

ASSESSMENT OF THE CURRENT PRACTICES OF PEDIATRIC RADIOGRAPHY IN KANO METROPOLIS, NIGERIA

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Abstract

Background: Pediatric radiography comes with many challenges and peculiarities due to the difficulty in gaining child trust and cooperation during the procedure and the greater caution that should be exercised in protecting children from the effect of ionizing radiation.

Aims of the study: The study aims at investigating the current status of pediatric radiography in Kano metropolis with respect to patient care, radiation protection and availability of dedicated facility.

Material and Methods: The study design is prospective and cross-sectional, conducted between March 2016 to September 2016. Eight centers were selected out of twenty two using non-probability purposive sample method. Radiographers were the respondents. The validity and reliability of the questionnaire were tested using pilot study. Informed consent was obtained from each respondent. Forty seven questionnaires were administered and the collected data was analyzed using SPSS version 16.0 software.

Results: Ninety one percent (n=43) out of the 100% (n=47) distributed questionnaires were returned and 78.7% (n=37) were properly filled. It was found that only 13.5% (n=5) of the respondents undergo specific training on pediatric radiography and only 27% (n=10) indicated the availability of dedicated paediatric unit their centres. It was established that only 13.5% (n=5) of the respondents indicated the availability of child friendly waiting room in their centers.

Conclusion: There is no standardized practice of pediatric radiography in Kano metropolis hence the needs for facility improvement.

Keywords: Current status, pediatric radiography, Kano metropolis.

Introduction

Pediatric radiography is the science and art that use ionizing radiation in the production of medical images for the diagnosis of diseases in infants and children the modalities used in pediatric radiography include; conventional radiography, fluoroscopy, computed radiography, digital radiography and computed tomography. The modalities are valuable tools for the production of medical images for diagnosis of various diseases in infants and children^[1]. The drawback of these modalities is the hazardous effect associated with ionizing radiation. There is no safe dose of ionizing radiation, as it takes only a single photon or particle to cause damage to DNA resulting in a genetic alteration^[2]. Being aware of the harmful effects of radiation, it is necessary to keep the total exposure level as low as consistent with other requirements of practice. In this regard, the International Commission on Radiological Protection (ICRP) recommends that medical exposure should be as low as reasonably achievable (ALARA)^[3]. Epidemiologic studies have shown that persons exposed to high levels of ionizing radiation have an increased risk of cancer, particularly leukemia, and later in life, breast and thyroid cancer^[4].

In addition, some epidemiologic studies have found that radiation exposure during childhood carries a higher risk of cancer than exposure at other ages^[5,6]. This is because pediatric tissues are more radiosensitive than adults due to active growth and development as well as longer life expectancy associated with infants and children. These result in wider window period for cancer development. Pediatric radiography comes with many challenges and peculiarities when compared with that of adults. One of the main challenges associated with pediatrics radiography is to gain the child's trust and co-operation before and throughout the duration of an examination, which can prove to be difficult in children who may be ill and have pain. Peculiarities of pediatric radiography include; dedicated imaging protocols to acquire the images, need for sedation or general anesthesia for longer procedures, specific training required for the healthcare personnel involved, thorough knowledge and expertise applied for evaluating the images,

and most importantly, it requires consideration of radiation exposure^[7]. Based on the researcher's experience in one of the government hospital in Kano metropolis challenges related to pediatric radiography are not tackled and there is no special consideration for it.

This prompted the researchers to investigate the practices in the entire Kano metropolis so that the results could be used as a base-line from which recommendations could be made to the relevant authorities. The study intends at investigating the status of pediatric radiography in Kano metropolis.

Methods and Materials

The study design is cross-sectional conducted from March 2016 to September 2016. Using non-probability purposive sampling method eight centers were selected; three federal government hospitals, three state government hospitals and two private radio-diagnostics centers. There were twenty two centers with functioning X-ray equipment but only the eight selected centers were managed by Radiographers and participate in pediatric radiography during the period of the study.

The centers were identified with numbers 1-8 and convenience sampling method was used to select the respondents in the selected centers. Radiographers were the respondents during the study. The Radiographers from which data was collected include; permanent staffs in all the selected centers, three sets of interns in one of the federal government hospitals, two sets of NYSC staffs in another federal government hospital, state and private radio-diagnostics centers. After intensive literature review a structured questionnaire was formulated. The validity and reliability of the questionnaire were tested using pilot study. The Cronbach's alpha reliability test was used to test the internal consistency of the measuring tool and reliability coefficient was found to be 0.796. The questionnaire was designed to investigate the status of pediatric radiography in Kano metropolis. Section A of the questionnaire was the demographic data of the respondent, questions asked in this section include; age, gender, cadre, workplace and work experience of the respondent. Section B contained questions that explored the practice of pediatric radiography. Some of the questions asked were; personnel specific training in pediatric radiography, consultation with a play specialist for attention or distraction, invitation of the patient's guardian in the examination room during the procedure, availability of dedicated pediatric unit,

performance of regular audit and quality checks and the availability of child friendly waiting room. Furthermore the type of the x-ray equipment, availability of the distraction devices, availability of the immobilization/restraint devices and lead protective devices were also confirmed from the respondents. Consent was sought and obtained from each respondent. Fifty questionnaires were administered and the collected data was analyzed using SPSS version 16.0 software.

Results

Eighty six percent (n=43) out of the 100% (n=5) questionnaires distributed were returned and 74% (n=37) were properly filled. The age of the respondents ranged from 26 to 60 years (mean = 31.0±8.3). The respondents consist of 81.0% (n = 30) males and 19.0% (n = 7) females. Fifty nine percent (n=22) of the respondents were from federal government hospitals, 22.0% (n=8) were from the state government hospitals and 19.0% (n=7) from the private radio-diagnostics centers. Work experience of the respondents ranges from 0 to 15 years. We found that only 13.5% (n=5) of the respondents went through specific training on paediatric radiography with only 5.4% (n=2) that consulted a play specialist to obtain maximum cooperation from the child. Fifty seven percent (n=21) of the respondents always invited patient guardians into the examination room during the procedure and 8.1% (n=3) occasionally invited guardians. Only 27.0% (n=10) had dedicated pediatric units and only 16.2% (n=6) performed a regular audit and quality checks. Only 13.5% (n=5) had child friendly waiting room. Thirteen point five percent (n=5) of the respondents had color character painted walls and equipment. The percentage scores of answers on the practice of pediatric radiography are shown in table 1 below.

Table 1: Percentage scores of answers on the status of pediatric radiography

Questions	Answers	% Scores
Do you undergo any specific training on pediatric radiography?	Yes	13.5
	No	86.5
Do you ever consult any play specialist for services or education?	Yes	5.40
	No	94.6
Do invite patient guardian into the examination room during the procedure?	Yes	57.0
	No	35.0
Do you have dedicated pediatrics unit in your center?	Sometimes	8.0
	Yes	27.0
	No	73.0
Do you perform regular quality checks?	Yes	16.2
	No	67.6
	Sometimes	16.2
Do you have a friendly child waiting room?	Yes	13.5
	No	86.5
	Yes	13.5
Are walls & equipment painted with a colorful characters?	Yes	13.5
	No	86.5

Figure 1 below, indicated that, only 2.7% (n=1) of the respondents had digital radiography, 5.4% (n=2) mobile X-ray machine and 35.1% (n=13) static X-ray machine as the x-ray equipment for pediatric radiography.

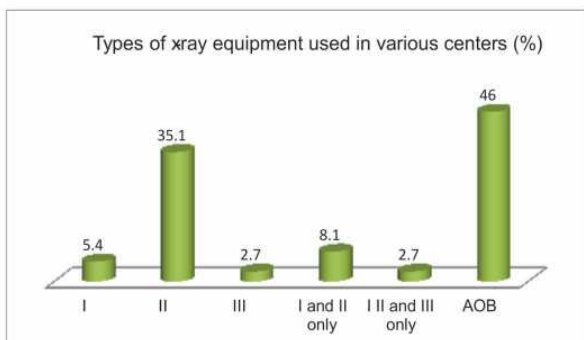


Figure 1: Responses on the types of x-ray equipment used in various centers.

Key: I=Mobile x-ray machine, II=Static x-ray machine, III=Digital radiography

The result shows that none of the respondents had toys, books, posters and television as distraction devices, 8.0% (n=3) toys, 10.8% (n=4) books, 43.2% (n=16) posters and 38.0% (n=14) television as shown on the figure 2, below.

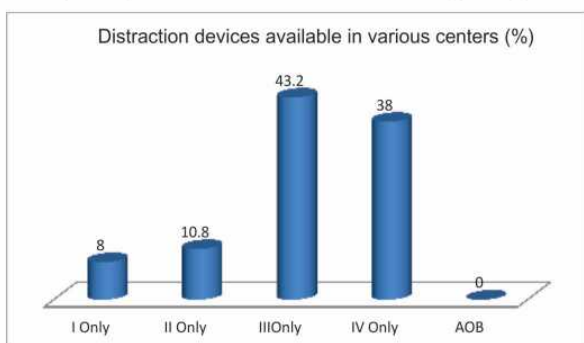


Figure 2: Responses on the types of distraction devices available in various centers.

Key: I=Toys, II=Books, III=Posters, IV=Television

We also found that 64.8% (n=24) of the respondents shows total absence of immobilization devices, 2.7% (n=1) had Tam-embored, Plexiglas hold-down paddle, and Pig-O-Stat, 0.0% (n=0) had Plexiglas hold-down paddle and Pig-O-Stat, 0.0% (n=0) had Tam-embored and Plexiglas hold-down paddle. Only 10.8% (n=4) Pig-O-Stat, 19.0% (n=7) Plexiglas hold-down paddle, and 2.7% (n=1) had Tam-embored as shown on figure 3, below.

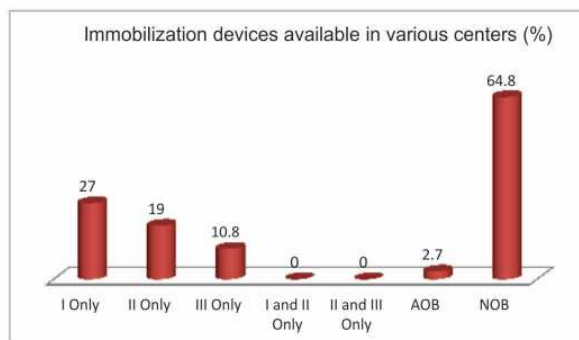


Figure 3: Responses on the types of immobilization devices available in various centers

Key: I=Tam-embord, II=Plexiglas hold-down paddle, III=Pig-O-Stat

Figure 4: Responses on restrain devices in various centers

Key: I=Sandbags, II=Sheets and towels, III=Covered radiolucent sponge blocks, IV=Socki-nettes V=Compression band.

Figure 4 below indicated that only 19.0% (n=7) of the respondents indicated the availability of sandbags, sheets and other restraining devices but 27.0% (n=10) had no restraining devices.

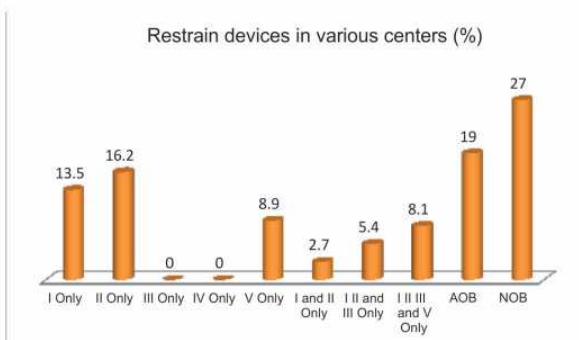


Figure 4: Responses on restrain devices in various centers

Key: I=Sandbags, II=Sheets and towels, III=Covered radiolucent sponge blocks, IV=Socki-nettes V=Compression band.

Forty three percent (n=16) of the respondents used immobilization devices while 46.0% (n=17) used the devices occasionally as shown on figure 5 below.

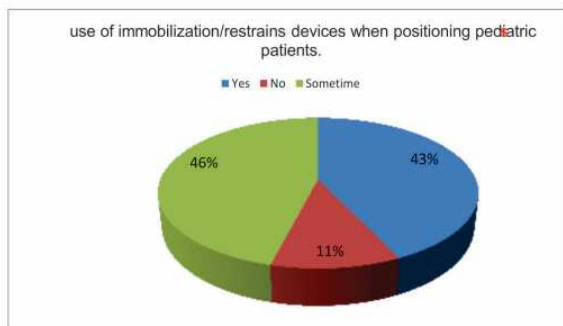


Figure 5: Responses on the use of immobilization/restraints devices when positioning pediatric patients

Only 2.7% (n=1) of the respondents had testicle capsule, thyroid shield, breast shield, and lead apron, 8.1% (n=3) had none of the protective devices. Furthermore, 2.7% (n=1) had testicle capsule and lead apron, 2.7% (n=1) had breast shield and lead apron, 32.4% (n=12) thyroid shield and lead apron, 46.0% (n=17) lead apron only, 2.7% (n=1) each thyroid shield and testicle capsule respectively as shown on figure 6 below.

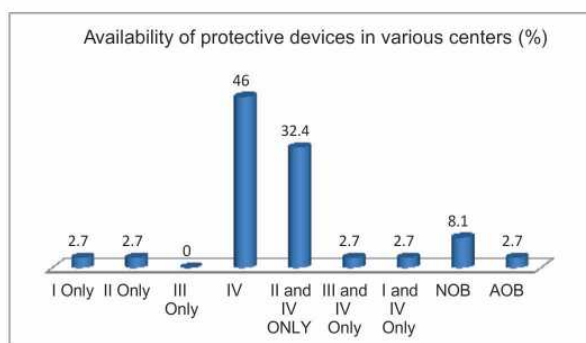


Figure 6: Responses on the availability of protective devices in various centers

Key: I=Testicle capsule, II=Thyroid shield, III= Breast shield, IV= Lead apron

Figure 7 below indicated only fifty one point four percent (n=19) of the respondents used of protective devices for their patients and guardian while 16. 2% (n=6) occasionally used it.

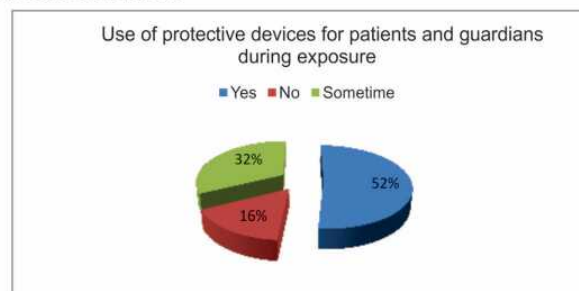


Figure 7: Responses on the use of protective devices for patients and guardians during exposure

Discussion: Using structured questionnaires data was collected from 50 consented Radiographers in Kano metropolis and the collected data was analyzed using SPSS version 16 software. We found that only 13.5% (n=5) of the respondents undergo specific training in paediatric radiography and only 27.0% (n=10) of the respondents had a dedicated pediatric unit in their centers. Only 16.2% (n=6) performed a regular audit and quality checks and only 13.5% (n=5) had child friendly waiting room. Thirteen point five percent (n=5) of the respondents had color character painted walls and equipment and only 5.4% (n=2) of the respondents had digital Radiography as the x-ray equipment for paediatric Radiography. The findings of the study show that there is no standardized practice of paediatric radiography in Kano metropolis hence the needs for facilities to improve. It is recommended that, the management of the facilities should send Radiographers for further training in paediatric Radiography, endeavor to have a dedicated paediatric unit, endeavor to have child friendly waiting area, and Radiographers should improve in their practice with the available equipment and accessories. The findings of the current study indicated that only 13.5% (n=5) of the respondents undergoes specific training on paediatric radiography as shown on table 1, above. The study is also in agreement with the study conducted by [8] which shows only 6% (n=1) of the respondents had specialized training in paediatric radiography. High sensitivity to ionizing radiation and difficulty in gaining child cooperation during examination and procedure makes it critical to obtain desired results without repeat. Such could only be achieved with a specialized training and skill of the personnel conducting the procedure [9]. The findings of the study show that only 5.4% (n=2) of the respondents contacted a play specialist for services or education as shown on table 1. One of the challenges related to paediatric patients is to gain their cooperation before and throughout the period of the procedures.

The challenges could be overcome by effective play with the patients by the personnel performing the procedure and that could be achieved by employing a play specialist for services or acquiring knowledge from him/her on how to play with patients to have the cooperation for successful conduct of the procedure^[10]. Fifty seven percent (n=21) of the respondents indicated that they invited the guardians of their patients into the examination rooms during the procedures, 8.1% (n=3) occasionally invited the guardians into the examination rooms as shown on table 1. Children always stick to person they are familiar with, whenever in a strange environment, to have their cooperation the guardians need to be invited into the examination room with the patient during the procedure.

The finding of the study show that only 27.0% (n=10) of the respondents indicated the availability of dedicated paediatric unit their centres. The findings are contrary to the findings of the study conducted by^[9] which shows that none of the respondents indicated the availability of the dedicated paediatric unit in their centres. Facilities should endeavour to have dedicated paediatric units so as to catch up with the challenges and peculiarities associated with paediatric radiography.^[7] The table 1 indicated only 16.2% (n=6) of the respondents performed regular audits and quality checks in their centres and 16.2% (n=6) conducted it occasionally. Regular audits and quality checks remain a critical component of paediatric radiography to ensure high quality diagnostic images are produced at the least exposure to ionizing radiation^[7].

The findings of the study show that only 13.5% (n=5) of the respondents indicated the availability of child friendly waiting room as shown on table 1. There is a need to have full cooperation of the patient before the procedure and this could only be achieved with child friendly waiting room^[11].

The result of the study shows that only 13.5% (n=5) of the respondents indicated that the walls of their examination rooms and equipment were painted with colourful characters. Children are naturally attracted by colourful characters, therefore the walls of the examination rooms and equipment should be painted with colourful characters which will certainly help in gaining the trust and cooperation of the patients during the procedure^[12]. The results of the study show only 2.7% (n=1) of the respondents indicated they used digital radiography as the only x-ray equipment for paediatric radiography in their centres as shown on figure 1.

High quality images produced by computed or digital radiography are recommended, so that exposure factors can be optimized and repeats are avoided^[13]. The findings of the study show that only 0.0% (n=0) of the respondents indicated the availability of toys, books, posters and television in their centres as distraction devices. Eight percent (n=3) indicated toys as the only distraction devices in their centres, 10.8% (n=4) indicated books, 43.2% (n=16) posters and 38.0% (n=14) indicated television as the only distraction devices in their various centres as shown on figure 2.

Distraction devices are very important during paediatric procedures and children have different affinity to different distraction devices that is why it is critical for a facility to have different types of distraction devices^[12]. The results of the study show that 64.8% (n=24) of the respondents indicated that there were no immobilization devices in their centres, 2.7% (n=1) of the respondents indicated the availability of Tam-embored, Plexiglas hold-down paddle, and Pig-O-Stat in his/her centres, 0.0% (n=0) each of the respondents indicated the availability of Plexiglas hold-down paddle and Pig-O-Stat and Tam-embored, and Plexiglas hold-down paddle respectively in their centers.

Furthermore, 10.8% (n=4) indicated Pig-O-Stat only, 19.0% (n=7) indicated Plexiglas hold-down paddle only, and 2.7% (n=1) indicated Tam-embored as the only immobilization devices available in their various units as shown on figure 3.

Immobilization remains one of the important aspects of pediatric radiography hence emotional blurring has been one of the causes of repeat. It therefore becomes necessary for facilities to have different types of immobilization devices to minimize repeats for radiation protection, cost effectiveness and departmental efficiency^[7].

The findings of the study shows that only 19.0% (n=7) of the respondents indicated the availability of sandbags, sheets and towels, covered radiolucent sponge and compression band in their centers, 5.4% (n=2) indicated sandbags, sheets and towels and covered radiolucent sponge, 2.7% (n=1) indicated the availability of sandbags, sheets and towel as restraining devices in their centers as shown on figure 4.

Only 8.1% (n=3) compression band only, 16.2% (n=6) sheets and towel only, and 13.5% (n=5) sandbags only. Furthermore, only 43.0% (n=16) of the respondents indicated the use of immobilization/restraining devices when positioning pediatric patients, 46.0% (n=17) indicated the use of the devices occasionally as shown on figure 5. Immobilization/restraining devices should be used when positioning pediatric patients no matter how the patient appears to be cooperative^[11].

The study also shows only 2.7% (n=1) of the respondents indicated the availability of testicle capsule, thyroid shield, breast shield, and lead apron as protective devices in their centers, 8.1% (n=3) shows that there were none of the devices mentioned in their centers.

Furthermore, 2.7% (n=1) of the respondents indicated the availability of testicle capsule and lead apron in their centres, 2.7% (n=1) indicated breast shield and lead apron, 32.4% (n=12) thyroid shield and lead apron, 46.0% (n=17) lead apron only, 2.7% (n=1) each of the respondents indicated the availability of testicle capsule and thyroid shield in their centres respectively as shown on figure 6. Various types of protective devices should be available in radiological facilities; the type of protective device used depends on the gender, age and region of interest that is why the facility should endeavour to have different types.

As shown on figure 7. 51.4% (n=19) of the respondents indicated they used protective devices for their patients and guardian while 32.4.2% (n=12) occasionally used it. Facilities should make an effort to have different types of protective devices for protection of the patients and their guardian during exposure. Protective devices should be used for patients and their relatives so as to protect them from unnecessary exposure to ionizing radiation^[7].

Conclusion

There is no standardized practice of pediatric radiography in Kano metropolis hence the need for facilities to improve.

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