Masters Thesis Information Showcase
Spring Semester-2026
Year 2026

	Department: Physics Programme: Master of Science Specialization: Medical Physics
1	**Title of the Thesis** Assessment and Comparison Of Organ Doses In Selected Radiology Procedures (CT And Fluoro) At Medical Centers In Karachi
2	**Abstract:** Computed tomography (CT) contributes significantly to patient radiation exposure despite representing a relatively small proportion of radiological procedures, and the absence of established Diagnostic Reference Levels (DRLs) in Pakistan highlights the need for local dose assessment and optimization. This retrospective cross-sectional study evaluated radiation dose indices and established local DRLs for chest and abdomen CT examinations at a tertiary medical center in Karachi over a 12-month period (January–December 2024). Data from 140 adult patients undergoing chest and abdomen CT scans were analyzed, including patient demographics, technical scanning parameters, CTDIvol, DLP, and calculated effective doses. Local DRLs were established at the 75th percentile according to ICRP Publication 135 recommendations, while statistical analyses included Shapiro-Wilk normality testing, Mann-Whitney U testing, and Pearson correlation analysis. The proposed local DRLs were 14.70 mGy and 741 mGy·cm for chest CT, and 15 mGy and 700 mGy·cm for abdomen CT, which were lower than European Commission reference values and comparable with international standards from the UK and Nigeria. Mean effective doses were approximately 8 mSv for both examination types. Significant protocol-related dose variations were observed, particularly between plain and contrast-enhanced examinations, while BMI demonstrated a strong positive correlation with abdomen CT dose. No significant sex-based differences were identified. The study successfully established the first local DRLs for Karachi, demonstrating that radiation doses were within acceptable international limits and emphasizing the need for protocol standardization, BMI-based dose optimization, automated exposure control refinement,

	iterative reconstruction utilization, and comprehensive dose monitoring to support future national DRL development and radiation safety improvement in Pakistan.
3	**Impact on SDG#___"** (min 500 words) (Please mention the impact of the relevant attained SDG) **Impact of My Thesis on Multiple SDGs (3, 4, and 12)** **SDG 3: Good Health and Well-Being** is the primary goal addressed by this research. Computed Tomography (CT) is an essential diagnostic imaging modality that plays a vital role in the early detection and management of many diseases. However, CT examinations involve relatively high doses of ionizing radiation, which may increase the lifetime risk of radiation-induced effects if not properly managed. This study evaluates patient organ doses during selected CT procedures and analyzes variations in radiation exposure. The findings provide valuable evidence for optimizing CT protocols and minimizing unnecessary radiation while preserving diagnostic image quality. The research also supports the establishment and implementation of **Diagnostic Reference Levels (DRLs)**, which serve as benchmarks for safe radiation practices. By promoting dose optimization according to the **ALARA (As Low As Reasonably Achievable)** principle, the study enhances patient safety, improves the quality of healthcare services, and contributes to reducing avoidable radiation risks. These outcomes directly support the objectives of SDG 3 by ensuring safer, more effective, and patient-centered healthcare. The research also contributes to **SDG 4: Quality Education** by strengthening knowledge and awareness of radiation protection and medical imaging practices. The results of this study provide evidence-based information that can be incorporated into the education and training of radiographers, radiologists, medical physicists, and other healthcare professionals. Understanding patient organ doses and dose optimization techniques is essential for improving clinical decision-making and ensuring safe imaging practices. The study can also serve as an educational resource for undergraduate and postgraduate students in medical physics, radiological sciences, and related healthcare disciplines. Furthermore, the research encourages future scientific investigations in radiation dosimetry and CT optimization, promoting a culture of research, innovation, and lifelong learning. By enhancing professional competence and supporting evidence-based education, this study contributes to the development of a skilled healthcare workforce capable of delivering high-quality diagnostic services. In addition, this research supports **SDG 12: Responsible Consumption and Production** by promoting the efficient and responsible use of radiation in healthcare. Medical imaging resources should be utilized in a way that maximizes clinical benefits while minimizing unnecessary exposure and resource wastage. This study identifies variations in organ doses and recommends optimized CT protocols that reduce radiation exposure without compromising diagnostic accuracy. Standardized imaging protocols and locally established Diagnostic Reference Levels (DRLs) help healthcare institutions avoid excessive radiation doses, reduce unnecessary repeat examinations, and improve the overall efficiency of CT services. The research also encourages regular quality assurance programs, equipment performance evaluation, and compliance with international radiation safety guidelines issued by organizations such as the International Commission on Radiological Protection (ICRP) and the International Atomic Energy Agency (IAEA). These measures promote the responsible

	use of medical technology, improve healthcare sustainability, and ensure the efficient utilization of available resource
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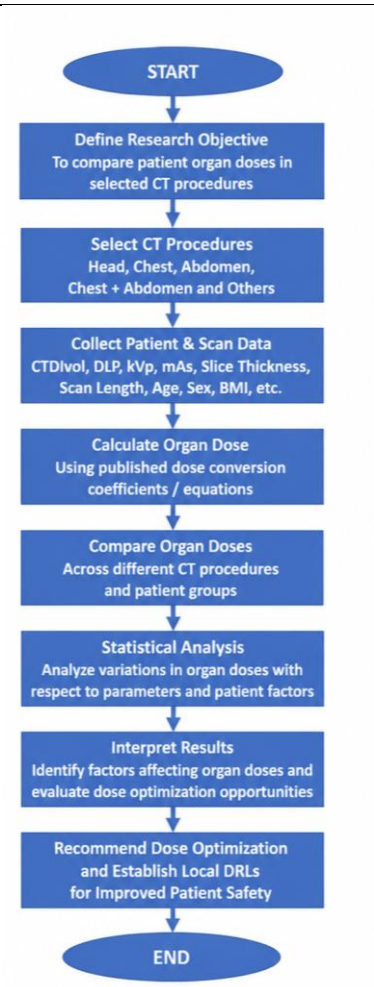
6	**Graphical Abstract**


START
Define Research Objective
To compare patient organ doses in selected CT procedures
Select CT Procedures
Head, Chest, Abdomen, Chest + Abdomen and Others
Collect Patient & Scan Data
CTDIvol, DLP, kVp, mAs, Slice Thickness, Scan Length, Age, Sex, BMI, etc.
Calculate Organ Dose
Using published dose conversion coefficients / equations
Compare Organ Doses
Across different CT procedures and patient groups
Statistical Analysis
Analyze variations in organ doses with respect to parameters and patient factors
Interpret Results
Identify factors affecting organ doses and evaluate dose optimization opportunities
Recommend Dose Optimization and Establish Local DRLs for Improved Patient Safety
END