**International University of Africa**

**Deanship of Postgraduate Studies**

**Faculty of Pure and Applied Sciences**

**Department of Physics**

# Estimation of Effective Dose and Incidence Cancer During Computed Radiography

***A thesis Submitted for Partial Fulfillment for the Requirements of MSc Degree in Medical Physics***

Presented by:

**Malaz Ahmed Ali Mohamed Ahmed**

Supervised by:

**Dr. Abdelfatah Mohamed Mohamed Ahmed Ahmed**

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# الآيـة

*قال تعالى* : اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ ﴿١﴾ خَلَقَ الْإِنسَانَ مِنْ عَلَقٍ ﴿٢﴾ اقْرَأْ وَرَبُّكَ الْأَكْرَمُ ﴿٣﴾ الَّذِي عَلَّمَ بِالْقَلَمِ ﴿٤﴾ عَلَّمَ الْإِنسَانَ مَا لَمْ يَعْلَمْ ﴿٥﴾

*سورة العلق*

# DEDICATION

To my father, who gave me anything and encouraged me since I was a baby, I ask my Allah to extend your age to see fruits be harvested after long time from education journey.

To my lovely mother, my angel in the life, who learned me the love and kindness, which support me at all my situations.

To my sisters Mai and Maha, candles lighting my life darkness.

To my supporter and my complain in the life, my brothers.

To my all true friends who with me at success road.

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# ABSTRACT

This study aim to evaluate the patient dose undergoing some common diagnostic department in four selected hospitals (Antaliya, Yastabshroon, Dar Alelaje and Royal Care) in Khartoum state. A total of 360 patients were examined. The data were collected using a particular data sheet for all patients in order to maintain consistency of the information. The data were analyzed by using the software (SPSS) and Microsoft excel. The obtained results showed that the digital techniques have been used to improve the practice of radiology, but still there is a risk of over use of radiation. We found main advantages of digital imaging are the wide dynamic range, post processing, multiple viewing options, and electronic transfer and archiving possibilities, but over exposure can occur without an adverse impact on image quality. The obtained results were shown differences between hospitals, and all radiation measured values were compatible with international guidelines except the chest values. We concluded that the doses to the patients should be regularly monitored and the proposed for national DRLs should be taken as guidance for optimization. The study recommends diagnosis through the use of computed radiography devices because the radiation dose is less than conventional imaging systems and enables us to adjust the image at a higher quality.

# المستخلص

الهدف من إجراء هذه الدراسة هو تقييم الجرعة الإشعاعية لعينه من المرضي في عدد من المستشفيات(أنطاليا، يستبشرون، دار العلاج، رويال كير) في ولاية الخرطوم. أختبر عدد 360 مريض في أربعه مستشفيات مختلفة. جمعت البيانات باستخدام أوراق جمع البيانات المجدولة لكل المرضي وذلك للحفاظ علي بيانات كل مريض على حدى، ومن ثم حللت باستخدام برنامج الحزم الاحصائية و برنامج الاكسيل. أوضحت النتائج التي تم الحصول عليها أن النظام التقني الرقمي يتم استخدامه لتحسين استخدام الاشعاع ولكن مازالت هنالك مخاطر عالية. خلال فتره إجراء هذه الدراسة وجد أن هنالك محاسن لنظام التصوير الرقمي منها، أن له مدي ديناميكي عالي، و بعد عملي، و له خيارات متعددة للعرض، و كذلك له نقل الكتروني، و لدية مقدرة للأرشفة. ولكن يمكن أن يحدث زيادة في الجرعة دون أن يحدث ضرر علي نوعية الصورة. أوضحت الدراسة أن هنالك فروقات بين المستشفيات التي أجريت فيها هذه الدراسة. خلصت الدراسة الي أن الجرعات للمرضي يجب أن تنظم وتراقب وتقترح الدراسة أنشاء نظام حدود ومرجعيات الجرعات التشخيصية الوطني (DRLs) وأن يتبع كموجه للتقليل من الجرعات. و توصي الدراسة بالتشخيص عن طريق استخدام أجهزه التصوير الإشعاعي المحوسب لأن الجرعة الإشعاعية الناتجة منه أقل من أنظمه التصوير التقليدية ويمكِنُنا من التعديل في الصورة بجودة أكبر.

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# List of Abbreviations

| NO | Abbreviations title | |
|---|---|---|
| 1 | **DNA** | Deoxyribo Nucleic Acid |
| 2 | **CR** | Computed Radiography |
| **3** | **IP** | Imaging Plate |
| **4** | **ESD** | Entrance Skin Dose |
| **5** | **DRL** | Dose Reference Level |
| **6** | **R** | Rontgen |
| **7** | **SI** | Standard International |
| 8 | **C** | Coulomb |
| 9 | **J** | Joules |
| 10 | **GY** | Gray |
| 11 | **PACS** | Picture Archiving and Communications Systems |
| 12 | **CCD** | Charge Coupled Device |
| 13 | **MTF** | Modulation Transfer Function |
| 14 | **NPS** | Noise Power Spectrum |
| 15 | **DQE** | Detective Quantum Efficiency |
| 16 | **DR** | Direct Radiography |
| 17 | **PSP** | Photo Stimulable Phosphor |
| 18 | **CMOS** | Complementary Metal Oxide Semiconductor |
| 19 | **FCR** | Fuji Computed Radiography |
| 20 | **PMT** | Photo Multiplier Tube |
| 21 | **CF** | Correction Factor |
| 22 | **ESE** | Entrance Skin Exposure |
| 23 | **BMI** | Body Mass Index |
| 24 | **PA** | Posterior Anterior |

| | | |
|---|---|---|
| 25 | **LAT** | Lateral |
| 26 | **OP** | Out Put |
| 27 | **FSD** | Focus to Skin Distance |
| 28 | **FFD** | Film Focus Distance |
| 29 | **SPSS** | Statistical Package for the Social Sciences |
| 30 | **ESAK** | Entrance Skin Air Kerma |