A REVIEW OF RADIATION PROTECTION IN NORTH EASTERN NIGERIA: DOES PAEDIATRIC RADIOGRAPHY GET THE REQUIRED ATTENTION?

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ABSTRACT

Background: Research in paediatric radiography in Nigeria, particularly as it relates to paediatric radiation protection has been a neglected area. This is further complicated by the fact that paediatric patients do not have a voice of their own.

Objective of Study: To assess the status of radiation proctection among paedatrics.

Methods: An extensive search of the literature was conducted on Google, Google Scholar, Mendeley, International Atomic Energy Agency (IAEA) Radiation Protection of Patients (RPoP) website and the alliance for radiation safety and image gently websites to gain an in-depth and up-to-date information on the subject. Terms such as paediatric radiography, paediatric radiology, and radiation protection were used in the search. There was no restriction on date and source of articles but emphasis was laid on publications from Nigeria and other developing countries.

Results: Current evidence from relevant literature search shows that the collective global effort is towards strengthening radiation protection in medicine worldwide with specific interest in paediatric patients. The situation in most developing countries especially in crisis prone areas like North Eastern Nigeria is still far from global reality.

Conclusion: Paediatric radiation protection in North Eastern Nigeria has not been given the attention it deserves. This is evidenced by the paucity of literature on the subject and apparent lack of dedicated paediatric radiography units and specialized training.

Keywords: paediatric radiography, paediatric radiology, radiation protection

INTRODUCTION

Radiation protection of paediatric patients undergoing medical X-ray examination is governed by the principles of justification and optimization[1,2]. Radiation dosimetry as an important aspect of radiation protection is required to inform medical practitioners of the levels of radiation exposure of patients and the risks from the diagnostic procedures. It provides a basis for justification and assists in optimization of procedures.

Paediatric radiography entails the use of ionizing and other forms of radiant energies to produce images of different body parts in children to aid in the diagnosis and treatment of diseases[3].

While, a huge body of literature exists on different aspects of radiation protection of adult patients, a close look at available local literature indicates that less emphasis and attention is given to the radiation protection of paediatric patients despite their peculiarities. This fact has been authenticated by a recent evidences[4,5]. Recently, there has been a widespread, global campaign on paediatric radiation protection with international stakeholders, such as the Image Gently Campaign, International Society for Radiographers and Radiologic Technologists (ISRRT), International Atomic Energy Agency (IAEA), World Health Organization (WHO), International Commission on Radiological Protection (ICRP), International Society for Radiology (ISR) among others[6,7], to strengthen the practice of radiation protection in medicine and to set the scene for the next decade. However, limited resource settings and crisis prone areas like in North Eastern Nigeria may not been aware of these current trends. It is not surprising to find radiographers in these areas who have not heard about the image gently campaign, a patient advocacy group focusing on improving paediatric radiation protection globally[8].

Previous research reports have shown low awareness of radiation protection and inappropriate use of ionizing radiation among healthcare professionals, even among referring clinicians in Nigeria and by extension Sub-Saharan Africa[9,10]. Hence, it is not uncommon to find indiscriminate and unjustified paediatric X-ray examination requests, This may be due to the gap in information and lack of specialized education and training on paediatric radiation protection[11] and appropriate or insufficient use of referral guidelines[12] . This on its part, may be due to lack of interest in paediatric radiation protection as opined by other researchers[4,13], which is further complicated by the armed conflict within the North Eastern region of Nigeria, which has led to massive exodus of people including researchers as well as other victims[14] .

The paucity of specialized training and funding opportunities for researchers with interest in paediatric radiography and by extension radiation protection has been identified as a major limiting factor in the development of paediatric radiography research in developing countries [4]. To have a proper perspective of whether radiation protection in paediatric radiography has received the attention it deserves, this portion presents a three-point argument: the importance of radiation protection in paediatric radiography; the humanitarian crisis in North Eastern Nigeria and suggested ways forward.

The Importance of Radiation Protection in Paediatric Radiography

The importance of radiation protection in paediatric radiography is well established in the literature[7,15,16].

Radiation protection is a term applied to concepts, requirements, technologies, and operations related to protection of people, (radiation workers, members of the public and patients undergoing diagnosis and therapy) against the harmful effects of ionizing radiation[3].

Paediatric patients are a special category of patients. Different authors define them differently, but a feature common to the entire paediatric population is the increased sensitivity of their tissues to radiation and the greater probability of developing certain stochastic effects due to longer life expectancy and rapidly proliferating cells [8,11,17].

The paediatric population must be protected from the hazards of ionizing radiation during radiography for reasons of greater chance for expression of radiation-induced effects, greater sensitivity for some cancers and high frequency for some examination [3,15].

Radiation exposure in paediatric imaging depends on several factors such as age, gender, body mass index, anteroposterior and lateral diameters, the cooperation of the children themselves, the technology and equipment used as well as and the selection of the exposure parameters or protocols[3,13]. Recent technological advances in the field of radiography have had serious implications for the paediatric population especially from the perspective of radiation protection, as the speed of image acquisition does not equal reduced radiation dose to the patient[18]. Hence, there is need for proper justification of radiological procedures through the use of referral guidelines and optimization of radiation protection through the establishment of diagnostic reference levels to ensure that radiation dose to the paediatric population is as low as reasonably achievable consistent with the required image quality. These issues have been dealt with extensively elsewhere [12,19-24].

Humanitarian Crisis in North Eastern Nigeria and the Challenge of Paediatric Radiation Protection

The humanitarian crisis in the North East region of Nigeria with Maiduguri being the epicenter has adversely affected healthcare facilities in rural settings. It has limited access to health care. This is counter-productive to the goals of the universal health coverage[17]. The situation is unsafe in the sense that, there is a major collapse of health care services at the primary and some secondary level. Almost all the 27 local government areas in Borno State are affected either directly or indirectly[14]. The implication of the present situation is that common diseases that could have been handled by essential services at primary or secondary levels are now referred directly to the tertiary level. This has lead to increased patient throughput, prolong waiting time, stress and burn out of healthcare personnel.

Casual observation by the researchers indicates that, prior to the present crisis in North Eastern Nigeria, paediatric radiography, generally radiation protection associated with it has been inadequately covered within the radiology landscape.

This is in terms of non availability of dedicated paediatric centred care and specialized training and equipment procurement process. This observation is not peculiar to North Eastern Nigeria alone, as it has been authenticated globally, by the International Atomic Energy Agency (IAEA) that paediatric radiology equipment has not enjoyed similar patronage as other radiology equipment[16]. The foregoing entities are already bad situation which has been made worse by the current crises. One can only imagine the burden borne by patients in the affected area, and the attendant effects the above has had on paediatric radiation protection.

The perceived neglect of paediatric radiation protection includes but is not limited to; paucity of literature on the subject, low awareness on the part of health professionals on justification and optimization of paediatric X-ray examinations, lack of adequate time to engage with paediatric patients and their parents on the part of the attending radiographer and radiologist, inadequate and effective communication skills to effectively communicate radiation risk to patients and their relations, little or no emphasis placed on the design of dedicated paediatric radiography facilities and provision of basic paediatric positioning aids, immobilization devices, paediatric-friendly lead aprons and other ancillary protective devices[16,25-27]. The aforementioned neglected areas of paediatric radiation are integral part of requirements for optimal paediatric radiation protection.

This article is intended to set the stage for subsequent empirical studies on paediatric radiography and radiation protection practices in the crisis-ridden region of North Eastern Nigeria. This is borne out of the concern that the paediatric population forms the bulk of internally displaced persons (IDPs). Dedicated paediatric radiography equipment and by extension radiation protection has been inadvertently de-emphasized in most radiology departments and the existing few facilities shared by both adults and paediatrics have been overstretched owing to the large proportion of victims of insurgency attacks that are being attended to on a regular basis[14].

Children are the worst hit during crisis situations. Globally it is estimated that 180 children die daily from interpersonal violence[17].

There is therefore an urgent need to alleviate the sufferings of these children from various forms of injury and traumatic amputations resulting from gunshot injuries, bomb blasts and suicide bomb attacks, by not adding an unnecessary radiation burden to them. While research evidence has shown that collective dose to the population may be small, cumulative dose to individuals (paediatric patients inclusive) due to increasing frequencies and dose magnitude for some type of examinations, for example, Computed Tomography (CT) could be significant[28] if adequate radiation protection measures are not put in place.

Availability of good quality care and health care work force trained to deal with children is essential in delivering effective health interventions. Efforts to improve children's health require health systems that are responsive. The global community increasingly recognizes the vital needs of children for quality health care services and there is an emerging consensus that investing intensively in children's health and development is not only key to improving their survival and well being, but is critical to the success of the post-2015 development agenda[17]. It is in recognition of this fact that the World Health Organisation (WHO) recently published a book in March (2016) on communicating radiation risks in paediatric imaging with information to support healthcare discussion on benefit and risks involved in the use of ionizing radiation in paediatric patients to prevent radiation injury in children[15]. Therefore, stakeholders in North East cannot afford to remain complacent. Specialized training is required for paediatric Radiographers and paediatric Radiologists for optimized patient care in paediatric radiology[3] owing to the dynamic nature of anatomy and pathology of the paediatric population.

Suggested ways forward

From the foregoing, we can safely infer that paediatric radiography has not received due attention and remains a missed opportunity. However, all hope is not lost as there is still room for improvement. Investments in paediatric radiation protection need greater attention, given the rise of armed conflicts and childhood cancers, childhood obesity[17] among others which may require imaging. Hence, to secure our collective future, especially as we expect the post-insurgency era in North Eastern Nigeria and as the government tries to rehabilitate rural communities, paediatric patients must be adequately catered for by provision for protection from the harmful effects of ionizing radiation.

This can be achieved by;

Providing essential radiological equipment with adequate training and retraining of radiographers, radiologists in the area of paediatric imaging and radiation protection as recommended by international agencies responsible for public health and radiation protection[7,15].

The referring physicians and other healthcare professionals should not be left out. The neglect of paediatric radiation protection must not be business as usual. More sensitization and awareness needs to be created on the benefits and risks involved in the use of ionizing radiation in paediatric patients. Referral guidelines should be adhered to. This will require concerted efforts on the part of radiological professionals, researchers, management of various healthcare institutions, the government at all levels, including the Ministries of Health and donor agencies to ensure that radiation protection, particularly that of paediatrics received the required attention as the rehabilitation of health care facilities in North East goes on.

In conclusion, the arguments in this article underline the imperatives to accelerate momentum on paediatric radiography in North Eeastern Nigeria while calling for innovative thinking and cutting age research and approaches to meet the radiation protection needs of millions of children around the North Eeast.

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REFERENCES

1. ICRP 2013. ICRP Publication 121. Ann ICRP. 2013;42(2). doi:10.1016/j.icrp.2012.10.001.

2. Wall BF. Radiation Protection Dosimetry for Diagnostic Radiology Patients. Radiat Prot Dosimetry. 2004;109(4):409-419. doi:10.1093/rpd/nch317.

3. European Society of Radiology. The Gentle Way: The Art of Paediatric Imaging. (Owen Arthurs KH, ed.). Vienna: European Society of Radiology; 2015.

4. Erondu OF. Challenges and Peculiarities of Paediatric Imaging in Medical Imaging in Clinical Practice. Intech; 2013:23-35. doi:http://dx.doi.org/10.5772/51611.

5. Andronikou S, Mchugh K, Abdurahman N, et al. Paediatric Radiology seen from Africa . Part I: Providing Diagnostic Imaging to a Young Population. Pediatr Radiol. 2011. doi:10.1007/s00247-011-2081-8.

6. IAEA, WHO. Bonn Call for Action: 10 Actions to Improve Radiation Protection in Medicine in the next Decade. 2012:16.

7. International Atomic Energy Agency. Radiation Protection in Medicine: Setting the Scene for the next Decade. Vienna, Austria: International Atomic Energy Agency; 2015:450.

8. Goske MJ, Applegate KE, Boylan J, et al. Image Gently SM: A National Education and Communication Campaign in Radiology Using the Science of Social Marketing. JACR. 2008;5(12):1200-1205. doi:10.1016/j.jacr.2008.06.007.

9. Ahidjo A, Garba I, Mustapha Z, Abubakar AM, Usman UA. Referring Doctors Knowledge about Radiation Doses in Patients undergoing Common Radiological Examinations. J Med Med Sci. 2012;3(April):222-225.

10. Moifo B, Edzimbi AL, Tebere H, Tambe J, Samba RN, Fotsin JG. Referring Physicians 'Knowledge on Justification of Medical Exposure in Diagnostic Imaging in a Sub-Saharan African Country, Cameroon'. Open J Radiol. 2014;4(March):60-68.

11. Hardy M. Paediatric Radiography. Oxford: Blackwell Science; 2003.

12. Bettmann MA, Oikarinen H, Rehani M, Holmberg O. Clinical Imaging Guidelines Part 4: Challenges in Identifying, Engaging and Collaborating with Stakeholders. JACR. 2015;12(4):370-375. doi:10.1016/j.jacr.2014.07.020.

13. Thukral BB. Problems and Preferences in Pediatric Imaging. Indian J Radiol Imaging. 2015;25:359-364. doi:10.4103/0971-3026.169466.

14. OCHA UNO of HA. Over 17,000 Nigerian Refugees Forcibly Returned from Cameroon. Humanit Bull Niger. 2015;(08):9.

15. World Health Organisation. Communicating Radiation Risks in Paediatric Imaging: Information to Support Health Care Discussions about Benefit and Risk. Geneva: World Health Organisation; 2016.

16. IAEA. Radiation Protection in Paediatric Radiology. Safety Reports Series N O . 7 1; IAEA Safety Standards and Related Publications. Vienna; 2012.

17. BMJ. Towards a New Global Strategy for Women's, Children's and Adolescents' Health. The bmj. 2015;351(Suppl1): 1-70.

18. Rehani MM. Radiation Protection in Newer Imaging Technologies. Radiat Prot Dosimetry. 2010:1-6.

19. Sodhi KS, Krishna S, Saxena AK, Sinha A, Khandelwal N, Lee EY. Clinical Application of "Justification " and " Optimization" Principle of ALARA in Pediatric CT Imaging : " How many Children can be protected from unnecessary Radiation ?" Eur J Radiol. 2015;84(9):1752-1757. doi:10.1016/j.ejrad.2015.05.030.

20. Radiography G. Justification of Exposure including Referral Criteria and Exposure Protocols Guidelines. 2012;(1):1-37.

21. Paper F. Justification of CT Examinations in Young Adults and Children can be improved by Education, Guideline Implementation and Increased MRI Capacity. 2013;(July). doi:10.1259/bjr.20130337.

22. Malone J, Guleria R, Craven C, et al. Justification of Diagnostic Medical Exposures: Some Practical Issues . Report of an International Atomic Energy Agency Consultation. 2012;85(May):523-538. doi:10.1259/bjr/42893576.

23. Benchman T. Patient Positioning: More than just turn every 2h". Barrow Q. 2006;22(3):16-24.

24. Malone J, Rosario-perez M, Bladel L Van, Jung SE, Holmberg O, Bettmann MA. Clinical Imaging Guidelines Part 2: Risks , Bene fits , Barriers and Solutions. J Am Coll Radiol. 2015;12(2):158-165. doi:10.1016/j.jacr.2014.07.024.

25. Eduwem DU, Paulinus SO, Akwa E. Journal of Association of Radiographers of Nigeria: A Survey of Positioning and Immobilization Techniques adopted in Paediatric Chest Radiography in Nigeria. J Assoc Radiogr Niger. 2011;25(1):1-7.

26. Graham P, Hardy M, Bd WY. The Immobilisation and Restraint of Paediatric Patients during plain Film Radiographic Examinations. Radiography. 2004;10:23-31. doi:10.1016/j.radi.2004.01.002.

27. Nkubli B, Nzotta C, Nwobi I, et al. Quality Control in Radiology Units of Tertiary Healthcare Centers. Niger J Med Imaging Radiat Ther. 2013;2(1):3-8.

28. Ciraj-bjelac O, Beganovic A, Faj D, et al. Radiation Protection of Patients in Diagnostic Radiology: Status of Practice in five Eastern-European Countries, based on IAEA project. Eur J Radiol. 2011:1-4. doi:10.1016/j.ejrad.2011.03.075.