

**ORIGINAL ARTICLE**

# The state of occupational radiation protection and monitoring in public and private X-ray facilities in Edo state, Nigeria

KC Eze, CC Nzotta<sup>1</sup>, TT Marchie<sup>1</sup>, B Okegbunam<sup>2</sup>, TE Eze<sup>3</sup>Department of Radiology, Ambrose Alli University, Ekpoma, <sup>1</sup>University of Benin Teaching Hospital, Benin City, <sup>2</sup>Irrua Specialist Teaching Hospital, Irrua, <sup>3</sup>St Philomena Hospital, Benin City, Edo State, Nigeria

## Abstract

**Aims and Objectives:** To find out the state of radiation protection and monitoring practices of the public and private X-ray centres in Edo State.

**Materials and Methods:** Survey visits were made to all the functional X-ray facilities in Edo state and the available facilities identified, staff interviewed and collected data analyzed.

**Result:** There are 18 functional X-ray facilities comprising 10 (55.56%) publicly owned and eight (44.44%) privately owned. Only two (20%) of the public and five (62.5%) of the private X-ray units have personnel and environmental monitoring. All the X-ray centers in both public and private hospitals have effective lead aprons. All the public (100%) and only four (50%) of the private centers have gonadal shield although none is using them on a routine basis. Qualified radiographers are available only in five (50%) of the public and six (75%) of the private centers. Only three (30%) of the public X-ray centers have the services of radiologists. Among the private X-ray units, five (62.5%) have radiologist while three (37.5%) have no radiologist. Only one (10%) of the public centers and one (12.5%) private X-ray centre have a purpose-built adequately designed X-ray unit with barium plasters and lead lining of walls and doors. There is also only limited lead lining of doors and walls in three (37.5%) private units while no lead lining or barium plasters are used in five (62.5%) of the private units. No X-ray unit in Edo State uses digital radiography or computerized information system. This means that lost hard copy must be repeated, leading to more radiation to patients and staff.

**Conclusions:** There are inadequate radiation protection and monitoring practices in most of the functional X-ray facilities in Edo state with only five (62.5%) of the private and two (20%) of the public X-ray units monitored. There is poor adherence to the advice of the medical physicists due to the cost implications of the implementation.

**Key words:** Edo state, monitoring, Nigeria, practices, protection, radiation, survey

**Date of Acceptance:** 14-Feb-2011


## Introduction

Radiation monitoring of staff in X-ray facilities improves awareness of radiation protection and ensures adequate protection of the staff and the public from medical exposure to radiation which comprises the greatest amount of radiation exposure to man.<sup>[1-6]</sup> In Nigeria, X-ray service personnel are scarce and adequately trained ones are rare.<sup>[1]</sup> We therefore aimed to find out the radiation monitoring practices of the X-ray centers in Edo State.

### Address for correspondence:

Dr. KC Eze,  
Department of Radiology, Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, Nigeria.  
E-mail: ezechallenge@yahoo.co.uk

In many public and private hospitals in Nigeria and Edo State, the need to conserve funds and improve profits lead to different types of practices that are detrimental to health. Some junior staff are employed with little formal education and they function with the little in-house training and experience acquired at the workplace. There is indiscriminate use of X-rays and other investigative facilities

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	DOI: 10.4103/1119-3077.86774
	PMID: 22037075

with the aim of generating funds since ironically the rich in poor socioeconomic settings have increased or greater ability to demand and pay for these procedures.<sup>[7]</sup> Non-specialists who open up X-ray centers for profit-making often pay less attention to radiation protection which is viewed as money wasting leading to poor standard of radiation protection to the public and the radiation worker.

## Materials and Methods

Eighteen functional X-ray facilities in Edo State were visited. Non-functional facilities were excluded because the absence of staff leads to inadequate identification of what is contained in locked-up rooms. Radiographers, doctors or other radiology department personnel who were identified were interviewed, to request for materials and evidence of radiation protection and monitoring in the department. A demand was made to see any available X-ray lead aprons, gonadal shields, evidence of radiation monitoring records and attempt at maintaining standard practice in terms of X-ray shielding. Several visits were made to some of the facilities. The data were collected in the form of questionnaires indicating the centre, presence or absence of the personnel or facility looked for. The result was analyzed.

## Results

There are a total of 18 functional X-ray centers in Edo State. Ten (55.56%) are government-owned while eight (44.44%) are privately owned. Among those owned by the government, four (40%) are located in the state capital (Benin City) alone, comprising only three of the 24 local government areas in the State. The northern part of Edo State has two (Agenebode and Auchi) while Edo Central zone has three (Uromi, Ubiaja and Ekpoma) X-ray centers. Among the eight functional private X-ray centers or clinics with effective X-ray facilities in Edo State, six (75%) are located in Benin City. Only two (20%) public X-ray units have personnel and environmental monitoring while eight (80%) public X-ray centers are not monitored. Among the private centers, five (62.5%) are monitored while three (37.5%) are not monitored. All the X-ray centers in both

public and private hospitals have effective lead aprons [Table 1]. All the public centers had gonadal shield although none is using them on a routine basis. Only four (50%) private centers has gonadal shield. Qualified radiographers are available only in five (50%) public centers while these are available in six (75%) private centers. Both the private and public centers use auxiliary darkroom technicians; 20% of darkroom technicians in public centers and 12.5% of those in private centers have qualification for the practice.

Only three (30%) public X-ray facilities have the services of radiologists [Table 1]. of a radiologist. These include the two teaching hospitals and the Central Hospital, Benin City. Each of them has at least two radiologists. Among the private X-ray units, five (62.5%) have radiologists and radiological procedures performed and reported by radiologists. While three (37.5%) have no radiologists. Thermoluminescent dosimeters (TLDs) were used for monitoring and read on a quarterly basis by an external physicist. None of the X-ray centers has a dedicated medical physicist or radiation safety officer or a dedicated TLD reader. One (12.5%) private X-ray centre is purpose-built with adequate safety measures but it is located in a residential area. Other private X-ray centers operated in rental buildings that are not designed for use for radiation prescription. In addition, these buildings are used for offices and are located in residential areas. There is also only limited lead lining of doors and walls in three (37.5%) private units while no lead lining or barium plasters are used in five (62.5%) private units. Only one (10%) public centre has a purpose-built adequately designed X-ray unit with barium coating of walls, lead lining of doors and offices located away from X-ray or procedure rooms. No X-ray unit in Edo State uses digital radiography information system. This means that lost hard copy must be repeated leading to more radiation to patients and staff.

## Discussion

The result reveals low radiation monitoring by hospitals in Edo State as only two (20%) of the 10 government hospitals and five (62.5%) of the eight private hospitals are monitored. Advices given by the radiation monitoring

**Table 1: Radiation protection indices of private and public X-ray facilities in Edo state**

Parameter	Public			Private		
	Yes	No	Total	Yes	No	Total
Personnel monitoring	2 (20)	8 (80)	10 (100)	5 (62.5)	3 (37.5)	8 (100)
Environmental monitoring	2 (20)	8 (80)	10 (100)	5 (62.5)	3 (37.5)	8 (100)
Presence of lead apron	10 (100)	0	10 (100)	8 (100)	0	8 (100)
Presence of gonadal shield	10 (100)	0	10 (100)	4 (50)	4 (50)	8 (100)
Presence of radiographer	5 (50)	5 (50)	10 (100)	6 (75)	2 (25)	8 (100)
Presence of radiologist	3 (30)	7 (70)	10 (100)	5 (62.5)	3 (37.5)	8 (100)
Lead plaster/lead lining of walls and doors	2 (20)	8 (80)	10 (100)	1 (12.5)	7 (87.5)	8 (100)
Purpose-built X-ray departments	1 (10)	9 (90)	10 (100)	1 (12.5)	7 (87.5)	8 (100)

physicists are often weighed against the financial implication of their implementation so that those that require substantial monetary involvement are discarded. Also, there is poor recordkeeping in both private and government hospitals,<sup>[8]</sup> but this is worse in private hospitals, with limited space and lack of reference to old records. All the hospitals in both the public and private setting have lead aprons that are frequently used. However, gonadal shield which is available in all government hospitals and four (50%) private X-ray facilities is not frequently used. The poor number of radiologists, three (30%) in government and five (65.5%) in private hospitals, and radiographers, five (50%) in government and six (75%) in private hospitals [Table 1], means that quality assurance is unlikely to be maintained leading to frequent repeat and time wasting with their associated increased radiation to both staff and patients.<sup>[9]</sup> The frequent use of auxiliary dark room technicians and X-ray technicians also leads to poor-quality radiographs, repeat and film wasting, with increased radiation dose to patients,<sup>[5-7]</sup> There is one radiology unit each in the private and public setting with purpose-built and adequately designed X-ray departments. The fact that only two (20%) of the 10 government hospitals are monitored supports the assertion of other authors<sup>[1-3]</sup> that in Nigeria heads of hospitals view radiation monitoring implementation as wastage of money. This is because of the problem of cost and the view that radiation monitoring does not provide a physical structure of political importance or visibility for the money spent.

Also, only two (20%) government hospitals had barium plastering of walls and lead lining of doors. These are the hospitals that are monitored for radiation. Only one (12.5%) of the eight private hospitals has lead lining of doors and walls. Therefore it is obvious that there is every attempt by administrators of both private and government hospitals to play down the importance of an effective and safe work environment in the radiology department or that the radiology staff do not adequately inform the administrators in government hospitals. Radiation monitoring is important

because it tends to create awareness of effective radiation protection to both the staff and the patients.<sup>[6,10]</sup>

## Conclusion

There is inadequate radiation protection and monitoring in most of the functional government and private X-ray facilities in Edo State, Nigeria and frequently, there is non-implementation of the advices provided by the medical physicists.

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**How to cite this article:** Eze KC, Nzotta CC, Marchie TT, Okegbunam B, Eze TE. The state of occupational radiation protection and monitoring in public and private X-ray facilities in Edo state, Nigeria. *Niger J Clin Pract* 2011;14:308-10.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

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