

## TABLE OF CONTENTS

RATIFICATION PAGE.....	ii
CERIFICATE OF ORIGINALITY .....	iii
DEDICATION .....	iv
ACKNOWLEDGEMENTS .....	v
TABLE OF CONTENTS .....	vii
LIST OF TABLES .....	xi
LIST OF FIGURES .....	xiii
ABBREVIATIONS .....	xv
ABSTRACT.....	xvii
<b>CHAPTER I.....</b>	<b>1</b>
<b>INTRODUCTION .....</b>	<b>1</b>
A. Background of the Study .....	1
B. Statement of Problem.....	7
C. Research Questions .....	8
D. Purpose of the Study .....	9
E. Significance of the Study .....	9
<b>CHAPTER II .....</b>	<b>11</b>
<b>LITERATURE REVIEW .....</b>	<b>11</b>
A. History of Radiation.....	11
B. Types of Radiation .....	11
B.1. Ionizing Radiation .....	11
B.2. Non-ionizing Radiation .....	12
C. Basic Principles of CT scan .....	12
D. History of CT scan Generations.....	14
D.1. First Generation.....	14
D.2. Second Generation .....	14
D.3. Third Generation .....	15
D.4. Fourth Generation .....	15
D.5. Fifth Generation .....	16

D.6. Sixth Generation.....	17
E. CT scan Instrumentation .....	18
E.1. X-Ray Tube .....	18
E.2. CT Gantry .....	19
E.3. CT Detectors .....	19
E.4. CT Filtration .....	20
E.5. CT Collimation .....	21
F. Radiation Doses in Diagnostic Radiology.....	22
F.1. Absorbed Dose.....	23
F.2. Equivalent Dose .....	23
F.3. Effective Dose.....	24
G. Factors Affecting Radiation Dose in CT scan .....	25
G.1. Radiation Beam Geometry .....	25
G.2. Filtration .....	25
G.3. Detector Efficiency .....	26
G.4. Slice Thickness.....	26
G.5. Pitch.....	27
G.6. Radiographic Technique .....	27
G.7. Patient Size and Body Part Thickness.....	28
G.8. Repeat Scans .....	28
G.9. Collimation.....	28
H. Radiation Dosimetry Instruments .....	28
H.1. Ionization Chambers .....	29
H.2. Geiger-Mueller Counter .....	29
H.3. Proportional Counters .....	30
H.4. Thermoluminescent Dosimetry (TLD).....	31
H.5. Direct Reading Dosimeters: .....	31
I. Radiation Interaction with Tissue (Damage).....	33
I.1. Linear Energy Transfer (LET):.....	34
I.2. Relative Biologic Effectiveness (RBE): .....	34
I.3. The Oxygen Enhancement Ratio (OER) .....	35

J. Mechanisms of Biological Damage by Ionizing Radiation .....	35
J.1. Direct Action .....	35
J.2. Indirect Action .....	36
K. Somatic and Genetic Cells Effects by Ionizing Radiation .....	37
L. Effect of Ionizing Radiation on DNA .....	38
L.1. Single Strand Break .....	38
L.2. Double Strand Break.....	38
M. Radiosensitivity.....	39
M.1. Radiosensitivity for the Thyroid Gland .....	40
M.2. Radiosensitivity for Gonad .....	41
O. Theoretical Framework .....	42
P. Conceptual Framework.....	43
Q. Hypothesis.....	44
<b>CHAPTER III.....</b>	<b>45</b>
<b>MATERIALS AND METHOD.....</b>	<b>45</b>
A. Research Design.....	45
B. Study Population .....	45
C. Sample Size .....	45
C.1 Chest CT Scan Sample Size. ....	46
C.2. Abdominopelvis CT Scan Sample Size.....	47
C.3. Sample size for Brain CT scan .....	48
D. Criteria of Exclusion and inclusion.....	49
D.1. Inclusion Criteria.....	49
D.2. Exclusion Criteria.....	49
E. Research Variables .....	49
E.1. Independent Variable .....	49
E.2. Confounding factors .....	49
E.3. Dependent Variables.....	50
F. Research Tool .....	50
G. Research Procedure.....	50
G.1.Radiation dose measurements .....	50

H. Statistical Analysis.....	51
I. Scheme of Work Plan.....	52
<b>CHAPTER IV .....</b>	<b>53</b>
<b>RESULTS AND DISCUSSION.....</b>	<b>53</b>
A. Results.....	53
A.1 Differences of Radiation Doses Received by Thyroid Gland and Gonad..	55
A.2 Comparison between Doses for With Contrast and Without Contrast.....	58
A.3 Scanning Parameters (Confounding Factors).....	59
A.4 Radiation Doses Received By Thyroid Gland and Gonad and the Influence of Scanning Parameters.....	64
A.5 Absorbed Dose and Deterministic Effect for Thyroid Gland and Gonad ..	72
B. Discussion .....	77
B.1 Correlation between Scanning Parameters in CT scan and Radiation Doses Received by Thyroid gland and Gonad.....	77
B.2 Radiation dose received by thyroid gland and gonads and radiation hazards for deterministic effects.....	85
<b>CHAPTER V.....</b>	<b>90</b>
<b>CONCLUSION AND RECOMMENDATIONS .....</b>	<b>90</b>
A. Conclusion .....	90
B. Recommendations .....	91
Appendix .....	99
References.....	93