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Patient Radiation Dose Assessment in Routine Pelvic
X-ray Examination in Selected Hospitals in Khartoum
State

تقييم جرعة الإشعاع للمريض خلال الفحص الروتيني للحوض بالأشعة
السينية في مستشفيات مُختارة بولاية الخرطوم

A dissertation submitted in partial fulfillment for the
requirement of degree of Master of Science in Medical Physics

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2017

الآية

قال تعالى:

" وَعِنْدَهُ مَفَاتِحُ الْغَيْبِ لَا يُعْلَمُهَا إِلَّا هُوَ وَيَعْلَمُ مَا فِي الْبُرِّ وَالْبَحْرِ وَمَا تَسْقُطُ مِنْ وَرَقَةٍ إِلَّا يَعْلَمُهَا وَلَا حَبَّةٌ فِي ظُلُمَاتِ الْأَرْضِ وَلَا رَطْبٌ وَلَا يَابِسٌ إِلَّا فِي كِتَابٍ مُبِينٍ "

صدق الله العظيم

الأنعام الآية 59

Dedication

This thesis is dedicated

*to my father, who taught me that the best kind of knowledge to have
is that which is learned for its own sake.*

*To my mother, who taught task can be accomplished if it is done one
step at time.*

*To those who have demonstrated to me what is the most beautiful of
life, my brothers and sisters.*

*To the man who encourages me, to the man that I belong to, my
husband.*

To my sweet little princess my daughter

To my supervisor Dr. Nadia Omer Alatta

To my science friends.

And my supporting teachers.

Acknowledgement

Firstly I would like thank Allah for blessing my life, and helped me to start this thesis and supported my strength to complete this thesis.

I would like to give my great sincere thanks to my supervisor Dr. Nadia Omer Alatta for her constructive guidance, help and support me in each step to establish valuable and useful result.

I would like to extend special thanks to my lovely mother and gorgeous father for their kind supporting and motivating me to do my best and never complain from my needs.

I am very thankful for staff for offering me ideal environment to perform this thesis.

Also I would like to give great thanks to my brothers, sisters and my husband for supporting my back and advice they display to me.

Last but not the least I extend my thanks to my teacher; friends and all people support me and believe on me.

Abstract

The aim of this study was to assess patient doses for pelvic examination being undertaken at selected diagnostic centers in Khartoum state, Sudan. Dose assessed was calculated on 80 patients 46 (57.5%) male, 34 (52.5%) female. ages between 19 to 86 years. The Entrance Surface Dose (ESD) was determined by an indirect method, using the patient's anthropometrical data (age, gender) and exposure parameters (kVp, mAs) utilized for the specific examination. To generate the ESD values Microsoft excel was used. There were variations in the technique factors used in all the centers. The average in all selected hospitals recorded lower ESD values below IAEA recommended diagnostic reference levels (10 mGy) and the average of ESDs of the all hospitals exceeded the UK national reference value (4mGy). The variation in ESD found among diagnostic centers in this study showed that there is need to standardize radiological techniques of pelvis X-ray examination among different diagnostic centers in Khartoum State. This would ensure optimal protection of patient against excessive radiation dose.

Arabic abstract

كان الهدف الأساسي من هذه الدراسة هو تقدير جرعة السطح الداخلة للمريض لإختبارات الحوض في عدد من المراكز التشخيصية في ولاية الخرطوم – السودان. تضمنت الدراسة عدد 46 مريض بنسبة 57.5% وعدد 34 مريضة بنسبة 52.5% ، تتراوح أعمارهم ما بين الـ19 عاما إلى 86 عاما".

وقد تم تحديد جرعة السطح الداخلة بطريقة غير مباشرة باستخدام قيم المعاملات (التيار في الثانية ، كمية الجهد ، وقيمة الخرج من الجهاز ، المسافة بين سطح المريض ومركز خرج الأنبوب) المستخدمة للاختبار المعني مع تحديد بيانات المريض العمر والنوع ، وبالنسبة لتوليد جرعة السطح فقد تم استخدام القيم المبرزة فيها . وقد كانت هنالك اختلافات في الأسلوب بالنسبة للعوامل المستخدمة في المراكز الاي شملت الدراسة على حسب المريض.

و بعد حساب متوسط قيم جرعة السطح الداخلة في المراكز المختارة ومقارنتها مع القيم المرجعية التشخيصية الموصى بها 10 mGy كانت النتائج أدنى منها ، وقد تجاوزت قيمتها القيمة المرجعية لبوطنية في المملكة المتحدة 4 mGy ، وعند مقارنتها مع دراسات محلية فقد تباينت الاختلافات من دراسة لآخرى.

وقد أظهر التباين في البيئة والتقنية المستخدمة الموجودة بين مراكز التشخيص في هذه الدراسة أن هناك حاجة لتوحيد التقنيات الإشعاعية للفحص بالاشعة السينية لمنطقة الحوض بين مختلف مراكز التشخيص في ولاية الخرطوم وهدام شأنه ضمان حماية أفضل للمريض ضد جرعة الاشعاع المفرطة .

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List of Abbreviations

DNA – Deoxyribo Nucleic Acid

ESD – Entrance Surface Dose.

DAP - Dose Area Product .

IAEA - International Atomic Energy Agency

ALARA – As Low As Reasonably Achievable.

DRLs - Diagnostic Reference Levels .

mGy – Milli Gray

KVp - Kilovoltage Peak .

mAs - Milliampere Seconds .

OP – tube outbut

FSD - Focus to skin Distance

BSF - Back Scatter Factor .

AP - Antero – posterior projection .

LAT - Lateral projection.

LSJ - Lumbo sacral projection

PA – posterior anterior projection .

CT - Computed tomography .

NCRP - National Council on Radiation Protection and measurements .

A° -Angstrom

Hz – hertz , unit of frequency.

KeV – kilo electron Volt.

MeV – Mega electron Volt.

mR – milli Rad.

ICRP – International Commission on Radiological Protection.

UNCEAR - United Nations Scientific Committee on the Effects of Atomic Radiation .

TLDs – Thermo Luminescence dosimetry.

GM – Geiger Muller detector.

LET – Linear Energy Transfer.

PMT – Photo Multiplier Tube.

MOSFET – Metal Oxide Semiconductor Field Effect Transistor.

KERMA – Kinetic Energy Released per unit mass.

ESAK – Entrance Surface Air Kerma

Gy – Gray, unit of absorbed dose

SI – International System of unit

H_T – Equivalent dose.

W_R – weighting factor for radiation R.

W_T - weighting factor for tissue.

ET - Extra Thoracic.

IVU - Intravenous Urography .

mGy – milli gray , unit of entrance surface dose.

AEC – Automatic Exposure Control.

UK - United Kingdom national reference value

QADDS – Quality Assurance Dose Data base Software

EC – European Commission

Max. - Maximum .

Min. - Minimum

Av – Average.

SD - Standard Deviation

μ Gy – micro gray