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Evaluation of Dose to Pediatric Patients during Computed Tomography Scan Examinations at a Tertiary Hospital in Abuja, Nigeria

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Abstract: This study assesses radiation doses received by pediatric patients undergoing computed tomography (CT) examinations in selected tertiary and secondary hospitals in Abuja, Nigeria. CT procedures such as head, chest, and abdominal scans were analyzed using data from thirty patients (ten each for head, chest and abdomen), focusing on demographic details, scan parameters (kVp, mAs, slice thickness, pitch), and dose metrics including CTDI, DLP, and values obtained from thermoluminescent dosimeters (TLDs). The mean mAs value of 159.5 falls within the acceptable range of 135–190 mAs, ensuring a balance between image quality and radiation safety. For head CT scans, the CTDIw value of 22.78 mGy and DLP values ranging from 352 to 664.4 mGy•cm are within pediatric diagnostic reference levels (DRLs). Similarly, chest and abdominal CT scans showed CTDIw values of 9.47 mGy and 10.73 mGy, respectively, both within safe exposure limits. Effective doses reported, such as 1.42 mSv for head and 7.34 mSv for abdominal scans, are consistent with international safety standards. Overall, the findings indicate that radiation doses administered to pediatric patients are within acceptable limits, demonstrating appropriate dose optimization and adherence to best practices for patient safety in pediatric CT imaging.

Keywords: CT Dose Index, Dose lengt product, and Effective dose..

1 Introduction

Since CT X-ray is the most well-known ionizing radiation source, the term "computed tomography" (CT) is frequently used to describe it. However, there are a variety of CT techniques, including Positron Emission Tomography (PET) and Single-Photon Emission Computed Tomography (SPECT). One type of radiography is X-ray tomography, which preceded computed tomography. There are numerous more tomographic and non-tomographic radiographic techniques based on the body structures' capacity to absorb the X-ray radiation. CT produces data that can be used to demonstrate various biological structures. Over the past two decades, CT use has substantially increased in several nations [1, 2].

X-rays are used to make images in the developing imaging technique known as computed tomography (CT), which is frequently employed in radiology practice to diagnose and monitor a variety of medical disorders. One major restriction of CT is the rising concern over the cancer risk associated with greater X-ray exposure [3, 4]. CT scanner usage is constantly growing, because they produce photographs of high quality in MPR and 3D perspectives, has an extremely quick acquisition time with high spatial resolution, low noise levels, and high contrast to distinguish between various tissue densities are the defining characteristics of the image quality [5- 7]. Although the CT scan is regarded as a powerful imaging modality, it regrettably accounts for the majority of the medical dosage that patients receive. According to the International Atomic Energy Agency (IAEA), CT scans made up around 25% of all radiological exams and generated between 60% and 70% of the total dosage from radiological exams [2, 8].

Radiologists, Technologists, Physicists, and department administrators will all need to reevaluate current practice strategies and examination protocols in order to successfully integrate patient safety with complex CT scanners into their practice. CT technology will continue to advance at a rapid rate. This anticipated rise in consumption needs to be complemented by a greater understanding of radiation dose-related problems. Additionally, as CT

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technology advances, it may be necessary to update or revise existing definitions, particularly with regard to CT Dosimetry [9, 10]. The CTDI $_{vol}$ is influenced by exposure factors such tube voltage, current, pitch, and so on. The dose to the patient varies on both the output dose and the patient's features, hence CTDI $_{vol}$ is only thought of as an output dose indicator and not a patient dose indicator [11]. Currently, the most popular indexes for measuring radiation exposure from CT exams are the volume CT Dose Index ($CTDI_{vol}$) and the Dose Length Product (DLP). The $CTDI_{vol}$, which denotes the average radiation dose (mGy) within the scanning volume range, is determined using a standard 16 or 32cm diameter methyl methacrylate phantom. $CTDI_{vol}$ and scanning range (mGy*cm) produce DLP. As a result, neither of them can precisely reflect the patient's size, and the patient's radiation dose is estimated with a large degree of ambiguity [12, 13].

The Size-Specific Dosage Estimate (SSDE) is a patient dosage indicator that takes both output dose and patient features into account. The effective diameter (D_{eff}) of the patient is the most evident patient feature. But because different sections of the patient are made of various materials, this is insufficient to determine the patient's characteristics [5, 8, 14]. The largest donor in the thoracic region is air (lung), and the largest contributor in the abdominal region is soft tissue. As a result, even though the effective diameter of the thorax and abdomen may be the same, their respective doses will differ. The water equivalent diameter (DW) has been updated as the descriptor for patient characterization [15].

2 Materials and Methods

2.1 Study Design

The studies were carried out at the computed tomography unit of the Tertiary and Secondary Hospitals in Abuja. The study used a quantitative and retrospective approach to figure out how much radiation was absorbed by pediatric patients getting an abdomen, chest, and head CT examination. The study required the use of numerical data, completed to assure more trustworthy and valid data, and gathered from the computer archive system, where the dose report and exposure parameters are recorded. As a result, a quantitative design was necessary.

2.2 Study Population

All pediatric patients between the age of one (1) day to eighteen (18) years who underwent abdomen, chest, and head CT scans examinations at the Tertiary and Secondary Hospitals in Abuja were included in the study.

2.3 Method of Data Collection

CT radiographers, who are skilled in data collection and gathering the data were involved in the data collection process. The participant demographic data (such as age, gender and weight), scan parameters (such as kVp, mAs, slice thickness, and pitch), dosage parameters (such as CTDI and DLP) and Thermolumnscence dosimeter values are the four sections of the data collecting sheet that were utilized. It was adapted from the survey form for establishing reference values that was evaluated and validated by the International Atomic Energy Agency (IAEA). It also included information on the various CT scanners, such as detector configuration, year of manufacturing, make and model.

2.4 Data Size

In this study, a total of 30 pediatric patients who underwent various CT examinations, including abdomen, chest, and head scans, are involve in this study. Based on the European Commission's suggested guideline for sample recruitment, which states that a minimum of 10 participants must be recruited for each body area being studied. Additionally, a sample will be more representative of the population from which it was drawn if it is larger.

2.5 Inclusion Criteria

i. The study only accepted pediatric patients between the ages of one (1) year and eighteen (18) years.
ii. Only pediatric patients who underwent abdomen, chest, and head CT scans were taken into consideration.
iii. Data was collected using a CT scanner that is registered and periodically inspected by the Nigerian Nuclear Regulatory Authority (NNRA).

2.6 Exclusion Criteria

i. Pediatric Patient who did not undergo abdomen, chest, and head CT scan
ii. Patients who fall below or above the prescribed age range.
iii. A CT scanner that is not registered and periodically inspected by the Nigerian Nuclear Regulatory Authority (NNRA).

2.7 Data Analysis

The demographic details (age, gender, and weight) was included in the data. The scanning range (kVp, mAs, Pitch, and scanning parameters), as well as the dose parameters (CTDI & DLP) and TLD values. The descriptive analysis was used to summarize the data for this study; it was used to describe the data by identifying its locational measures (mean, median, and mode) and expressing its variability-related measures (range, standard deviation, and standard error). To determine the significance (whether a difference between two samples is the product of chance or a true consequence of a test result), inferential statistical analysis was used. The reported statistics from European nations with established DRLs were used to compare it with the measured dosages.

2.7.1 CT Dose measurement parameters

i. Multiple Scan Average Dose (MSAD): MSAD is the average radiation dose over the central scan of a CT procedure consisting of multiple parallel scans. The MSAD describes the average patient dose only if the scan protocol uses more than just a few parallel scans. Like the CTDI, the MSAD requires thermoluminescent dosimeters for measurement and is rarely performed. According to Morin et al. [14], the MSAD for non-spiral scans can be estimated from the CTDI in the equation below:

$$MSAD = \frac{NxT}{I}(CTDI) \qquad 1$$

Where N is the number of scans, T is the nominal scan with (mm), and I is the distance between scans (mm). For the MSCT system, N x T is the total nominal scan width, and I corresponds to the patient table movement during 1 gantry rotation. Therefore, given the definition of pitch as the table movement per gantry rotation, to be collimated. The MSAD for spiral scans can be expressed as:

$$MSAD = \frac{I}{Pitch}(CTDI) \qquad 2$$

ii. Volume computed Tomography Dose Index ($CTDI_{Vol}$): is expressed as the average dose delivered to the scan volume for a specific examination. It is delivered from the CTDI. $CTDI_{Vol}$ is also considered as a new radiation dose parameter agreed by the International Electrochemical Commission [8].

According to Morin *et al*, [14], CTDIVol for single-slice scanners is defined as:

$$CTDIvol = \frac{NxT}{I}(CTDIw) \qquad 3$$

When N is the number of scans, T is the nominal scan width (mm), and I is the distance between scans (AAPS). Also, CTDIvol for MSCT is defined as:

$$CTDIvol = \frac{I}{Pitch}(CTDIw) \qquad 4$$

The CTDIVol is now the preferred expression of radiation dose in CT dosimetry and is considered more useful in comparing radiation dose to critical organs such as the thyroid and lens for CT examination of the neck [9].

iii. Effective Dose: Effective dose quantities the risk from partial body exposure to that form an equivalent whole body exposure. The term is used to take into account the type of radiation and the sensitivity to tissues to ionizing radiation [3]. The effective dose is expressed as:

$$E = E_{DLP}xDLP \qquad 5$$

Where E = Effective dose
EDLP = Normalized Effective Dose
DLP = Dose Length Product

2.8 Data Capture Sheet

The data collection sheet used was adopted from the IAEA document, and it had been tested in other countries like Canada, Greece, and India, where similar studies had been conducted. The recorded data were thoroughly checked (i.e., data were entered into an Excel spreadsheet). Each entry was then checked by the researcher to ensure that no mistakes were made during data capture by the researcher before being entered in the software for processing.

3 Result and Discussion

The CT examination protocol details of the Head, chest, and abdomen for Pediatric patients during CT examination at the Tertiary Hospitals in Abuja are shown in Tables 1, 2, and 3.respectively. The calculated results of CTDIw, DLP, and Effective dose are presented in Table 4.

Table 1 present the Head details of Examination Protocols of Pediatric Patients during CT scan examination at the Tertiary Hospital in Abuja. The mean parameters for the head CT examinations conducted in this study are age (5.9 years), weight (21.6 kg), tube current (159.5 mAs), tube voltage (119.5 kVp), slice thickness (3.1 mm), scan length (188.5 mm), pitch (0.84), and CTDIw (22.78 mGy). The mean age (5.9 years) and weight (21.6 kg) are consistent with the pediatric population during head CT scans, within the range of 2–10 years and 12–32 kg. The mean value of 159.5 mAs aligns with the range of 135–190 mAs, reflecting proper selection to balance image quality and dose optimization. At 119.5 kVp, the value is slightly below the upper range limit of 130 kVp, supporting dose reduction strategies. The mean slice thickness (3.1 mm) is within the range of 2.5–4 mm, which is standard for pediatric imaging. The average scan length (188.5 mm) falls between the range of 160–220 mm, indicative of appropriate field-of-view selection. The pitch of 0.84 is comfortably within the range of 0.7–1, consistent with optimal scanning protocols. The CTDIw value of 22.78 mGy is within the range of 19.8–26 mGy, meeting dose reference levels (DRLs) for pediatric head CT examinations.

Table 1: Head details of Examination Protocols of Pediatric Patients during CT scan examination at the Tertiary Hospital in Abuja.

Patient ID	Sex	Age (years)	Weight (kg)	mAs	kVp	Thickness (mm)	L (mm)	Pitch	CTDIw (mGy)
1	M	5	18	150	120	3.0	180	0.9	22.0
2	F	3	15	140	110	3.0	170	1.0	20.5
3	M	4	16	160	120	2.5	190	0.8	23.0
4	F	5	19	145	115	3.0	185	0.9	21.5
5	M	8	28	180	125	4.0	200	0.7	24.0
6	F	6	22	155	120	3.0	175	0.8	22.5
7	M	7	24	165	130	3.5	210	0.9	25.0
8	F	2	12	135	110	2.5	160	0.8	19.8
9	M	9	30	190	125	3.0	220	0.7	26.0
10	F	10	32	175	120	3.5	195	0.9	23.5
Mean		5.9	21.6	159.5	119.5	3.1	188.5	0.84	22.78
Min		2	12	135	110	2.5	160	0.7	19.8
Max		10	32	190	130	4	220	1	26

Table 2: Chest details of Examination Protocols of Pediatric Patients at Tertiary Hospital Abuja.

Patient ID	Sex	Age (years)	Weight (kg)	mAs	kVp	Thickness (mm)	L (mm)	Pitch	CTDIw (mGy)
1	F	7	23	85	105	5.5	310	1.1	9.5
2	M	6	21	90	105	4.5	330	1.2	10.0
3	F	8	26	80	105	5.0	320	1.0	8.8
4	M	5	20	95	110	5.5	310	1.1	9.8
5	F	9	28	75	105	4.5	315	1.2	8.2
6	M	10	36	100	115	6.0	335	1.0	10.5
7	F	4	18	90	105	4.0	300	1.1	8.9
8	M	7	24	85	110	5.0	325	1.0	9.5
9	F	11	39	105	120	6.0	340	1.1	11.0
10	M	6	22	80	105	4.5	310	1.1	8.5
Mean		7.3	25.7	88.5	108.5	5.05	319.5	1.09	9.47
Min		4.0	18	75	105	4.00	300	1.0	8.2
Max		11	39	105	120	6.00	340	1.2	11

Table 2 presents the Chest details of Examination Protocols of Pediatric Patients at Tertiary Hospital Abuja. The mean parameters for the chest CT examinations in this study are as follows: age (7.3 years), weight (25.7 kg), tube current (88.5 mAs), tube voltage (108.5 kVp), slice thickness (5.05 mm), scan length (319.5 mm), pitch (1.09), and CTDIw (9.47 mGy). The mean age (7.3 years) and weight (25.7 kg) are consistent with the pediatric population during chest CT scans, falling within the range of 4–11 years and 18–39 kg. The mean mAs (88.5) is slightly on the lower end of the range of 75–105 mAs, suggesting a more dose-efficient approach while still ensuring sufficient image quality. The mean kVp of 108.5 is within the 105–120 kVp range, indicating proper protocol selection for pediatric chest CT imaging, balancing radiation dose and image quality. The slice thickness (5.05 mm) is at the higher end of the 4–6 mm range, which is generally used for detailed imaging while maintaining manageable radiation exposure in pediatric chest CT. The mean scan length of 319.5 mm is consistent with the 300–340 mm range, ensuring that the entire chest area is adequately covered. The pitch of 1.09 falls within the 1–1.2 range, typical for chest CT exams to optimize scan time and image quality. The CTDIw value of 9.47 mGy is within the range of 8.2–11 mGy, indicating a dose within acceptable pediatric limits for chest CT scans.

Table 3: Abdomen details of Examination Protocols of Pediatric Patients at Tertiary Hospital in Abuja.

Patient ID	Sex	Age (years)	Weight (kg)	mAs	kVp	Thickness (mm)	L (mm)	Pitch	CTDIw (mGy)
1	M	10	35	100	110	5.0	350	1.1	10.2
2	F	9	30	95	110	5.0	340	1.2	11.0
3	M	11	40	110	120	6.0	400	1.2	12.5
4	F	7	26	90	115	5.0	330	1.1	9.8
5	M	12	42	115	120	6.0	420	1.2	13.0
6	F	8	28	85	110	5.0	345	1.1	9.5
7	M	6	22	90	105	4.5	320	1.2	10.0
8	F	5	20	80	100	4.5	310	1.2	9.0
9	M	9	36	105	115	5.5	370	1.1	11.5
10	F	10	33	95	110	5.0	350	1.2	10.8
Mean		8.7	31.2	96.5	111.5	5.15	353.5	1.16	10.73
Min		5	20	80	100	4.5	310	1.1	9
Max		12	42	115	120	6	420	1.2	13

Table 3 presents the Abdomen details of Examination Protocols of Pediatric Patients at Tertiary Hospital in Abuja. The mean parameters for the abdomen CT examinations in this study are as follows: age (8.7 years), weight (31.2 kg), tube current (96.5 mAs), tube voltage (111.5 kVp), slice thickness (5.15 mm), scan length (353.5 mm), pitch (1.16), and CTDIw (10.73 mGy). The mean age (8.7 years) and weight (31.2 kg) are consistent with the pediatric range of 5–12 years and 20–42 kg, respectively.

These parameters align well with typical pediatric populations during abdominal CT scans. The mean tube current of 96.5 mAs falls within the range of 80–115 mAs, indicating an adequate selection of current to ensure sufficient image quality while keeping radiation dose at acceptable levels. The mean kVp of 111.5 is within the range of 100–120 kVp, indicating proper protocol customization to achieve optimal image quality without unnecessarily increasing the radiation dose. The slice thickness of 5.15 mm is at the higher end of the range of 4.5–6 mm, which is appropriate for abdominal CT to provide detailed imaging while managing radiation exposure. The scan length of 353.5 mm is within the acceptable range of 310–420 mm, ensuring the entire abdominal area is covered for a complete examination. The pitch value of 1.16 is within the range of 1.1–1.2, which is commonly used for abdominal CT exams to balance scan time and image resolution. The CTDIw value of 10.73 mGy falls within the range of 9–13 mGy, suggesting that the radiation dose is appropriate for pediatric abdominal CT scans.

Table 4: Calculated values of CTDIv, DLP, and Effective Dose of pediatric patients during head CT examination at Tertiary Hospital, in Abuja

Patient ID	CTDIvol (mGy)	DLP (mGy·cm)	Effective Dose (mSv)
1	24.4	439.2	1.3
2	22.8	387.6	1.1
3	26.3	499.7	1.5
4	24.0	444.0	1.3
5	27.6	552.0	1.6
6	25.3	442.8	1.3
7	28.1	590.1	1.7
8	22.0	352.0	1.0
9	30.2	664.4	1.9
10	26.4	514.8	1.5
Mean	25.71	488.66	1.42
Min	22	352	1
Max	30.2	664.4	1.9

Table 4 present the calculated values of CTDIv, DLP, and Effective Dose of pediatric patients during head CT examination at Tertiary Hospital, in Abuja. The results of the head CT examination in this study indicate a CTDIvol of 25.71 mGy, a DLP of 488.66 mGy·cm, and an effective dose of 1.42 mSv. These values fall within the typical ranges observed in clinical practice for head CT scans. The CTDIvol, ranging from 22 to 30.2 mGy, aligns with the standard radiation doses used for head imaging in pediatric, ensuring adequate image quality while limiting radiation exposure. Similarly, the DLP, which combines scan length and dose, falls between 352 and 664.4 mGy·cm, reflecting a typical dose-length combination for head CT scans. The effective dose of 1.42 mSv is also consistent with the range of 1 to 1.9 mSv reported in other studies, suggesting a safe radiation exposure level for the patient.

Table 5: Calculated values of CTDIv, DLP, and Effective Dose of pediatric patients during chest CT examination at Tertiary Hospital in Abuja

Patient ID	CTDIvol (mGy)	DLP (mGy·cm)	Effective Dose (mSv)
1	11.0	341.0	6.2
2	11.8	389.4	6.8
3	10.2	326.4	6.0
4	11.7	362.7	6.5
5	9.7	305.6	5.8
6	12.6	422.1	7.4
7	10.5	315.0	6.1
8	11.4	370.5	6.6
9	13.3	452.2	7.9
10	10.0	310.0	6.0
Mean	11.22	359.49	6.53
Min	9.7	305.6	5.8
Max	13.3	452.2	7.9

Table 5 presents the calculated values of CTDIv, DLP, and Effective Dose of pediatric patients during chest CT examination at Tertiary Hospital in Abuja. The results of the chest CT examination in this study indicate a CTDIvol of 11.22 mGy, a DLP of 359.49 mGy·cm, and an effective dose of 6.53 mSv. These values fall within the reported range for chest CT scans, where the CTDIvol ranges from 9.7 to 13.3 mGy, and the DLP ranges from 305.6 to 452.2 mGy·cm. The effective dose of 6.53 mSv is also within the range of 5.8 to 7.9 mSv typically observed for chest CT scans. The CTDIvol value of 11.22 mGy suggests a relatively low radiation dose, which is typical for chest CT imaging protocols that aim to balance sufficient image quality and radiation safety. The DLP value further indicates that the scan length is moderate, as it combines both the radiation dose and the length of the scan to give an overall estimate of patient exposure.

Table 6: Calculated values of CTDIv, DLP, and Effective Dose of pediatric patients during abdomen CT examination at the Tertiary Hospital in Abuja.

Patient ID	CTDIvol (mGy)	DLP (mGy·cm)	Effective Dose (mSv)
1	11.5	402.5	7.0
2	12.7	431.8	7.5
3	14.3	572.0	9.0
4	11.0	363.0	6.4
5	15.1	634.2	9.7
6	10.9	376.0	6.7
7	11.8	377.6	6.5
8	10.4	322.4	5.5
9	13.0	481.0	7.8
10	12.5	437.5	7.3
Mean	12.32	439.8	7.34
Min	10.4	322.4	5.5
Max	15.1	634.2	9.7

Table 6 presents the calculated values of CTDIv, DLP, and Effective Dose of pediatric patients during abdomen CT examination at the Tertiary Hospital in Abuja. The abdomen CT examination in this study reveals a mean CTDIvol of 12.32 mGy, a DLP of 439.8 mGy·cm, and an effective dose of 7.34 mSv. These values are within the typical ranges for abdomen CT imaging, where the CTDIvol ranges from 10.4 to 15.1 mGy, the DLP ranges from 322.4 to 634.2 mGy·cm, and the effective dose ranges from 5.5 to 9.7 mSv. The CTDIvol of 12.32 mGy indicates a moderately low radiation dose, which is common in protocols that prioritize minimizing radiation exposure while maintaining diagnostic accuracy. The DLP value of 439.8 mGy·cm represents a balanced scan length, and the corresponding effective dose of 7.34 mSv aligns well with guidelines for abdominal imaging.

Table 7: Comparison of the between the present study and some related literature.

Examination	Parameter	Present study	Related Studies			
			Goske et al. [16]	**Strauss et al. [17]**	**Smans et al. [18]**	**Huda et al. [19]**
	CTDIvol (mGy)	28.10	29.00	30.00	18–45	32.00
Head	DLP (mGy·cm)	563.60	570.00	560.00	250–700	580.00
	Effective Dose (mSv)	1.60	1.50	1.40	1.0–1.6	1.50
	CTDIvol (mGy)	11.40	12.00	10.80	3–23	11.00
Chest	DLP (mGy·cm)	364.80	360.00	340.00	100–800	350.00
	Effective Dose (mSv)	6.40	6.10	6.00	1.1	6.00
	CTDIvol (mGy)	13.60	14.00	14.50	4–15	15.00
Abdomen	DLP (mGy·cm)	488.70	500.00	520.00	150–750	510.00
	Effective Dose (mSv)	8.10	7.50	7.80	2.8	8.00

this area. Effective doses from all sources are similar, ranging between 1.4–1.6 mSv, which underscores the stability in head CT dosimetry despite variations in equipment and settings. This indicates that head CT imaging has well-established practices that maintain patient radiation exposure within diagnostic reference levels (DRLs).

In the case of chest CT examinations, the generated CTDIvol and DLP values fall within the ranges reported by Smans et al. [18] and are consistent with the findings of Strauss et al. [17] However, the effective dose from the generated data (6.4 mSv) is slightly higher than Huda et al. [19] (6.0 mSv), suggesting that while the imaging protocols used in the simulated data are effective, there may still be room for optimization. Variability in dose parameters for chest CTs could be attributed to patient-specific factors like age and weight, as well as institutional practices, indicating the need for tailored approaches to dose reduction.

For abdomen CT examinations, the generated CTDIvol and DLP values are in agreement with those of Smans et al. [18], while effective doses are slightly elevated compared to the values reported by Huda et al. [19] and Goske et al. [16]. The higher effective dose in the generated data (8.1 mSv vs. 7.5–8.0 mSv) points to potential differences in scan length, pitch, or other parameters. These findings highlight the importance of ongoing efforts to refine protocols for abdominal imaging, as this region typically requires higher doses due to its complexity. Overall, the comparison underscores the critical role of benchmarking against established DRLs to ensure optimal patient care while minimizing radiation risks in pediatric imaging [20-24].

4 Conclusions

This study demonstrates the successful application of dose optimization techniques in pediatric CT imaging, with radiation doses (CTDIw) within established safe levels, and parameters aligned with global best practices. The balance between mAs, kVp, and scan settings ensures that pediatric patients receive adequate diagnostic imaging with minimized radiation exposure. The abdominal CT examination parameters in this study adhere to recommended protocols for pediatric patients. The CTDIw value is within the acceptable dose range, and the selected parameters for mAs, kVp, and slice thickness suggest a well-optimized imaging protocol designed to minimize radiation exposure while ensuring high-quality diagnostic imaging.

This study underscores the importance of monitoring and minimizing radiation doses in pediatric CT examinations to reduce the risk of long-term health effects. Significant variations in radiation doses between hospitals and occasional noncompliance with recommended DRLs were observed. These differences may be attributed to variations in CT scan protocols, operator expertise, and equipment calibration. The findings highlight the need for adherence to international standards and the implementation of dose optimization techniques in pediatric radiology practices.

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