitative one, further qualitative studies may be conducted.

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Personal communication list

- Ibrahim Abbas, deputy director of radiology department in Ministry of Health (October 2008): Data about Numbers and Situation of The Radiotechnologists in Gaza Governmental Hospitals. Personal interview.

ANNEXES

Annex 1

Palestinian National Authority
Ministry of Health
Helsinki Committee

السلطة الوطنية الفلسطينية
وزارة الصحة
لجنة هلسنكي

Date: 15/8/2008

Name: Safa Abu Draz

I would like to inform you that the committee has discussed your application about:

التاريخ: ٢٠٠٨/٨/١٥

الاسم: صفاء أبو دراز

نفيدكم علما بأن اللجنة قد ناقشت مقترح دراستكم حول:-

Knowledge, Attitudes, and Practices Regarding Radiation Protection among Radio Technologist in Governmental Hospitals in Gaza Governorates.

In its meeting on August 2008
and decided the Following:-
To approve the above mention research study.

و ذلك في جلستها المنعقدة لشهر أغسطس ٢٠٠٨
و قد قررت ما يلي:-
الموافقة على البحث المذكور عاليه.

Signature
توقيع

Member	Member	Chairperson
عضو	عضو	

Ministry of Health – Halsinki Committee

Conditions:-
- Valid for 2 years from the date of approval to start.
- It is necessary to notify the committee in any change in the admitted study protocol.
- The committee appreciate receiving one copy of your final research when it is completed.

Gaza Etwam – Telefax 972-7-2878166

Annex 2

Al-Quds University

Jerusalem

School of Public Health

جامعة القدس

القدس

كلية الصحة العامة

26/7/2008

الأخ الدكتور / محمد الكاشف المحترم

مدير عام المستشفيات بوزارة الصحة

تحية طيبة وبعد،،،

الموضوع: مساعدة الطالبة صفاء أبو دراز

تقوم الطالبة المذكورة أعلاه بإجراء بحث بعنوان:

"Knowledge, Attitudes and Practices regarding Radiation Protection among Radio Technologists in Governmental Hospitals in Gaza Governorates"

كمتطلب للحصول على درجة الماجستير في الصحة العامة-مسار صحة البيئة و عليه نرجو التكرم للإيعاز لمن ترونه مناسب لتسهيل مهمة الطالبة في جمع البيانات اللازمة حيث تشمل عينة الدراسة فني الأشعة في جميع مستشفيات الحكومة. علما بأن المعلومات ستكون متوفرة لدى الباحثة و الجامعة فقط.

و اقبلوا فائق التحية و الاحترام،،،

د. بسام أبو حمد

منسق عام برامج الصحة العامة

نسخة:

- الملف

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ص.ب/51000-القدس

Annex 3

بسم الله الرحمن الرحيم

السيد/ة................................حفظه الله

تحية طيبة وبعد:

أقدم لسيادتكم الاستبيان المرفق للتحكيم من قبلكم عن مدى ملائمة الأسئلة الموضوعة به بهدف جمع البيانات اللازمة لانجاز البحث العلمي الذي أقوم به كمتطلب للحصول على الماجستير في الصحة العامة من جامعة القدس وهو بعنوان

"Knowledge, Attitudes and Practices regarding Radiation Protection among Radiotechnologists in Governmental Hospitals in Gaza Governorates"

ومرفق أهداف الدراسة العامة والخاصة واستمارة التحكيم والاستبيان.

لذا أرجو من سيادتكم التكرم بإبداء الرأي حول موضوعية الأسئلة ومدي توافقها مع أهداف الدراسة وموافاتنا بأي وجهة نظر ترونها و ستؤخذ بعين الاعتبار.

وتقبلوا مني فائق الاحترام والتقدير

الباحثة / صفاء أبو دراز

General objective

To evaluate the level of knowledge and attitudes regarding radiation protection and its practices among radiotechnologists in Gaza governmental hospitals.

Specific objectives

1. To identify the level of knowledge regarding radiation protection among radiotechnologists in Gaza governmental hospitals.

2. To determine attitudes toward radiation protection among radiotechnologists in Gaza governmental hospitals.

3. To describe radiotechnologists practices regarding radiation protection among in Gaza governmental hospitals.

4. To investigate the level of knowledge and attitudes of the radiotechnologists about radiation risks.

5. To examine the effects of socio demographic factors such as age, gender, marital status, hospital region, qualifications and years of experience on the KAP level.

6. To enable decision makers to develop future plans and programs on the basis of the findings of this study

Annex 4

إستبانة للتعرف على معرفة, اتجاهات وممارسات فنيي الأشعة حول الوقاية من الإشعاع في المستشفيات الحكومية لجميع محافظات قطاع غزة

تسلسل:-----

أولا: المعلومات الشخصية:

□ **منطقة العمل**: □ الجنوب (خان يونس و رفح) □ الوسطى □ الشمال (غزة وشمال غزة)

□ **العمر بالسنين**: -------------

□ **سنوات الخبرة في مجال العمل**:----------

□ **الجنس**: □ أنثى □ ذكر

□ **الحالة الاجتماعية**: □ متزوج/ة □ غير متزوج/ة □ مطلق/ة □ أرمل/ة

□ **المؤهل العلمي**: □ ثانوية عامة □ دبلوم متوسط □بكالوريوس فما فوق

□ **هل تعمل داخل مجال الأشعة في مكان آخر ؟**

□ نعم □ لا

ثانيا: الأسئلة المتعلقة بقياس مستوى المعرفة حول أخطار الأشعة وطرق الوقاية منها:

م	السؤال	نعم	لا	لا أعرف
1	تعرض الجسم لجرعة إشعاعية في فترة زمنية طويلة يكون أكثر تأثيرا من التعرض لنفس الجرعة الإشعاعية في فترة زمنية أقل			
2	غشاوة العين تعتبر من تأثيرات الأشعة الوراثية ذات المدى الطويل			
3	يعتبر سرطان الدم أحد تأثيرات الأشعة ذات المدى القصير			
4	كلى الإنسان أكثر حساسية للأشعة من معدته			
5	أول ثلاثة شهور هي الفترة الأكثر حساسية للأشعة في عمر الجنين			
6	تعرض الجنين للأشعة في أول ثلاثة شهور من عمره ينتج عنه تأثيرات تظهر في مراحل متقدمة من حياته مثل السرطان			
7	الجرعة الإشعاعية السنوية المسموح بها لفني الأشعة هي 20 سيفر			
8	لا يوجد جرعة إشعاعية سنوية محددة لجسم المريض			
9	الجرعة الإشعاعية الكلية المكافئة للجنين هي 0.5 rem			
10	حماية المريض من الأشعة الغير ضرورية أثناء الفحوصات الإشعاعية يقع على عاتق فني الأشعة فقط			
11	إستخدام كيلو فولت عالي أثناء إعطاء الجرعة الإشعاعية يكون أعلى جرعة على المريض			
12	إذا قل وقت التعرض للأشعة أثناء الفحوصات الإشعاعية فإن جرعة المريض سوف تقل			
13	إذا زادت المسافة من مصدر الأشعة إلى الضعف فإن جرعة المستلمة سوف تقل إلى النصف			
14	المسافة الموصى تركها بين جهاز الأشعة و العامل على الجهاز هي متر واحد			
15	إستخدام المحدد "Collimation" أثناء التصوير الإشعاعي ليس له أي فائدة في تقليل جرعة المريض			
16	واقي الرصاص يجب فحصه بشكل دوري كل شهر لتجنب حدوث فيه أي تشققات			
17	الحاجز الإشعاعي الأولي "Primary radiation barrier" يجب أن			

	يكون على إرتفاع 3 أمتار			
18	سمك الرصاص في جدار غرفة الأشعة الأولي primary x- ray room يجب أن يكون 0.8 ميليمتر			
19	أثناء التصوير الملون وفي حالة الاهتمام بجرعة الرأس والرقبة فإن جهاز قياس الأشعة الشخصي يوضع في مستوى الرقبة فوق الواقي			
20	عندما تكون فنية الأشعة حاملا فإنه يجب عليها وضع جهازين لقياس الأشعة, أحدهما في مستوى الرقبة والآخر على الصدر			

<u>ثالثا: مجموعة أسئلة لمعرفة اتجاهات فنيي الأشعة حول خطر الأشعة و طرق الوقاية منها:</u>

م	السؤال	موافق	غير متأكد	غير موافق
1	أعتقد أن التعرض للأشعة له تأثيرات خطيرة على صحتنا			
2	كلما قل التعرض للأشعة سوف تقل نسبة الإصابة بالسرطان			
3	أعتقد أن تأثيرات الأشعة قد تمتد إلى أجيالنا المستقبلية			
4	أعتقد أن جرعات الأشعة القليلة ليس لها أي تأثير صحي خطير			
5	حسب رأيي هناك جرعة أمان"threshold dose" للتعرض الإشعاعي			
6	أعتقد أن المريض يعتبر مصدر خطورة على فني الأشعة			
7	أرى أن التعرض للأشعة أكثر خطورة على الجنين			
8	أعتقد أن الفنية الحامل يجب أن تعمل بعيدا عن مجال الأشعة			
9	أرى أن برامج الوقاية من الإشعاع تهتم فقط بحماية فني الأشعة			
10	فني الأشعة يجب أن يتبع تعليمات الوقاية من الإشعاع ليتجنب الأشعة الغير ضرورية			
11	محاضرات وندوات التوعية حول الوقاية من الإشعاع تحسن من مستوى المعرفة و الممارسات لدى فنيي الأشعة			
12	أعتقد أن برنامج تدريب مستمر يساعد في تحسين مستوى الوعي حول الوقاية من الإشعاع لدى فنيي الأشعة			
13	الجرعة التي يتعرض لها فني الأشعة أثناء عمله يجب أن تكون			

	تحت المراقبة الدورية			
14	أعتقد أن فني الأشعة يمكنه مسك المريض بنفسه للوصول إلى صورة إشعاعية أكثر كفاءة			
15	أعتقد أن تقديم التعليمات للمريض قبل إعطائه الجرعة الإشعاعية له دور فعال في حمايته			
16	ليس من الضروري إفراغ غرفة الفحص الإشعاعي من مرافقي المريض قبل أعطاء الجرعة الإشعاعية			
17	من الضروري إستخدام المحدد " collimation" أثناء التصوير للتقليل من السطح المعرض للأشعة			
18	يمكنني إعتبار زيادة المسافة عن مصدر الأشعة كوسيلة للتقليل من مخاطر الأشعة			
19	أعتقد أن أدوات الترصيص " lead apparels " يجب أن تكون تحت مراقبة مستمرة			
20	أعتقد أن طرق الوقاية من الإشعاع ليس لها فائدة في التقليل من مخاطر الأشعة			

رابعا: مجموعة أسئلة لوصف ممارسات فنيي الأشعة حول الوقاية من الإشعاع:

1. هل شاركت في دورات حول الوقاية من الإشعاع؟

 نعم لا

2. أثناء عملك كفني أشعة, هل تقرأ طلب الأشعة جيدا قبل تصوير المريض؟

 نعم أحيانا لا

3. هل تقوم بتوضيح تعليمات الفحص الإشعاعي للمريض قبل تصويره؟

 نعم أحيانا لا

4. هل تتأكد من وضع المريض بطريقة صحيحة قبل إعطائه جرعة الأشعة؟

 نعم أحيانا لا

5. أثناء قيامك بالتصوير الإشعاعي هل تقوم باستخدام collimation دائما لتقليل سطح المريض المعرض للإشعاع؟

□ نعم □ أحيانا □ لا

6 . قبل إعطاء الجرعة الإشعاعية, هل تقوم بإفراغ غرفة الأشعة من مرافقي المريض؟

□ نعم □ أحيانا □ لا

7 . هل تقف خلف الحاجز المرصص عند تصويرك للمريض؟

□ نعم □ أحيانا □ لا

8 . في حالة عدم إحتواء طلب الطبيب تصوير gonads هل تقوم بإستخدام gonadal shield لحماية هذه الأعضاء؟

□ نعم (إنتقل إلى سؤال 11) □ أحيانا □ لا

9 . إذا كانت الإجابة"لا", حسب رأيك ما هي أسباب عدم إستخدام gonadal shield أثناء التصوير

(يمكنك اختيار أكثر من إجابة)

- عدم توفر gonadal shield في قسم الأشعة
- غياب المراقبة من قبل إدارة القسم
- إهمال من قبل فني الأشعة
- عدم توفر المعرفة حول أهمية إستخدام gonadal shield

10 . أثناء عملك بإستخدام جهاز أشعة متنقل, هل تقوم بالحفاظ على المسافة المطلوبة بينك وبين مصدر الأشعة؟

□ نعم □ أحيانا □ لا

11 . في حالة تصويرك لطفل, هل تقوم بمسكه لضمان جودة أعلى لصورة الأشعة؟

□ نعم □ أحيانا □ لا (انتقل إلى سؤال 13)

12 . إذا كانت الإجابة "نعم", هل تقوم بإرتداء أدوات الوقاية من الإشعاع لحماية نفسك من الأشعة؟

□ نعم □ أحيانا □ لا

13 . هل تقوم بحماية الشخص الآخر الذي يقوم بتثبيت الطفل أثناء التصوير؟

□ نعم □ أحيانا □ لا

14 . هل تملك جهاز قياس أشعة خاص بك ؟

□ نعم □ لا (انتقل إلى سؤال 22)

15 . إذا كانت الإجابة " نعم", هل تقوم بوضعه أُثناء عملك في مجال الأشعة؟

☐ نعم ☐ أحيانا ☐ لا

16 . هل تتشارك مع زملائك في استخدام جهاز القياس الإشعاعي الخاص بك؟

☐ نعم ☐ أحيانا ☐ لا

17 . هل تستخدم جهاز القياس الإشعاعي الشخصي في مكان عمل آخر؟

☐ نعم ☐ لا

18 . في داخل قسمك هل يوجد مكان مصمم بطريقة علمية لحفظ جهاز القياس الإشعاعي فيه؟

☐ نعم ☐ لا

19 . إذا كانت الإجابة "نعم", هل تقوم بوضع جهاز القياس الإشعاعي الخاص بك في هذا المكان ؟

☐ نعم ☐ أحيانا ☐ لا

20 . هل يتم قراءة جهاز القياس الإشعاعي الخاص بك بشكل منتظم من قبل الجهات المعنية؟

☐ نعم ☐ لا

21. إذا كانت الإجابة"لا", هل أنت قلق من هذا الإهمال؟

☐ نعم ☐ لا

22 . في حالة عدم إمتلاكك لجهاز القياس الإشعاعي , هل تقوم بالعمل في مجال الأشعة بدون أي نظام مراقبة لجرعتك المهنية؟

☐ نعم ☐ لا

****

شكرا جزيلا لمشاركتك في هذه الدراسة, لإستلام نتائج البحث يمكنك مراسلة البريد الإلكتروني:

malakdraz@hotmail.com

Annex 5

بسم الله الرحمن الرحيم

السيد/ة المشارك:

تحية طيبة مني وبعد...

أنا الطالبة **صفاء محمد أبو دراز** أدرس بكلية الصحة العامة جامعة القدس –أبو ديس, و كمتطلب للحصول على درجة الماجستير. أقوم بإعداد بحث بعنوان

"معرفة,اتجاهات وممارسات فنيي الأشعة المتعلقة بالوقاية من الإشعاع في جميع المستشفيات الحكومية لمحافظات قطاع غزة"

Knowledge, Attitude and Practices regarding Radiation Protection among Radiotechnologists in Governmental Hospitals in Gaza Governorates.

تهدف هذه الدراسة إلى التعرف على مستويات المعرفة, الاتجاهات والممارسات لدى فنيي الأشعة حول الوقاية من الإشعاع والخروج بتوصيات تساعد صانعي القرار في تحسين خططهم المستقبلية المتعلقة بفنيي الأشعة.

أرجوا المشاركة في هذه الدراسة بالإجابة على بعض الأسئلة خلال المقابلة التي لن تستغرق أكثر من 15 دقيقة تقريبا. المشاركة طوعية ويحق لك الامتناع عن إجابة أي سؤال .

أرغب أن أنوه أن المعلومات التي سوف يتم جمعها ستكون مصدر ثقة وسرية تامة و سوف تستخدم فقط بغرض البحث العلمي وبدون ذكر أسماء لذلك أرجوا منك أن تكون الإجابات دقيقة.

أنا مستعدة للإجابة على أي استفسار من طرفك.

هل توافق على المشاركة في هذه الدراسة؟

☐ نعم ☐ لا

شكرا على حسن تعاونك

Annex 6

استمارة تحكيم الاستبيان

المفتاح:

1 = السؤال ممتاز ولا يحتاج إلى تعديل

2 = السؤال يحتاج إلي تعديلات مع الإشارة إليها

3 = السؤال ليس له علاقة بالموضوع ويجب حذفه كليا

من فضلك ضع علامة (X) حسب المفتاح المبين أعلاه

التعديلات المقترحة	درجات التحكيم			رقم السؤال
	3	2	1	
Knowledge questions				
				1
				2
				3
				4
				5
				6
				7
				8
				9
				10
				11
				12
				13
				14
				15
				16
				17
				18
				19
				20
Attitudes questions				
				1
				2
				3

				4
				5
				6
				7
				8
				9
				10
				11
				12
				13
				14
				15
				16
				17
				18
				19
				20
Practices questions				
				1
				2
				3
				4
				5
				6
				7
				8
				9
				10
				11
				12
				13
				14
				15
				16
				17
				18
				19
				20
				21
				22
				23

Annex 7

قائمة بأسماء السادة المحكمين لأداة قياس مستوى المعرفة, الإتجاهات و الممارسات لدى فنيي الأشعة حول الوقاية من الإشعاع في داخل أقسام الأشعة للمستشفيات الحكومية لمحافظات غزة:

1. د. يحي عابد
2. د. سامي الأغا
3. د. سعدي جابر
4. أ. إبراهيم عباس
5. أ. خالد أبو شاب
6. أ. أسامة مهدي

ملخص الدراسة

معرفة, إتجاهات وممارسات فنيي الأشعة حول الوقاية من الإشعاع في المستشفيات الحكومية لمحافظات غزة

في أواخر القرن التاسع عشر تم إكتشاف الأشعة بواسطة العالم الألماني ويليام رونتجن. ومنذ ذلك الحين تم إستخدامها في مجالات مختلفة مثل تعقيم المعلبات الغذائية, توليد الطاقة الكهربائية, الطب, كما تم إستخدامها أيضا في الحروب. التعرض للأشعة له مخاطر صحية جسيمة على الإنسان, حيث أنها تعتبر كعامل مسرطن, بالإضافة أنها تتسبب في حدوث طفرات جينية على مدى أجيال متتالية, لذلك ينصح بتقليل التعرض لها على قدر المستطاع و إستخدام وسائل الحماية خصوصا للعاملين في مجال الأشعة الذين يتعرضون لها على مدى فترات طويلة.

تهدف هذه الدراسة إلى تقييم مدى معرفة فنيي الأشعة العاملين في المستشفيات الحكومية لمحافظات قطاع غزة حول الوقاية من الإشعاع و اتجاهاتهم وممارساتهم , بالإضافة إلى دراسة العلاقة بين مستوى المعرفة والتوجه والممارسة و بعض المتغيرات الديموغرافية مثل العمر , الجنس , الخبرة , التعليم , مناطق العمل ، الحالة الاجتماعية, كما وتهدف إلى التوصل لتوصيات من شأنها المساهمة في تحسين الوعي حول الوقاية من الإشعاع بين فنيي الأشعة في قطاع غزة .

تم تطبيق هذه الدراسة الوصفية المقطعية في إحدى عشر مستشفى حكومي داخل قطاع غزة يقوم بتزويد المرضى بخدمات إشعاعية. استخدمت في هذه الدراسة استبانه تحوي 69 سؤال في أربعة محاور تشمل:
المحور الأول يتضمن معلومات شخصية حول فنيي الأشعة (7 أسئلة) , المحور الثاني يحوي معلومات حول المعرفة بأخطار وطرق الوقاية من الإشعاع (20 سؤال), المحور الثالث يشتمل على أسئلة تساعد في تحديد اتجاهات فنيي الأشعة (20 سؤال), بينما المحور الأخير يتكون من اثنى و عشرون سؤال حول الممارسات الحقيقية لفنيي الأشعة حول الوقاية من الإشعاع . تم الإستعانة بستة خبراء من مجالات مختلفة مثل الصحة العامة, أكاديميين في علوم الأشعة , بالإضافة إلى باحثين في نفس المجال لتحكيم أداة البحث.

Mean of knowledge

قامت الباحثة بإجراء دراسة أولية لتتأكد من إمكانية تطبيق هذه الإستبانة ومدى ملائمة الأسئلة المقترحة, شملت هذه الدراسة على ستة عشر فنيا تم إختيارهم بطريقة غير عشوائية, ولم يتم إضافة هذه الإستبانات على النتائج النهائية لهذه الدراسة.

قام بالإجابة على الاستبانة 135 فنيي من خلال مقابلات شخصية مع الباحثة. و تم تحليل نتائج الدراسة باستخدام برنامج الحاسوب الإحصائي (SPSS). تم عرض النتائج باستخدام frequency لكل سؤال وكذلك تم إستخدام ANOVA وIndependent t test لإيجاد الفروقات بين متغيرات الدراسة .

أظهرت نتائج الدراسة أن مستوى المعرفة حول أخطار الأشعة وطرق الوقاية منها كان ضعيفا ,حيث بلغ المتوسط الحسابي لمعرفة فنيي الأشعة 9.5 درجة من الدرجة الكلية البالغة 20 درجة ,بينما إتسمت توجهات فنيي الأشعة نحو أخطار الأشعة وضرورة الوقاية منها بأنها مرتفعة , حيث تبلغ متوسط الاتجاهات 16.5 درجة من الدرجة الكلية البالغة 20 درجة . كانت ممارسات فنيي الأشعة المطبقة لمواجهة مخاطر الأشعة ذات مستوى منخفض , حيث بلغ المتوسط الحسابي لممارسات المشاركين في الدراسة 5.6 درجة من الدرجة الكلية البالغة 18 درجة . لم تظهر النتائج أي فروق إحصائية بين مستوى المعرفة ومتغيرات الدراسة , بينما أظهرت فروقات إحصائية بين مستوى الممارسات وبعض المتغيرات مثل العمر حيث وجد أن فنيي الأشعة ذوي الفئة العمرية ذات 36 سنة فما فوق كانوا الأكثر إستخداما لطرق الوقاية من الإشعاع. المتغير الثاني هو مستوي التعليم حيث وجد أن فنيي الأشعة ذوي حملة شهادة الدبلوم المتوسط أكثر ممارسة لطرق الوقاية من الإشعاع من حملة شهادة البكالوريوس الجامعية. وعندما قامت الباحثة بدراسة تأثير الخبرة في مجال العمل على مستوى الممارسة وجدت أن فنيي الأشعة الأكثر خبرة في مجال العمل هم الأكثر تطبيقا لوسائل الوقاية من الإشعاع, بينما تميز المتزوجون من فنيي الأشعة بصورة ملحوظة في إستخدام وسائل الوقاية من الإشعاع.

بناء على هذه النتائج أوصت الباحثة بضرورة بذل الكثير من الجهود بهدف تحسين مستوى المعرفة و الممارسة حول الوقاية من الإشعاع عن طريق تطبيق برنامج تدريب مستمر وإعطاء دورات تعليمية لتقوية المفاهيم لدى فنيي الأشعة ضمن برنامج متكامل للوقاية من الإشعاع . كما أن الباحثة أوصت بضرورة تقييم المواد الدراسية المتعلقة بالوقاية من الإشعاع التي تقدم في جامعات قطاع غزة .