Sudan University of Science and Technology
College of Graduate Studies

Comparative Study of Implementation of Safety Measures in Diagnostic Imaging Departments

دراسة مقارنة تنفيذ تدابير السلامة في أقسام التصوير بالأشعة التشخيصية

A Thesis Submitted, as a partial fulfillment of aware of Master Degree in Diagnostic Radiology

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بسم الله الرحمن الرحيم

صدق الله العظيم

سورة طه :114

Dedication

To my father

Who always supported me in every endeavor,
Allah’s mercy and forgiveness to him

To my mother

Who is the reason I am here at all, and made me who I am today

If I donated to you everything in this world, it is not enough to give you your rights

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Abbreviations

ARRT	American Registry of Radiologic Technologists
IPSG	International Patient Safety Goals
JCIA	the Joint Commission International Accreditation
MRI	Magnetic Resonance Imaging
U/S	Ultra Sound
RSO	Radiation Safety Officer
TLD	Thermo Luminescent Dosimeter
PPEs	Personal Protective Equipments
ACR	American College of Radiology
RACE	Rescue, Alarm, Contain, Extinguish
PASS	Pull, Aim, Squeeze, Sweep

CME	Continuous Medical Education

Abstract:

One of the greatest challenges today is to improve the quality and safety of care provided; unintentionally serious harm comes to patients as well as healthcare provider during routine clinical practices. Medical imaging department is one example where various types of hazards and safety issues arise. Implementation of radiation safety guidelines and polices have the greatest impact on both patients and radiographers.

Study objective to Study the extent of implementation of safety measures in diagnostic imaging departments in Sudan, Khartoum hospitals.

Descriptive cross sectional study was carried to compare the implementation of safety measures in diagnostic imaging department between hospitals in United Arab Emirates (Abu Dhabi) and Sudan (Khartoum), sample including 100 radiologic technologists, 50 participants from each country. Data was collected by self-administered questionnaires after verbal consent. Data were analyzed using SPSS, IBM V 20.

Almost all radiologic technologists from Abu Dhabi hospitals were compliant to annual device testing, corresponding to 14% from Khartoum hospitals. Among 50 participants in Khartoum 54% had done at least one wrong x-ray or miss identify patient compared to 14% in Abu Dhabi. The participants were

evaluated about their knowledge in international patient safety goals, 88% are aware of all of them in Abu Dhabi hospitals in comparison to 20% in Khartoum hospitals. Throughout the study 76% are keen to apply the infection control measures like hand hygiene and using PPEs in Abu Dhabi. This percent is much lower in Khartoum 22%.

It realized that the main reason for this large disparity between two research centers is the financial issues, other factor includes absence of documented guidelines and policies which controlling the radiation safety within the departments, so based on this finding; important factors like general safety guidelines and policies for each department, Training and courses, along with Financial support can have great impact in improving safe practices within radiology department.

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مستخلص البحث

واحدة من كبرى التحديات التي تواجهنا اليوم هي تحسين جودة وسلامة الرعاية الصحية المقدمة؛ فقد يحدث ضرر خطير عن غير قصد للمرضى فضلا عن توفير الرعاية الصحية خلال الممارسات السريرية الروتينية. بقسم التصوير الطبي وعلى سبيل المثال, حيث يتوقع تنشأ أنواع مختلفة من المخاطر والتي تتطلب تدابير مختلفة للسلامة. تنفيذ المبادئ التوجيهية للسلامة من الإشعاع يكون لها أكبر تأثير على كل من المرضى والعاملين بالقسم.

هدفت الدراسة الى دراسة مدى تطبيق تدابير السلامة في أقسام التصوير بالأشعة التشخيصية بالسودان.

وقد أجريت دراسة وصفية بمقارنة تطبيق تدابير السلامة في قسم التصوير التشخيصي- بين- المستشفيات في الإمارات العربية المتحدة (أبو ظبي) والسودان

(الخرطوم)، وقد شملت الدراسة 100 مشارك من تقني الأشعة، 50 مشاركا من كل بلد. تم جمع البيانات عن طريق الاستبيانات ذاتيا بعد الموافقة الشفهية.

جميع المشاركين من ابوظبي أقروا بوجود نظام باداراتهم لفحص أدوات الوقاية من الاشعاع مقارنة بنسبة 14% من المشاركين بالخرطوم. 54% أكدوا حدوث اخطاء في الفحص نتيجة عدم التعرف على المريض الصحيح بينما كانت النسبة 14% بابوظبي. عند سؤال المشاركين عن الاهداف العالمية لحماية المريض, 88% اجابوا بمعرفتهم بها من ابو ظبي مقارنة بنسبة 20% من الخرطوم. أوضح 76% من المشاركين من ابو ظبي اهتمامهم بالقيام بالخطوات الموصى عليها عالميا بخصوص مكافحة انتشار العدوى من تعقيم الايدي والالتزام باستخدام وسائل الحماية الاخرى. كانت النسبة من مشاركي الخرطوم 22%.

توصلت الدراسة الى أن السبب الرئيسي لهذا التفاوت الكبير بين اثنين من مراكز البحوث يكمن في القضايا المالية، مع وجود عوامل آخرى كغياب اللوائح التوجيهية والسياسات الموثقة التي تسيطر على السلامة من الإشعاع داخل الاقسام، مستندا في ذلك على هذه النتيجة. من العوامل الهامة مثل إرشادات السلامة العامة والسياسات الخاصة بكل قسم والتدريب والدورات، جنبا إلى جنب مع الدعم المالي يمكن أن يكون لها تأثير كبير في تحسين الممارسات الآمنة داخل أقسام الأشعة.

Chapter one

1.1 Introduction:

Safety, is the state of being "safe" , the condition of being protected against physical, social, spiritual, financial, political, emotional, occupational, psychological, educational or other types or consequences of failure, damage, error, accidents, harm or any other event which could be considered non-desirable. Safety can also be defined to be the control of recognized hazards to achieve an acceptable level of risk. This can take the form of being protected from the event or from exposure to something that causes health or economical losses. It can include protection of people or of possessions. *(Thomas, Barbara R.;)*

Health care has evolved greatly over the past years. Our knowledge of diseases and technological innovations has all contributed to improving life expectancy during the 20th Century. But one of the greatest challenges today is not about keeping up with the latest clinical procedures or the latest high-tech equipment. Instead, it is about delivering safer care in complex, pressurized and fast-moving environments. In such environments, things can often go wrong. Adverse events occur. Unintentionally, but serious harm comes to patients during routine clinical practice, or as a result of a clinical decision. Many countries in the world have already recognized that patient safety is important and are building ways and approaches to improve the quality and safety of care. They have also recognized the importance of educating health-care professionals on the principles and concepts of patient safety. Strengthening such competencies is needed in order to keep pace with the complexities of the system and the demands of workforce requirements. *(Thomas, Barbara R.;)*

Hospitals and healthcare services are vital components of any well-ordered and humane society, and will indisputably be the recipients of societal resources. Those hospitals should be places of safety, not only for patients but also for the staff and for the general public. Safety measures in hospitals must include avoiding exposing any individual within the hospital, whether the patients, medical staff or visitors for the risks that may occur. A successful standard for keeping safety in hospitals has been developed and is subject to periodic review on an ongoing basis. These standards provide hospitals with mechanisms to demonstrate the quality and safety that they are providing in their hospitals. The standards are designed to

help each hospital standardize the care and services it provides, establish a quality and safety culture, and manage information in a manner that facilitates care and services across the hospital and during transfers to other health care facilities. *(Thomas, Barbara R.;)*

Quality and safety are rooted in the daily work of individual health care professionals and other staff. As physicians and nurses assess patient needs and provide care, this chapter can help them understand how to make real improvements to help their patients and reduce risks. Similarly, managers, support staff, and others can apply the standards to their daily work to understand how processes can be more efficient, resources can be used more wisely, and physical risks can be reduced. *(Biological shield".. 2010)*

Medical Imaging Department, as part of the restructuring of hospitals, and since it is in dealing with patients and the public with the presence of staff within the department, must implement safety standards that will protect all of the patients, employees and visitors. Generally, when talking about the risks which can happen in the medical imaging department inclined to mind the harm of ionizing radiation used in this field, The condition of being protected against medical, physical, financial, occupational, educational or other types or consequences of failure, damage, error, accidents, harm or any other event which could be considered as risk and life saving to the patients, staff and individuals. *(Biological shield".. 2010)*

All we believe that tackling patient safety in the general hospitals collectively and in a systematic way can have a positive impact on the quality of care and efficiency of these hospitals.

Radiologic technologists are at the forefront of patient safety and quality. The Code of Ethics of the American Registry of Radiologic Technologists (ARRT), which forms the first part of the ARRT Standards of Ethics, includes these four statements: The radiologic technologist acts to advance the principal objective of the profession to provide services to humanity with full respect for the dignity of mankind; The radiologic technologist assesses situations; exercises care, discretion, and judgment; assumes responsibility for professional decisions; and acts in the best interest of the patient; The radiologic

technologist uses equipment and accessories, employs techniques and procedures, performs services in accordance with an accepted standard of practice, and demonstrates expertise in minimizing radiation exposure to the patient, self, and other members of the healthcare team and The radiologic technologist practices ethical conduct appropriate to the profession and protects the patient's right to quality radiologic technology care. *(ACR standard and guidelines)*

When we talk about safety in imaging department, it comes to the minds the danger of ionizing radiation. Certainly, the risks of radiation occupies a large space in the field of researches that takes place over the world about finding the best ways to avoid the risk of exposure to ionizing radiation. With that, we cannot neglect other aspects that would be risk factors for patients, workers in the department or visitors. Correct patient identification, infection control, avoiding risk of fall within department, fire safety system, contrast media reactions and high alert medication In addition to using radiation safely will be the focus of this study. *(Diagnostic Imaging Services Regulation DHA)*

1.2 Problems of the study:

Hospitals and diagnostic imaging departments have serious hazards lifting and moving patients, needle sticks, slips, trips, ionizing and magnetic harm, infection, falls, and the potential for agitated or combative patients or visitors along with a dynamic, unpredictable environment and a unique culture. Caregivers feel an ethical duty to "do no harm" to patients, and some will even put their own safety and health at risk to help a patient.

Diagnostic imaging departments work can be surprisingly dangerous for the staff and workers. The likelihood of injury or illness resulting in days away from work is higher in hospitals than in construction and manufacturing industries that are traditionally thought to be relatively hazardous. Injuries and illnesses come at a high cost. When an employee gets hurt on the job, hospitals pay the price in many ways, including: Workers' compensation for lost wages and medical costs; temporary staffing, backfilling, and overtime when injured employees miss work; turnover costs when an injured

employee quits; and decreased productivity and morale as employees become physically and emotionally fatigued.

1.3 Importance of study:

This study will spot light in Safety measures in imaging department that will help avoiding exposing any individual within the hospital, whether the patients, medical staff or visitors for the risks that may occur. This study will also help to state successful standards of safety in hospitals .These standards provide hospitals with mechanisms to demonstrate the quality and safety that they are providing in their hospitals.

1.4 Objectives:

1.4.1 General objective:

Study the extent of implementation of safety measures in diagnostic imaging departments in Sudan, Khartoum hospitals.

1.4.2 Specific objectives:

- To study the level of knowledge, standards and implementation of Safety Measures in Diagnostic Imaging Department.
- To assess the risk of accidents can happen within the imaging department.
- To determine how to avoid any risk of harms, damages or loss of life when accidents happen.

Chapter two

2.1 Literature review:

2.1.1 Patient Safety:

The patient is the most important person in the hospital who should be treated with the highest professional way while providing maximum health care to him, focusing the measures protection and safety set by the competent authorities. *(Health Care Quality Improvement :..)*

Safety program in medical imaging department with regards to the patients and hospital customers in general includes: Verification of the correct patient information received by the reception, Improve staff communication, Use medicines

safely, Prevent mistakes in imaging exams, Reduce the risk of patient harm resulting from fall, Improve effective radiation safety program, Prevent infection, Reduce the risk of department fire, Learn and share safety lessons and Promote reporting.

In April 2002, The Joint Commission appointed a panel of widely recognized patient safety experts to advise it on the development of Sentinel Event Alert, The Joint Commission's patient safety newsletter. At that time, the panel was named the Sentinel Event Advisory Group. Over time, the group's responsibilities expanded to include advising on National Patient Safety Goals, and in 2009 the panel was renamed the Patient Safety Advisory Group. *(Improving Patient and Worker Safety,)*

The group is composed of nurses, physicians, pharmacists, risk managers and other professionals who have hands-on experience in addressing patient safety issues in a wide variety of healthcare settings. The Patient Safety Advisory group advises the Joint Commission on existing, newly identified and emerging patient safety risks. *(Improving Patient and Worker Safety,)*

The Group also advises on the most effective methods that The Joint Commission, Joint Commission Resources, and the Joint Commission Center for transforming healthcare might employ to assist healthcare organizations in identifying and reducing these patient safety risks. *(Improving Patient and Worker Safety,)*

2.1.2 International Patient Safety Goals (IPSG):

A set of goals have been formulated by the joint commission international accreditation. The purpose of the National Patient Safety Goals is to improve patient safety. The goals focus on problems in health care safety and how to solve them, such as Identify patients correctly, improve staff communication, Use medicines safely, Prevent infection, and the risk of harm resulting from falls. *(Improving Patient and Worker Safety,)*

The International Patient Safety Goals (IPSG) promotes specific improvements in patient safety. The goals highlight the

most common problems in health care and provide support with simple, effective solutions. The Mater Private is committed to following the advice and recommendations of the International Patient Safety Goals and we have put many measures in place to ensure we provide safe care. It has been formulated to achieve the following: To promote specific improvements in patient safety and to highlight problematic areas in healthcare and describe evidence and expert-based consensus solution of these problems. *(Improving Patient and Worker Safety,)*

2.1.3 List of international patient safety goals:

Goal 1: Identify patients correctly.

Goal 2: Improve effective communication.

Goal 3: Improve the safety of high-alert medications.

Goal 4: Ensure correct-site, correct-procedure, correct-patient surgery.

Goal 5: Reduce the risk of health care-associated infections.

Goal 6: Reduce the risk of patient harm resulting from falls. *(Improving Patient and Worker Safety,)*

The first goal focuses on the importance of the right patient receiving the right care. It is imperative that healthcare professionals use at least two ways to identify a patient when giving medicines, blood or blood products, taking blood samples and other specimens for clinical testing, or providing any other treatments or procedures. In the imaging department, it is very important to identify the patient who received by reception or patient in wards. The patient's room number cannot be used to identify the patient. *(Improving Patient and Worker Safety,)*

Misidentification leads to: Wrong prescription of medication and treatment, Wrong collection of sample, Wrong verification of site, Wrong Investigations for the wrong patients and Threat for life or near miss. It may also lead to

fatality/Temporary or permanent harm, financial loss/Medical legal aspect, Reputation of the Hospital and Wrong Documentations. *(Improving Patient and Worker Safety,)*

Effective communication, which is timely, accurate, complete, unambiguous, and understood by the recipient, reduces errors and results in improved patient safety. The goal is to ensure that standardized critical content is communicated between healthcare providers during handovers of patient care. In addition, this goal aims to ensure the implementation of a process/procedure for taking verbal or telephone orders or for the reporting of critical test results that requires a verification “read-back” of the complete order or test result by the person receiving the information. *(Improving Patient and Worker Safety,)*

Injection of iodinated radiographic contrast media is generally safe; however with increased use adverse events are more likely to occur. The most important adverse effects include hypersensitivity reactions, contrast-induced nephropathy and Thyrotoxicosis. In patients with moderate renal dysfunction, adequate hydration and use of as little contrast media as practical is recommended. Contrast-induced nephropathy is often transient. Metformin has been associated with several cases of renal failure and lactic acidosis in patients who have received contrast media. If contrast media causes renal failure, Metformin, can reach toxic levels resulting in lactic acidosis. It is now recommended that Metformin be discontinued at least 12 hours before the contrast investigation and not be resumed for a minimum of 36 hours after the procedure, and longer if the serum Creatinine has not returned to baseline. Alternative methods of managing the patient's glucose levels may be required during this interval. *(AGH, Guidelines)*

Wrong-site, wrong-procedure, wrong-patient surgery is an alarmingly common occurrence in hospitals. These errors are the result of ineffective or inadequate communication between members of the surgical team, lack of patient involvement in site marking, and lack of procedures for verifying the operative site. In the Mater Private we use a checklist, including a “time-out” just before starting a surgical procedure, to ensure the correct patient, procedure and body part. The checklist also addresses the verification process that all documents and equipment needed for surgery are on hand and correct and

functioning properly before surgery begins. In addition, we ensure that the precise site where the surgery will be performed is marked clearly in advance and the patient is involved in doing this. *(Improving Patient and Worker Safety,)*

Although much of the attention paid to patient and procedure verification has focused on surgery, occurrences of patient misidentification, procedure mistakes, and side or site confusion errors and near misses continue to surface outside the surgical suite. Despite quality improvement efforts, the prevalence of these errors in other disciplines, namely, radiology services may be more common than generally expected and reported. Ensuring correct patient identification is a recognized healthcare challenge, and the acute care setting poses the greatest challenge because a wide range of interventions are delivered in various locations by numerous staff who work in shifts. Failure to correctly identify patients and correlate their clinical information to an intended radiologic study continues to result in one of four recognized wrong events: Wrong patient, wrong procedure, wrong side and wrong site. *(Improving Patient and Worker Safety,)*

Infection prevention and control are challenging in most health care settings, and rising rates of health care–associated infections are a major concern for patients and health care practitioners. Infections common to all health care settings include catheter-associated urinary tract infections, bloodstream infections, and pneumonia (often associated with mechanical ventilation). Central to the elimination of these and other infections is proper hand hygiene, which is a central part of everything we do. *(Improving Patient and Worker Safety,)*

Each hospital must have a clear and strict policy with regard to infection control. Diagnostic imaging facilities must have an infection control and prevention program to identify and reduce the risks of acquiring and transmitting infections among patients, healthcare personnel, and visitors. *(Improving Patient and Worker Safety,)*

Many injuries in hospitals to both inpatients and outpatients are a result of falls. The risk for falls is related to the patient, the situation, and/or the location. Risks associated with patients might include patient history of falls, medications use, alcohol consumption, gait or balance disturbances, visual impairments, altered mental status, and the like. Patients who have been initially assessed to be at low risk for falls may suddenly become at high risk. Reasons include, but are not limited to, surgery and/or anesthesia, sudden changes in patient condition, and adjustment in medications. *(Improving Patient and Worker Safety,)*

2.1.4 Hospital Emergency Codes:

Hospital emergency codes are used to alert staff in a myriad of emergency situations. They are designed to convey essential information as quickly and with as little confusion as possible whilst also remaining discreet in order to keep both patients and visitors calm. They may be posted in signs around the hospital or on the back of employee identification cards for reference. In general, the codes are based on a color system, though there are also codes with numbers and names. These codes may be different from hospital to hospital, but there is a movement to standardize the code for easy access and to avoid the wrong command being followed. *(HAAD Standards for Major Incident and Disaster)*

Many hospitals use established call notification systems. These systems may be set up to send emergency notifications to all or select hospital staff. They may also establish notification communication and coordination for emergencies requiring regional response. To handle the emergency situations in hospital, staff must be familiar with codes which the hospital follows. *(HAAD Standards for Major Incident and Disaster)*

2.1.5 Radiation Safety:

Is the science and practice of protecting patient and individuals within the hospital from the harmful effects of ionizing radiation, that to ensure safety and radiation protection for the patients who are coming to the department for any

radiation exam and be sure to give them the lowest possible dose that will be necessary to obtain the examination, With detailed explanations of Optimization and Dose Limits. *(FANR, FANR-REG-04)*

Three main factors are control the amount, or dose, of radiation received from a source, (Time, Distance and Shielding). Radiation exposure can be managed by a combination of these factors. Distance and Shielding must be considered while: Designing and constructing a new department; obtaining x-ray examinations for any patient within the department and Handling examinations outside the department. *(AGH, Guidelines)*

Different types of ionizing radiation interact in different ways with shielding material. The effectiveness of shielding is dependent on the Stopping power of radiation particles, which varies with the type and energy of radiation and the shielding material used. Different shielding techniques are therefore used dependent on the application and the type and energy of the radiation. *(FANR, FANR-REG-04)*

The safe distance of any person from the radiation source must be considered in the design of the x-ray rooms and during examinations. Last researches in this field decided that it must be “not less than 6 feet any point from the source”. Several researches conducted with regard to exposure time and they worked to get the best results “less time for exposing”. *(FANR, FANR-REG-04)*

2.1.6 Imaging department staff safety:

The radiological technologist is an important member of the diagnostic health care team. They are responsible for producing high quality medical images that assist medical specialists and doctors to diagnose or monitor a patient's injury or illness. As the one who is dealing with imaging devices, will be focused to any risk within the department as radiation, magnet, infection transmission and utility failure. *(Radiation Protection in Diagnostic and interventional Radiology, IAEA)*

2.1.7 Radiation Safety Officer (RSO):

Radiation protection practitioner gives advice and guidance about the possible hazards of ionizing radiation, such as X-ray. Radiation Protection Officers should be fully familiar

with the work performed by a licensee, its organizational infrastructure and working procedures, and should have an understanding of the relevant regulatory requirements. They should have sufficient authority and access to management to be able to perform their functions effectively. *(FANR, FANR-REG-04, DHO Guidelines)*

They should also be responsible for organizing training of Workers. A Radiation Protection Officer should be the central point of reference within a licensee for Radiation Protection matters, and may carry out or directly supervise contingency plans in the event of an Accident or Incident. The responsibilities and qualifications of a Radiation Protection Officer and the time needed to fulfill his or her duties will depend on the activities of the Licensee. *(FANR, FANR-REG-04, DHO Guidelines)*

2.1.8 Film badges:

To provide individual monitoring for any Worker who is normally employed in a Controlled Area or who occasionally works in a Controlled Area and may receive significant Occupational Exposure. *(MOH, UAE guidelines)*

The Authority also recommends individual monitoring for any Worker who is likely to receive more than 10% of the annual Dose limit of 20 mSv in any one year. For most cases individual monitoring means that Workers must wear personal dosimeters. *(FANR, FANR-REG-04, DHO Guidelines)*

2.1.9 Caution signs and warning lights:

X-Ray radiation can pose a serious safety and health hazard, especially for workers who are exposed daily. The best way to protect employees and visitors from the dangers of your workplace is to keep them informed about biological hazards and other threats. Communicate hazards easily and efficiently using X-Ray and Radiation Warning Signs. *(Diagnostic Imaging Services Regulation, DHA)*

2.1.10 MRI and U/S safety:

Just as there is a risk of ionizing radiation using, there are also risks in use the MR Imaging but in different concept. Documented guidelines with regards to infection control are highly recommended. Routine quality control testing should be conducted by properly trained individuals with review at least annually by the supervising physician and qualified medical physicist as described in the ACR Technical Standard for

Diagnostic Medical Physics Monitoring of Magnetic Resonance Imaging (MRI) and U/S Equipments.
(ACR standard and guidelines)

2.2 Previous study:

In 2009, the Pennsylvania Patient Safety Authority received reports of 652 events. Although much of the attention paid to patient and procedure verification has focused on surgery, occurrences of patient misidentification, procedure mistakes, and side or site confusion errors and near misses continue to surface outside the surgical suite. Despite quality improvement efforts, the prevalence of these errors in other disciplines, namely, radiology services may be more common than generally expected and reported in the literature.

Those 652 events specifically related to wrong-procedure or test (50%), wrong-patient (30%), wrong-side (15%), and wrong-site (5%) radiology errors. Predominant testing modalities reported to the Authority included radiography (45%), computed tomography (CT) scan (18%), mammography (15%), magnetic resonance imaging (MRI) (6%), and ultrasound (5%). The Table outlines the number of wrong-patient, wrong-procedure, wrong-side, and wrong-site events associated with each radiologic study. *((http://patientsafetyauthority.org, 13/10/2015))*

Table. Wrong Events by Radiologic Study Reported to the Pennsylvania Patient Safety Authority, 2009

RADIOLOGIC STUDY	WRONG EVENT				NUMBER OF WRONG EVENTS	PERCENTAGE OF WRONG EVENTS
	Wrong Patient	Wrong Procedure	Wrong Side	Wrong Site		
Radiography	93	104	75	24	296	45.4%
Computed tomography	36	69	4	6	115	17.6
Mammography	7	87	4	0	98	15.0
Magnetic resonance imaging	7	27	5	0	39	6.0
Ultrasound	13	13	6	3	35	5.4
Nuclear medicine	4	8	0	1	13	2.0
Interventional	3	3	0	0	6	0.9
Dexa scan	1	1	0	0	2	0.3
Positron emission tomography	1	0	0	0	1	0.2
Not specified	31	14	2	0	47	7.2
Total Number of Events	**196**	**326**	**96**	**34**	**652**	
Total Percentage of Events	**30.1%**	**50.0**	**14.7**	**5.2**		**100**

Chapter Three

3.1 Material and methods:

This is a descriptive cross sectional study that comparing Implementation of Safety Measures in Diagnostic Imaging Department between eleven hospitals, six hospitals in United Arab Emirates (Abu Dhabi) and five hospitals located in Sudan (Khartoum) , in the period between August 2015 to December 2015.

The study was done among 100 radiologic technologists, 50 participants from each country. The sample was obtained by simple random sampling technique. Self-administered questionnaires were distributed to the participants over a period of two months. The purpose of the study was explained to the radiologic technologists and verbal consent was obtained. The confidentiality of the participants was assured through keeping the questionnaires in locked cabinets.

The questionnaire comprised demographic data and questions about the level of knowledge, standards, implementation of Safety Measures in Diagnostic Imaging Department, the risks and accidents that can happen within the imaging department.

Data was checked for completeness, consistency and range. Descriptive frequency analysis was done for all variables. Results were displayed in appropriate tables constructed by Microsoft Office word and figures were constructed using IBM, SPSS statistics V 20 and Excel 2007.

Chapter four

4.1 Results:

Among 50 participants in Khartoum 70% mentioned that the radiation hazard signs are available and displayed within the department comparing to 100% of participants in Abu Dhabi mentioned that it is available, Table (4.2.2).

radiologic technologists were recruited for this study. 100

Almost all radiologic technologists from Abu Dhabi hospitals were compliant to annual protective devices testing, corresponding to 14% from Khartoum hospitals. The overall compliance rate was 57%, Table 4.2.4).

of radiologic technologists in Abu Dhabi always use the 24%

protective device when examining the patient, and by assessing Khartoum hospitals it was found that 32% examine the patient without any protection, while only 12% always using it, Table (4.2.5).

Among 50 participants in Khartoum 54% had done at least

one wrong x-ray or miss identify patient compared to 14% in Abu Dhabi had experienced this, Table (4.2.7).

The participants were evaluated about their knowledge in

international patient safety goals, 88% are aware of all of them in Abu Dhabi hospitals in comparison to 20% in Khartoum hospitals, Table (4.2.9).

The emergency exit clear sign availability was 44% and

100% in Khartoum and Abu Dhabi hospitals respectively, see figure (4.3.11).

No significant difference found in the incidence of magnetic

harm events between Khartoum and Abu Dhabi, figure (4.3.13).

Guidelines with regards to equipment cleaning and

disinfection were followed by 94%in Abu Dhabi, in Khartoum this percent found to be 56%, see figure (4.3.14). Throughout the study 76% are keen to apply the infection control measures like hand hygiene and using PPEs, as they doing it all the time in Abu Dhabi. This percent is much lower in Khartoum 22%, figure (4.3.15).

Note: All tables and figures of result mentioned as {A} for Khartoum and {B} for UAE.

Table (4.2.1): Sex distribution:

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	17	34.0	34.0	34.0
	female	33	66.0	66.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	31	62.0	62.0	62.0
	female	19	38.0	38.0	100.0
	Total	50	100.0	100.0	

Table (4.2.2): Radiation hazard signs display availability

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	35	70.0	70.0	70.0
	no	15	30.0	30.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	50	100.0	100.0	100.0

Table (4.2.3): Protection Devices (PD) availability in the department

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	31	62.0	62.0	62.0
	no	19	38.0	38.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	50	100.0	100.0	100.0

Table (4.2.4): Protective devices testing annually

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	7	14.0	14.0	14.0
	no	43	86.0	86.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	50	100.0	100.0	100.0

Table (4.2.5): Using the protective devices while examining patients

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	always	6	12.0	12.0	12.0
	sometimes	28	56.0	56.0	68.0
	never	16	32.0	32.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	always	12	24.0	24.0	24.0
	sometimes	38	76.0	76.0	100.0
	Total	50	100.0	100.0	

Table (4.2.6): Applying standards of radiation protection during your daily work

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	always	13	26.0	26.0	26.0
	sometimes	30	60.0	60.0	86.0
	never	7	14.0	14.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	always	28	56.0	56.0	56.0
	sometimes	22	44.0	44.0	100.0
	Total	50	100.0	100.0	

Table (4.2.7): **Performing wrong x-ray study to patient, or miss identify patient**

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	always	3	6.0	6.0	6.0
	sometimes	27	54.0	54.0	60.0
	never	20	40.0	40.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	sometimes	7	14.0	14.0	14.0
	never	43	86.0	86.0	100.0
	Total	50	100.0	100.0	

Table (4.2.8): **High alert medication guidelines**

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	24	48.0	48.0	48.0
	no	26	52.0	52.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	50	100.0	100.0	100.0

Table (4.2.9): **Knowledge of the international patient safety goals**

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	all of them	10	20.0	20.0	20.0
	some of them	34	68.0	68.0	88.0
	never hear about	6	12.0	12.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	all of them	44	88.0	88.0	88.0
	some of them	6	12.0	12.0	100.0
	Total	50	100.0	100.0	

Table (4.2.10): **Effective system for firefighting availability**

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	30	60.0	60.0	60.0
	no	20	40.0	40.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	50	100.0	100.0	100.0

Table (4.2.11): **Following the steps in fighting fire (RACE & PASS)**

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	always	5	10.0	10.0	10.0
	sometimes	21	42.0	42.0	52.0
	never	24	48.0	48.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	always	44	88.0	88.0	88.0
	sometimes	6	12.0	12.0	100.0
	Total	50	100.0	100.0	

Table (4.2.12): Emergency exits signs availability in the department

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	21	42.0	42.0	42.0
	no	29	58.0	58.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	50	100.0	100.0	100.0

Table (4.2.13): Investigating system in case of machinery failure in the department

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	always	12	24.0	24.0	24.0
	sometimes	26	52.0	52.0	76.0
	never	12	24.0	24.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	always	41	82.0	82.0	82.0
	sometimes	9	18.0	18.0	100.0
	Total	50	100.0	100.0	

Table (4.2.14): MRI and cases of magnetic harm

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	18	36.0	36.0	36.0
	no	32	64.0	64.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	3	6.0	6.0	6.0
	no	47	94.0	94.0	100.0
	Total	50	100.0	100.0	

Table (4.2.15): Equipment cleaning and disinfection guidelines

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	28	56.0	56.0	56.0
	no	22	44.0	44.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	47	94.0	94.0	94.0
	no	3	6.0	6.0	100.0
	Total	50	100.0	100.0	

Table (4.2.16): Applying the infection control measures (hand hygiene and using PPEs)

A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	always	11	22.0	22.0	22.0
	sometimes	39	78.0	78.0	100.0
	Total	50	100.0	100.0	

B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	always	38	76.0	76.0	76.0
	sometimes	12	24.0	24.0	100.0
	Total	50	100.0	100.0	

4.3 Figures:

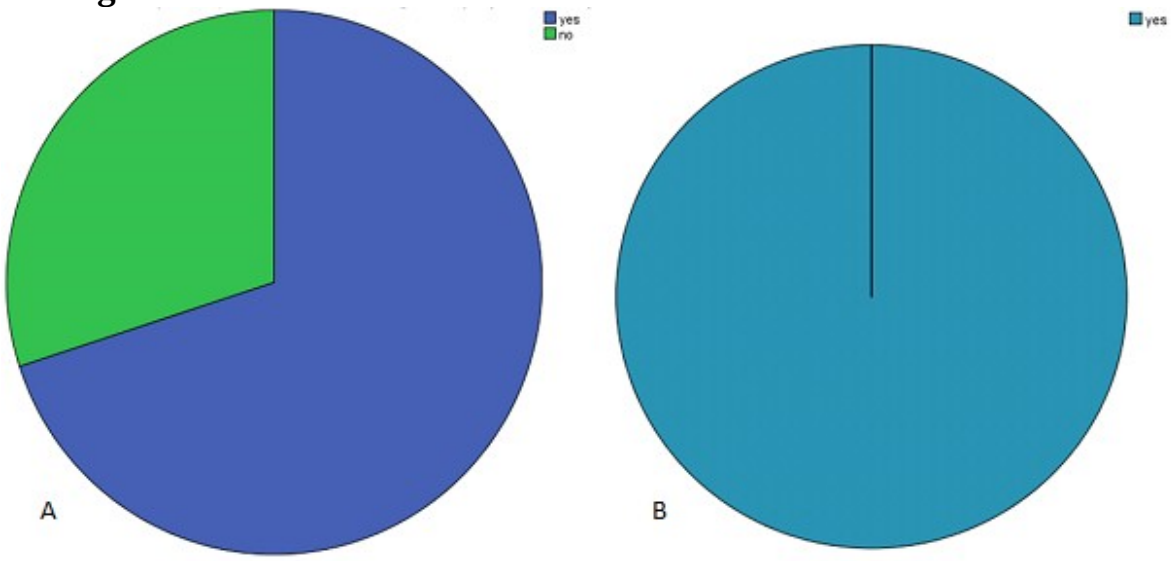

Figure (4.3.1): Radiation hazard signs display availability

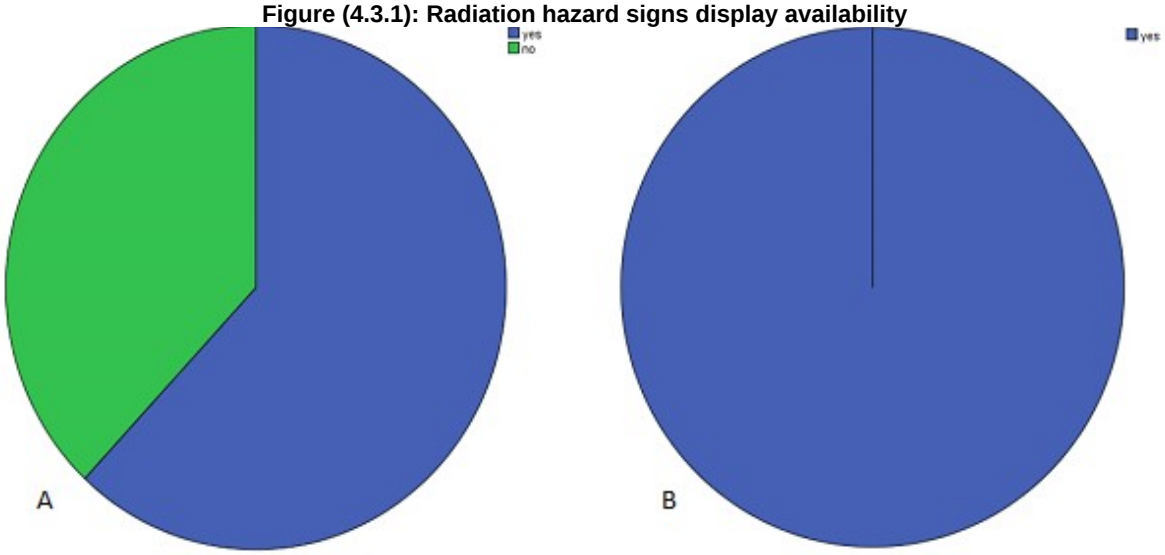

Figure (4.3.2): Protection Devices (PD) availability in the department

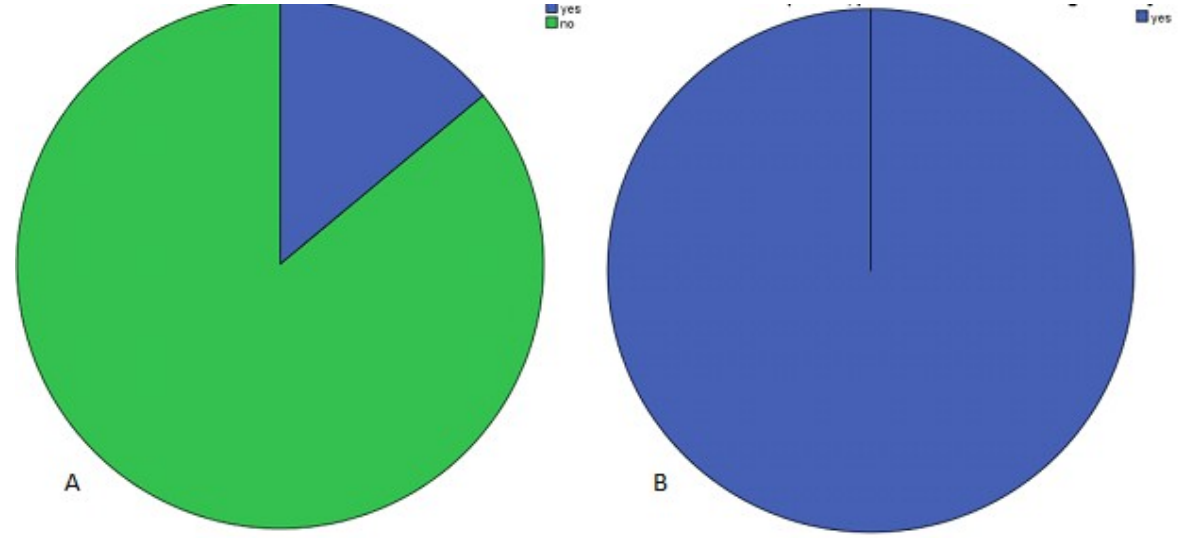

Figure (4.3.3): Protective devices testing annually

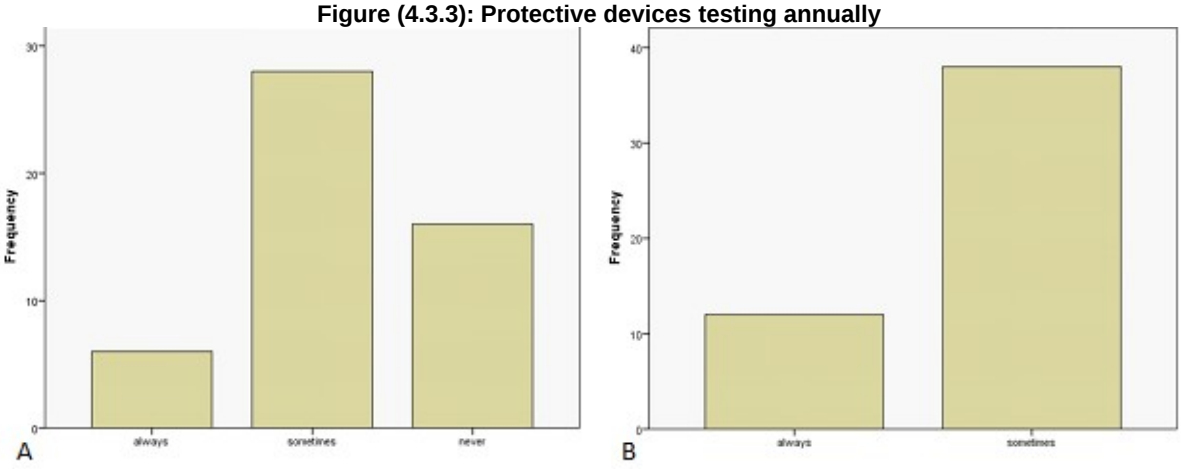

Figure (4.3.4): Using the protective devices while examining patients

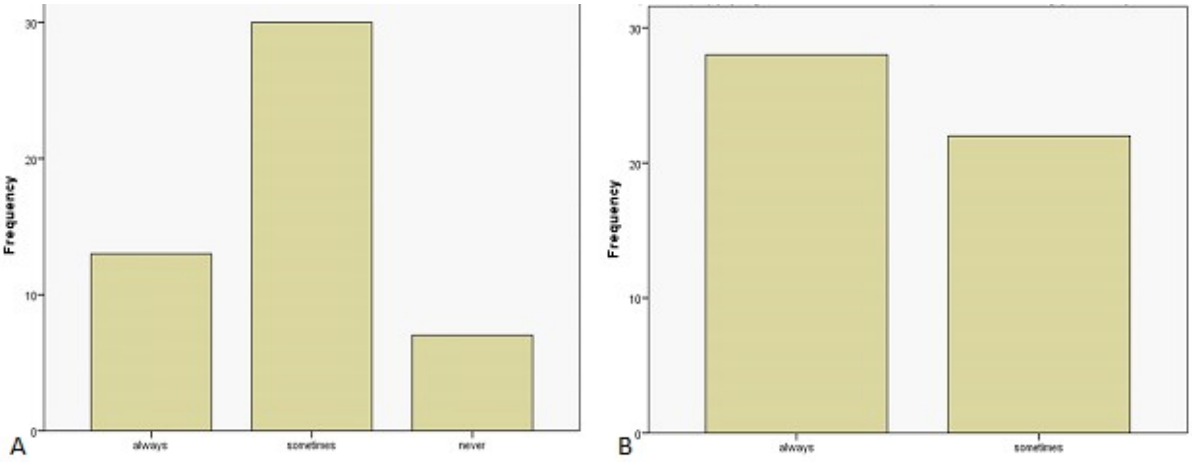

Figure (4.3.5): Applying standards of radiation protection during your daily work

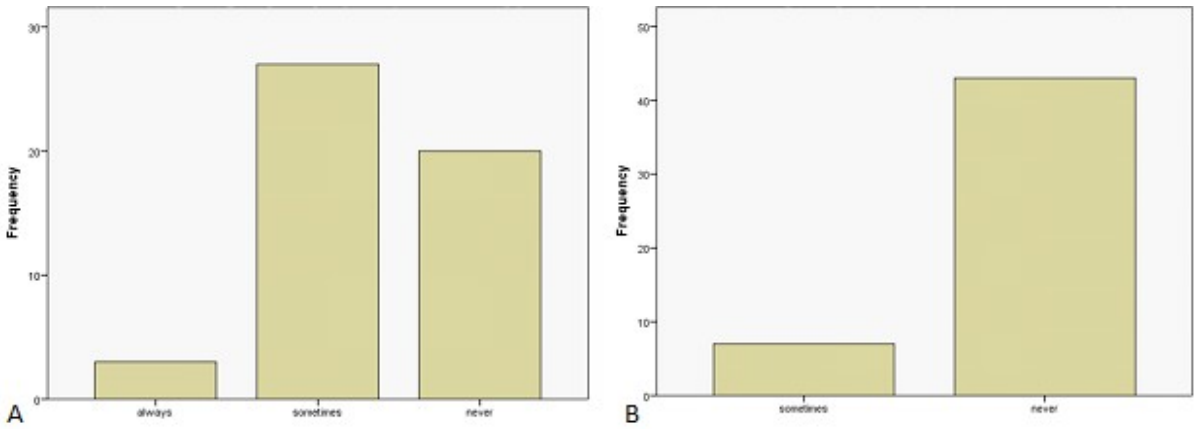

Figure (4.3.6): Performing wrong x-ray study to patient, or miss identify patient

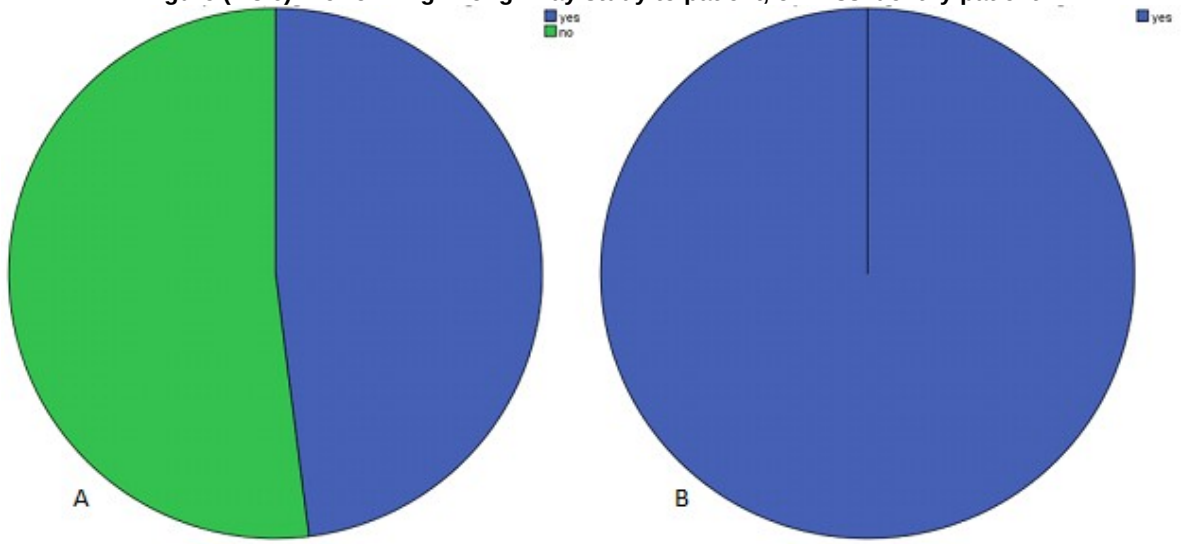

Figure (4.3.7): High alert medication guidelines

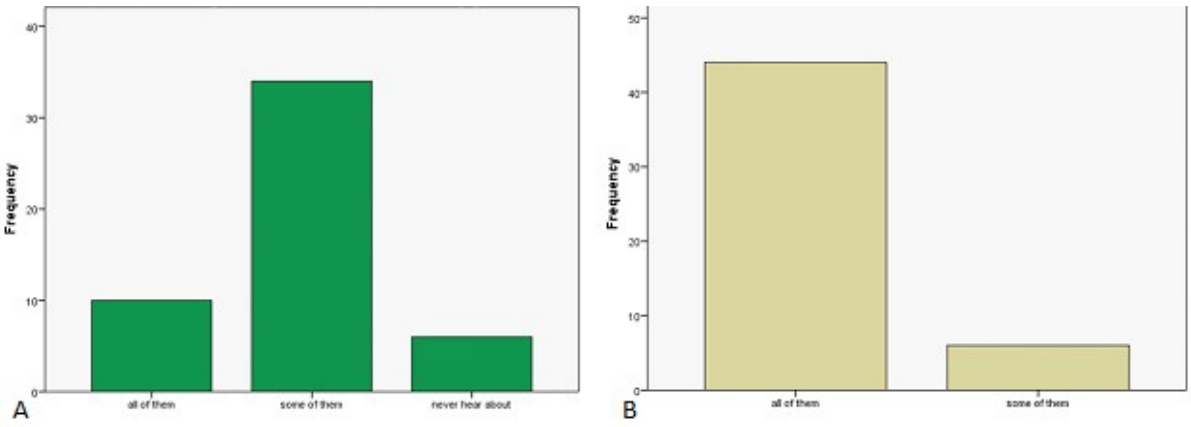

Figure (4.3.8): Knowledge of the international patient safety goals

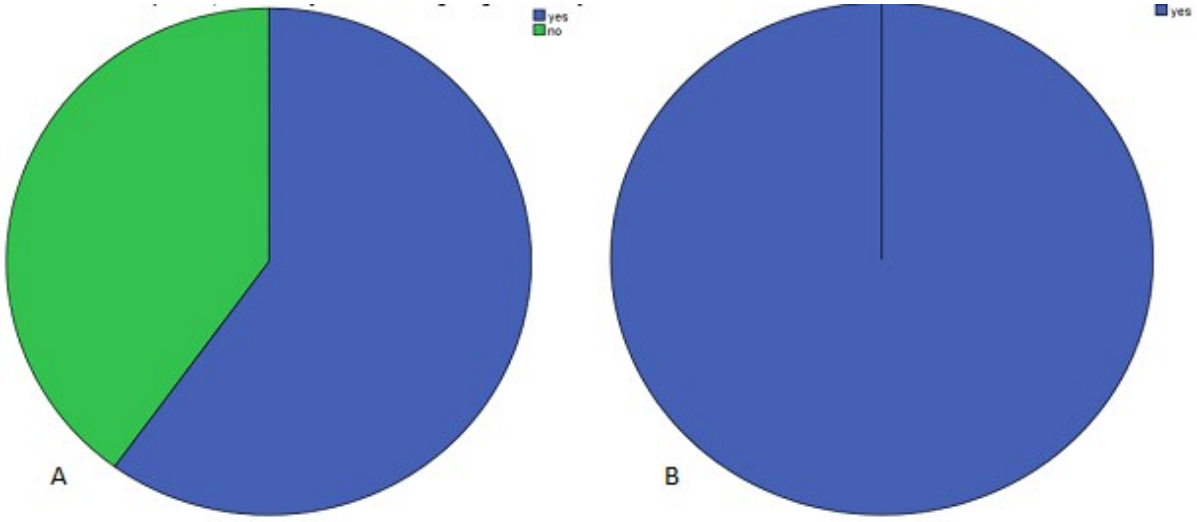

Figure (4.3.9): Effective system for firefighting availability

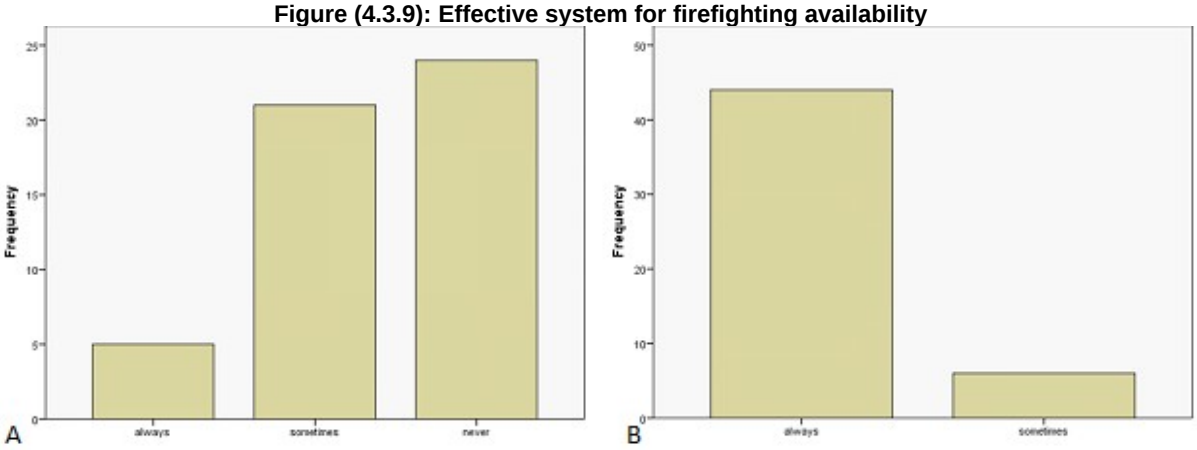

Figure (4.3.10): Following the steps in fighting fire (RACE & PASS)

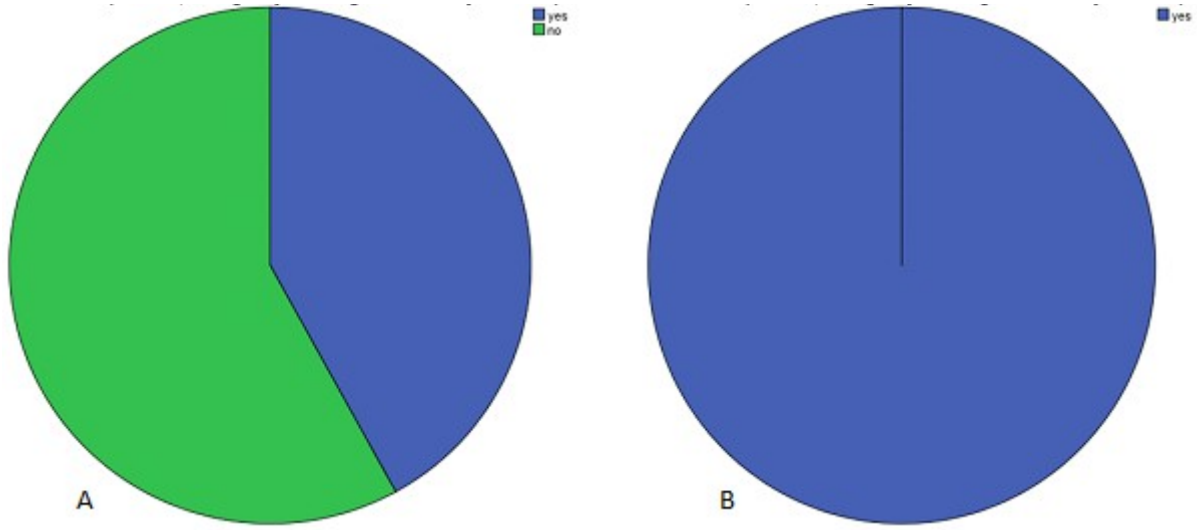

Figure (4.3.11): Emergency exits signs availability in the department

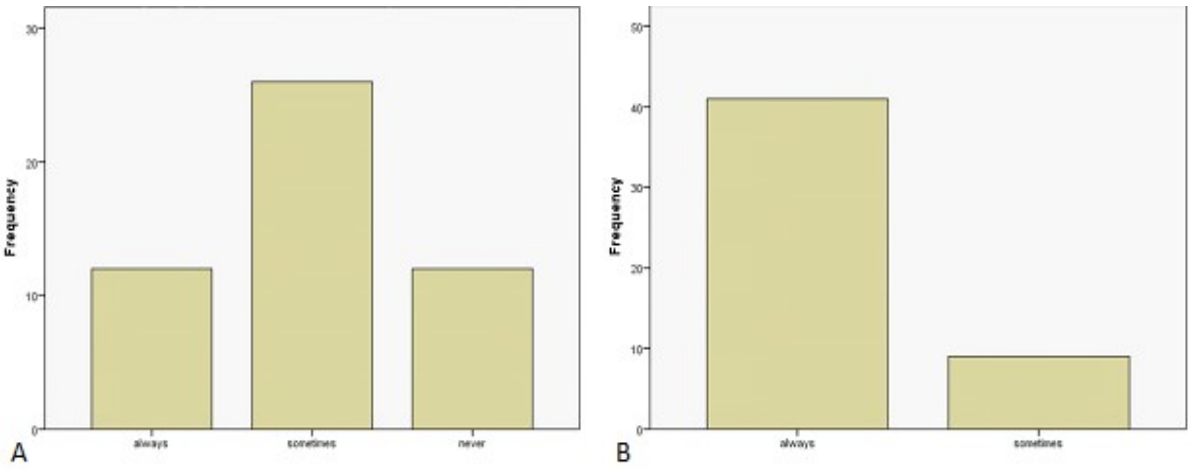

Figure (4.3.12): Investigating system in case of machinery failure in the department

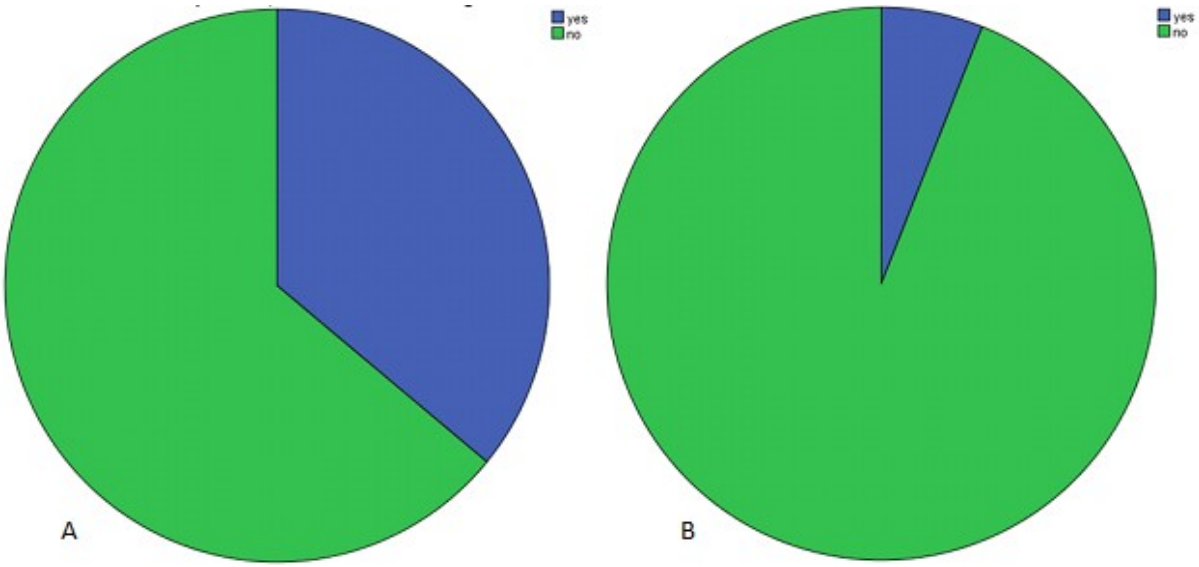

Figure (4.3.13): MRI and cases of magnetic harm

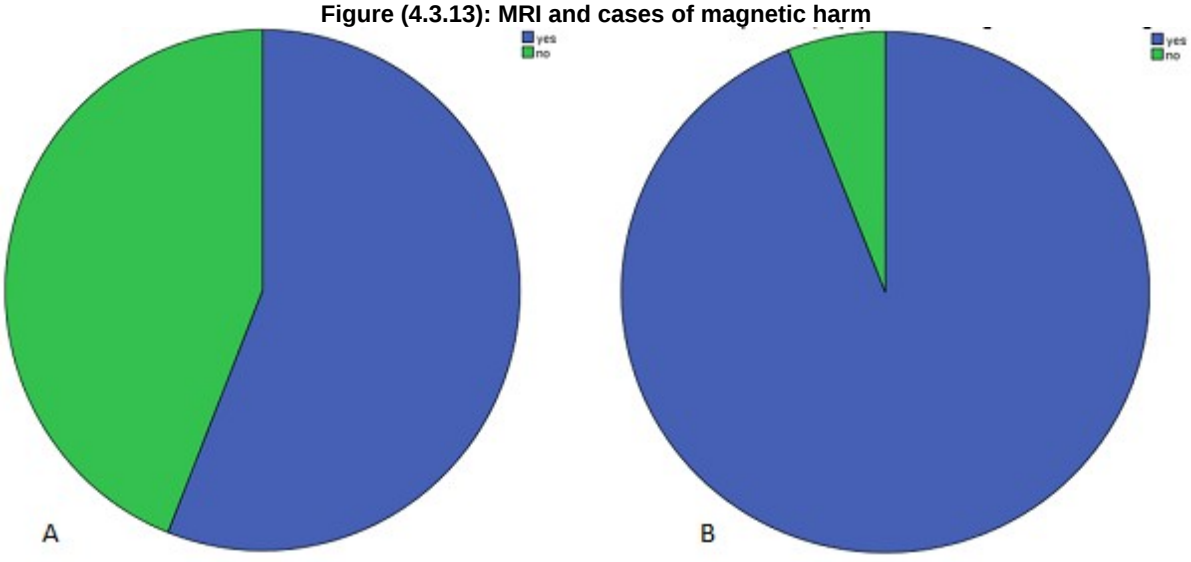

Figure (4.3.14): Equipment cleaning and disinfection guidelines

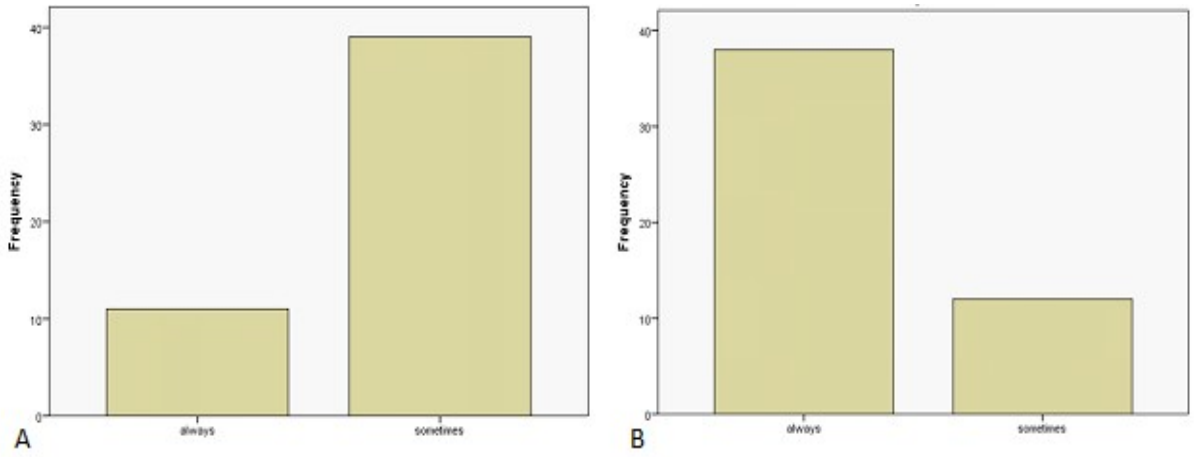

Figure (4.3.15): Applying the infection control measures (hand hygiene and using PPEs)

Chapter five

5.1 Discussion:

Despite the Health care has evolved greatly over the past years, one of the greatest challenges today is to deliver this care in a safe way. Allot of issues raised about the safety in radiology department for patient and personnel, this maybe because they are dealing with invisible risk (radiation!). “Patient safety” terminology becomes a popular word in any institution not only for the quality and prestigious point of view but for authorization also. In this study we made comparative study between two country differ in regulations and policies to explore if this has to have effective role in improving patient safety in radiology or not .

The study found that 100% radiologic technologists from Abu Dhabi doing the annually test for the protective device compared to 15%? From Khartoum, and this difference can be explained by the policies in the Abu Dhabi that mandate this test.

Using the personal protective devices (PPEs) while examining the patient show to have comparable result between Abu Dhabi and Khartoum 66%, 22% respectively, International result is 77%. The financial issue play a vital role in the availability of this (PPEs), that why country like UAE can approach the international figure.

In Abu Dhabi for all health care provider to have their license renewal they have to attend CME activities, this are well reflected in the percent of the radiologic technologists who are knowledgeable about the international patient safety goals 90% ,compared to 20% in Khartoum which not necessitate no continues educational requirement .

In Khartoum hospitals the found that only 10% of participants know the steps of RACE & PASS and how to deal with fire compared to 88% in Abu Dhabi participants. The reason of that is there are clear guidelines in each department with regards to firefighting in addition to consecutive training sessions in Abu Dhabi.

The study found out 94% of participants in Abu Dhabi following cleared guidelines with regards to equipment cleaning and disinfection (U/S, X-Ray, MRI, etc...) compared to 56% in Khartoum. The importance of policies plays a vital role.

Finally, by asking participants in Khartoum directly, it turns out they did not have available film badges which used for monitoring the amount of radiation resaved during work time, the absence of strict policies and may be financial issues lead

to this default. It is one of responsibilities of the radiation safety officer to be available in each department; the RSO position is absence in almost of departments. The studier asked about using any effective emergency codes system to handle the emergency situations in hospital, staff must be familiar with codes; the found out it is rarely used. All these issues are highly recommended in Abu Dhabi hospitals and controlled by strict policies to reach the requirements of Implementation of Safety Measures in the diagnostic imaging department.

5.2 Conclusion:

By reviewing the results of studying the extent of implementation of safety measures in diagnostic imaging departments in Sudan, Khartoum hospitals, and comparing it with results from Abu Dhabi, the study found that there is a great negligence in applying the principles of safety in Sudan. The study found that the main reason of almost of this large disparity is going to be financial issues. Therefore, when considering radiation safety as general, almost of radiologic technologists from Khartoum mentioned that the reason of lack of using protection devises is due to un availability of these devises in their departments (lead shielding, TLD’s, etc,…). Also it is clear that there is absence of documented guidelines and policies which controlling the radiation safety within the departments.

Other reasons of that great difference in the results between the two countries, is the poor caring of applying systemic safety program within hospitals in Khartoum. Again, there are no guidelines and policies with regards to infection control programs, international safety gales, firefighting programs and hospital safety command systems. Negligence of hospitals administrations part to provides safety trainings and updating courses in general safety programs. It is highly recommended to have more focusing from hospitals administrations and the ministry of health in Sudan regarding the hospitals safety programs. Hospitals should have documented general safety guidelines and policies for each department. Scheduling enough trainings and courses programs for health care providers and more financial support to cover the hospitals needs to reach the international safety standards.

5.3 References:

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Appendix

Sudan University of Sciences and Technology

College of graduate Sciences

((Imaging Department staff Questioner))

Note: This survey is only for educational purpose and your answers will be confidential.

Personal information: **Optional**

1. Name: _____ 2.Telephone No: _____

3. Age: _____ 4.Sex: Male Female

(1): Is your department has Radiation hazard signs displayed?

a) Yes b) No

(2): Do you have protective (PD) devices available in the department (lead aprons & shields)?

a) Yes b) No

(3): Do you perform protective devices testing annually?

a) Yes b) No

(4): Do you usually use the protective devices when examining patients?

a) Always b) Sometimes c) Never

(5): Do you apply the standards of radiation protection during your daily work?

a) Always b) Sometimes c) Never

(6): Have you performed wrong x-ray study to patient, or miss identify patient?

a) Always b) Sometimes c) Never

(7): Has your department any system to know patient allergy to some medication?

a) Yes b) No

(8): Do you know the international patient safety goals?

a) All of them b) Some of them c) Never hear about

(9): In case of fire, has your department applied an effective system to deal with fire?

a) Yes b) No

(10): Are you following the steps in fighting fire (RACE & PASS) to reduce the proportion of losses to the minimum?

a) Always b) Sometimes c) Never

(11): Are emergency exits clear signs available in the department?

a) Yes b) No

(12): Are you following an investigating system in case of machinery failure in your department?

b) Always b) Sometimes
c) Never

(13): if you have an MRI device in the department, have you experienced any case of magnetic harm?

a) Yes b) No

(14) Are you following clear guidelines with regards to equipment cleaning and disinfection?

a) Yes b) no

(15) Are you applying the infection control measures (hand hygiene and using PPEs) in the department?
a) All the time b) sometimes
c) never