

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

International University of Africa

Deanship of graduate studies

**Faculty of Pure and Applied Science**

**Department of Physics**

**Assessment of Organ Dose in Patients Undergoing  
Skull X-Ray Imaging Using CAL-Dose Program**

**By**

Nosiba Hessian Idreess Hameid

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in medical physics

**Supervisor**

Dr- Nadia Omar AL-Atta

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## الاية

قال تعالى :

( وَقُلْ اَعْمَلُوا فَاَسْبِرْ لِي اللهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ وَسَتُرَدُّونَ اِلَىٰ عَالِمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُمْ  
بِمَا كُنْتُمْ تَعْمَلُونَ )

صدق الله العظيم

الايه 105 من سورة التوبه

## Dedication

**I dedicate this work to the spirit of my mother, and darling father,  
brothers and sisters for their unlimited support.**

## Acknowledgment

First of all, I am grateful to Allah who gave me health, strength and power that enable me to complete this study.

Also, I would like to extend my deep thanks to my supervisor Dr. Nadia Omer Al-Atta. I would like also to thank my father who supported me.

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## **Abstract**

X-ray is electromagnetic radiation which use in medical field for diagnostic as well as to treatment of some diseases, all radiographic techniques have one thing in common, they can give a significant radiation dose to the patient. As with all medical uses of ionizing radiation, the general view is that this exposure should be carefully managed. This study was done in two hospitals in Khartoum state in Sudan to assessment of organ dose in patient undergoing skull x-ray, for 31 patients it has been divided according to (male, female) and range of age 20-79year for each hospital. In hospital No 1 (12 males, 7 female) and hospital No 2 (7 males,5 female).

The CAL-Dose software was used for calculations of entrance surface air kerma (ESAK) and organs doses by entering the patient information age, ID, sex, name, ) and tube parameter (kV, mAs, and machine type and field of position,).

Variation was found in values the entrance surface air kerma ESAK and organ dose from each hospital, these variations due to different in settings of the exposure factors to each patient.

While comparing the values of ESAK to each hospital with the dose reference level for diagnostic it was found that value was lower than DRLs, and it was found that the value of hospital No1 greater than hospital No 2, and eyes is high organ revised the radiation compare with (oral mucosa, salivary gland, brain) because it high radio-sensitivity.

Continuing education and training of radiological personnel in appropriate radiological technique need to be implemented in order to maintain reasonable patient dose.

## المستخلص

الاشعه السينيه هي احد انواع الاشعاع الكهرومغناطيسي، وتستخدم في الطب بشقيه في التشخيص والعلاج.

تتسم التقنيات الاشعاعيه في الطب بشقيه (التشخيص ، العلاج) بميزة مشتركة فيها وهي اهمية التحكم في كمية التعرض للاشعاع .

هذه الدراسه اجريت في ولاية الخرطوم في السودان في مستشفيين مختلفين في قسم الاشعه التشخيصيه لعدد 31 مريض خضعوا لفحص الراس بالاشعه السينيه اعمارهم في المدى بين 20-79 بواقع 12 ذكور و7 اناث في المستشفى رقم 1 و7 ذكور و5 اناث في المستشفى رقم 2.

الهدف الاساسي لهذه الدراسه هو تقييم الاشعاع الواصل للاعضاء التشريحيه الاخرى بمجاورة الرأس تم حساب قيم الجرعه السطحيه وذلك بادخال معلومات المرضى ( العمر -النوع -الرقم) ومعاملات التعرض ( KV, mAs, and the output of machine ) لبرنامج ال CALDOSE-X

وجد ان قيم الجرعه السطحيه مختلفه بين المستشفيين وان هذا الاختلاف نتيجة لاختلاف عوامل التعرض من مريض لآخر واختلاف الخرج من كل جهاز على حده.

وبمقارنة قيم الجرعات الاشعاعيه السطحيه المتحصل عليها في الدراسه بالقيم بالمرجعيه وجد أنها اقل منها ووجد ايضاً ان قيم الجرعات في المستشفى رقم واحد أعلى من المستشفى رقم اثنين ، وأن العين هي اكثر عضو يستقبل الاشعاع مقارنة ب (التجويف الفموي والغدد اللعابيه والمخ) لشدة حساسيتها للاشعاع.

التعليم والتدريب المستمران للعاملين في مجال الاشعه التشخيصيه مهم جداً لانه يمكنهم من التحكم في كمية التعرض للاشعاع.

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## List of Abbreviations

Abbreviations	Standard Forum
EM	Electromagnetic
SV	Sievert
Bq	Becquerel
HT	Equivalent dose
WR	Weighting factor
FDD	Focus to Detector Distance
Gy	Gray
AP	Anterior Posterior
RT-LA	Right Lateral
LT-LA	Left Lateral
DRLs	Dose Reference Level
ESD	Entrance Surface Dose
ED	Effective Dose
KV	Kilo Voltage
mAs	milli Amber second
DAP	Dose Area Product
ESAK	Entrance Surface Air kerma
INAK	Incident Air kerma
ICRP	International commission on Radiological protection
NRPB	National Radiological protection Board
IAEA	International Atomic Energy Agency
UK	United kingdom