

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

قال تعالى

وانتقوا الله...

ويعلمكم الله والله

( بكل شيءٍ عليم )

صدق الله العظيم

سورة البقرة الآية 282

## ***Dedication***

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To my family..

my mother..

brothers, sisters..

& to the memory of my  
father ... I dedicate

# this effort

## ***Acknowledgment***

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This is always a very difficult part because so many people have helped in so many different ways. Nonetheless, there are those that should be recognized for the critical help they have provided.

Special thanks to, **Dr Isam Salih** who has been my true support and friend from the beginning to the end of this research and teach me how to achieve my goals and in same time motivated me to complete this work in success. This couldn't have been made with out him.

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I present my great thanks to every one who render a service to me and had a favor for success this work.

## الخلاصة

الغرض من هذه الدراسة هو تسليط الضوء على مجال الوقاية من الإشعاع فى الطب النووى ، لما له من أهمية ، وملاحظتنا للضعف الواضح فى تطبيق برامج الوقاية فى مراكز الطب النووى المختلفة وعدم الأهتمام بها من قبل المختصين. لهذا و ذاك ظهرت الحاجة لتقييم مستوى تطبيق برامج الوقاية الإشعاعية فى أقسام الطب النووى فى السودان، وتم اختيار قسم الطب النووى بالمركز القومي للعلاج بالأشعة والطب النووى بالخرطوم كمثال.

قسمت الدراسة لأربعة أبواب رئيسية، الباب الأول عبارة عن مقدمة عن الطب النووى والخطة التي اعتمد عليها الباحث.و شمل الباب الثاني دراسة نظرية شاملة لكل أسس الوقاية الإشعاعية و القوانين و اللوائح المطبقة فى أقسام الطب النووى. و لما كانت هيئة الطاقة الذرية العالمية هي المشرع الأول لكل هذه اللوائح والقوانين، فقد كانت إصداراتها هي المصدر الرئيسي- لكل الدراسة النظرية لهذا البحث، كما تمت عملية التقييم تبعا لتوصياتها.

الباب الثالث تناول طرق البحث والمتمثلة فى تقييم مستوى الوقاية الإشعاعية فى قسم الطب النووى بالمركز القومي للعلاج بالأشعة والطب النووى بالخرطوم، والذي أستخدم فيه التفتيش النظري بأسخدام نموذج الهيئة العالمية للطاقة الذرية للتفتيش،مع الأخذ فى الاعتبار توصيات الجهات العالمية المختصة والتي تم ذكرها فى الباب الثاني من الدراسة كأساس مرجعي

لعملية التقييم. كما تم استخدام الأستبيان للعاملين فى المجال لزيادة الدقة فى التقييم. بعد ذلك تمت عملية التحليل وأستخلاص النتائج ومناقشتها فى الباب الرابع كخلاصة لهذا العمل.

استنادا إلى النتائج المتحصل عليها وبعد مناقشتها وضح أن مستوى الوقاية من الأشعاع فى مراكزنا يحتاج لبعض الأهتمام والتطوير، و استنادا الى ذلك تم وضع المقترحات والتوصيات التي من شأنها أن تساعد فى تحسين مستوى الوقاية من الإشعاع فى أقسام الطب النووى بالسودان.

## ***Abstract***

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This study aimed to review and evaluate the status of radiation protection at nuclear medicine departments in Sudan. Because of the need for such programs to be implemented at these departments, the present study discussed the basic aspects of radiation protection depending on international standards, using the radiation isotopes center Khartoum as a sample.

The study is divided into four chapters. The first one is proposal and introduction to the study. The second chapter covers the literature review for all radiation protection programmes. The IAEA articles are our source for this.

Chapter three deal with the research methods by evaluate the radiation protection in the nuclear medicine department in RICK in which we used the simulated inspection using the IAEA inspection form for this purpose with a consideration of all international recommendations which are discussed in chapter two of these research in order to use its as a reference for the evaluation process. Worker questionnaire was also used in this chapter for more accuracy of evaluation result. Discussion regarding the evaluation results was done in chapter four.

Reviewing the status of radiation protection in nuclear medicine departments in the country it was observed that there is a need to improve the radiation protection programs. In order to develop the implementation of radiation protection program in our departments we put some recommendations at the end of this study.

**BSS:** International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources. Safety Series No.115, IAEA, Vienna (1996).

**BE:** Binding Energy

**CT:** Computed Tomography

**DNA:** Deoxyribonucleic Acid

**EC:** Electron Capture

**HVL:** Half Value Layer

**IC:** Internal Conversion

**ICRP:** International Commission on Radiological Protection

**ILO:** International Labour Office

**ISO:** International Organization for Standardization

**IT:** Isomeric Transition

**KE:** Kinetic Energy

**LET:** Linear Energy Transfer

**MeV:** Mega Electron Volt

**MRI:** Magnetic Resonance Imaging

**PET:** Positron Emission Tomography

**QA:** Quality Assurance

**QC:** Quality Control

**RIA:** Radionuclide Immune Assay

**RICK:** Radiation Isotopes Center ( Khartoum)

**RPO:** Radiation Protection Officer.

**SGRDC:** Specific Gamma Ray Dose Constant

**SI:** International System of Units

**SPECT:** Single Photon Emission Computed Tomography

**TLD:** Thermo Luminescent Dosimeter

**TVL:** Tenth Value Layer

**WHO:** World Health Organization

# ***Abbreviations***

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