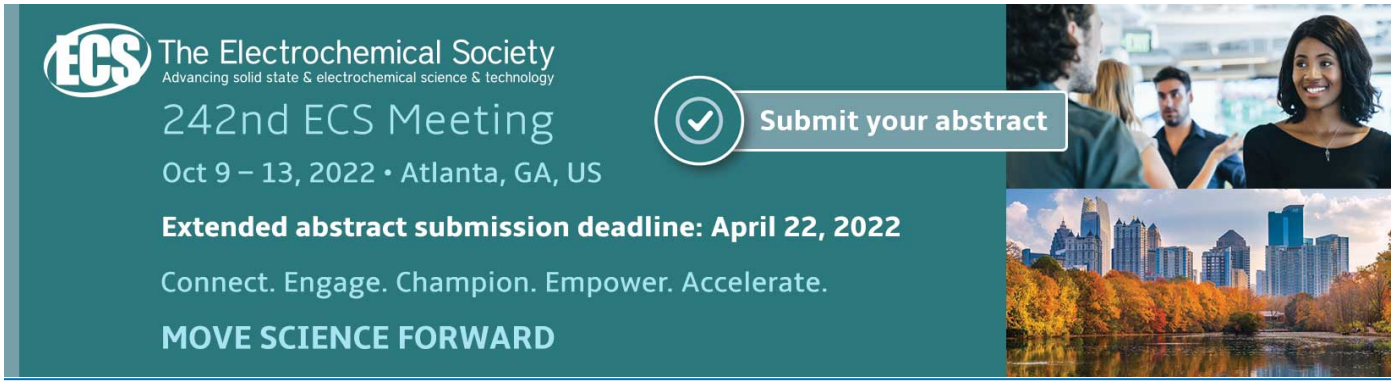
X-Ray Imaging Techniques Appraisal: Pathway to Sustainable Health Status



X-Ray Imaging Techniques Appraisal: Pathway to Sustainable Health Status

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Abstract. There is possibility for sustainable healthcare delivery through the implementation of periodic x-ray imaging techniques appraisal. The aim of this study is to evaluate the x-ray imaging techniques in the study area in order to promote sustainable health status of the populace. Data for this study was collected from 12 major healthcare institutions located in Southwest Nigeria using self-structured form. The study centres were designated using S1 to S12. The x-ray imaging techniques in the study area were radiography, computed tomography (CT), mammography and fluoroscopy. Radiography machine was available in all the study centres while 75 % of the centres had CT scanners, 50 % had mammography machines and 25 % had fluoroscopy machines. The x-ray imaging centre with the highest number of equipment is Centre S2 while Centre S6 has the least equipment. The outcome of this study implied that x-ray imaging techniques appraisal would boost procurement of more and newer equipment, enhance improved quality and efficiency of the x-ray equipment. Thereby, accord patients accessibility to all the benefits of the modalities x-ray imaging can provide; and consequently promoting patients health status. Hence, this study recommended the implementation of periodic x-ray imaging techniques appraisal.

Keywords: X-ray imaging techniques, Appraisal, Sustainable Healthcare, Southwest Nigeria

1. Introduction

X-ray imaging techniques appraisal is a vital tool for sustainable healthcare delivery practices and the role of x-ray imaging in healthcare delivery is indispensable. X-ray imaging provides accurate diagnosis and highlights valuable information about health status. Diagnostic x-ray has revolutionized medical practice in that it allows improved imaging for anatomical, physiological and metabolic studies [1-2]. Coupled with ultrasound, x-ray imaging provide about 70-80 % of all clinical diagnostic needs [3-4]. Recent estimates reported 3.6 billion x-ray examinations per annum [5-6]. The United Nations Scientific Committee on the Effects Atomic Radiation (UNSCEAR) recommends regular surveys of x-ray medical examinations in order to study the trends and differences in the use of radiation [5]. Furthermore, to determine the relative contribution to dose from various x-ray modalities

and procedures. Consequently, minimizing radiation exposure of the populace through implementation of effective radiation protection strategies.

Therefore, monitoring and appraisal of x-ray imaging techniques and examinations is a tradition in many developed nations. Contrarily, periodic evaluation of x-ray imaging techniques and examinations is not been practiced in Nigeria. According to research, there is limited data on trends and frequency of medical examinations in developing countries [5]. Several healthcare institutions and hospitals in the developing countries lack adequate fundamental imaging equipment [3, 7]. Even accessories of medical x-ray facilities are inadequate and a challenge to radiation protection in Nigeria [8]. The World Health Organization (WHO) estimated access to computer tomography (CT) as one per 3.5 million population in developing countries and one per 64,900 population in developed countries [9].

The inadequacy of medical x-ray facilities in Nigeria has been reported [9-11]. Research has noted poor technical expertise among upcoming radiation technologists due to inadequate facilities [10]. Another author commented that several imaging centres are not adequately equipped. As such, medical imaging practice in Nigeria is still being under-explored and under-exploited [11]. Similar research has reported the scarcity of advanced x-ray imaging technology for some procedures in part of Nigeria [7, 12]. In addition, some study has shown loss of revenue due to lack of diversification of imaging procedures [13-15]. Thus, it is necessary that medical x-ray facilities are readily available in order to prevent patients from seeking alternative healthcare that might endanger their health.

Furthermore, adequacy of diagnostic x-ray equipment is a key factor to the radiation protection of patient in diagnostic radiology. The reason is because it reduces the workload of the x-ray equipment, prevent recurrent breakdown of the equipment due to over usage, reduce deterioration of the equipment that may result to inconsistent x-ray tube output and minimize work pressure that may result to lack of optimization of procedure and inefficient radiation protection practices. Therefore, regular appraisal of x-ray imaging techniques is a vital tool for improvement in the sector. Adequacy of x-ray imaging equipment will provide; ease of accessibility, promote correct diagnosis, early treatments and effective healthcare delivery among others. Hence, this study desire to evaluate the x-ray imaging techniques in the study area in order to promote sustainable health status of the populace.

2. Materials and Method

The study collected data from 12 major healthcare institutions located in Southwest Nigeria for a period of six months. The study centres were designated S1 to S12 for confidentiality. Ethical clearance duly approved by the Management of each institution before the commencement of the research. Collection of data was done manually using self-designed form. Data collected are: the number of diagnostic x-ray equipment, kinds of x-ray techniques, available resources, working hours and frequency of examination among others. The data generated were collated and analyzed using Microsoft Excel. Statistical analysis such as mean and percentages were determined.

2. Results and Discussion

A total of 37 diagnostic x-ray equipment were present in the study centres as showed in Figure 1. There are 10 digital and 9 conventional radiography equipment (19). The number of Computed Tomography (CT) scanners was 9 while mammography equipment was 6 and Fluoroscopy equipment was 3 as shown in Figure 2. The Federal Government funded hospitals is 33 % while the State healthcare institutions is 42 % and those funded by private stakeholders is 25 % are as presented in Figure 3. However, about 83 % renders tertiary healthcare services while the remaining 17 % renders secondary healthcare services. The frequency of x-ray of x-ray imaging examinations is estimated 41,035 for a six months duration.

There is possibility for sustainable healthcare delivery in the study area through the implementation of periodic x-ray imaging techniques evaluation. The result from this study revealed that diagnostic x-ray facilities are inadequate in the study area not excluding Nigeria as a country. Scarcity of x-imaging equipment in Nigeria are well documented in literature [7, 12, 17, 18]. One of the authors reported

3000 radiography machines, 150 computed tomography (CT) scanners and 60 mammography machines in Nigeria [18]. According to the population report, Nigeria is about 200 million [19]. Based on this statistics, patient accessibility to radiography equipment in Nigeria is in the ratio of one to 67,000 people. For CT scanner, accessibility ratio is one to 1.3 million people while mammography equipment is estimated at one to 1.6 million people on the basis that 49 % of the populations are females [19]. This estimate confirms the report of World Health Organization [9] on the inadequacy of computed tomography in low-income countries.

Centre S2 has the highest number of medical x-ray equipment while Centre S6 has the least equipment. The reason for the low number of diagnostic x-ray equipment in Centre S6 is attributable to lack of involvement in public-private partnership (PPP). Most of the government owned hospitals like Centre S2 with a minimum of four equipment practiced PPP. Radiography machine was present in all the study centres while 75 % of the centres had CT scanners, 50 % had mammography machine and 25 % had fluoroscopy machine. Research has shown that radiography machine are readily available compared to other x-ray imaging equipment in the study environment [7]. Another research reported same finding for Nigeria [18]. The finding align with the study confirming radiography equipment as the most essential imaging equipment [20].

There were 41,035 x-ray imaging examination reported in the study area in six months. Out of these, radiography had 89.5 % recorded, 7.5 % for CT, 1.7 % for fluoroscopy and 1.3 % for mammography. Radiography examination is widely reported in literature as the most common x-ray imaging examinations [6, 21, 22]. In addition, it is the cheapest compared to other x-ray imaging modalities. The low frequency of examinations reported for CT and fluoroscopy indicate several procedures are not been performed. It is envisage, as there are dearth of advanced imaging equipment in the study area [7, 12]. However, considering the number of fluoroscopy equipment with the frequency of examination there is a disparity. The imbalance is due to the usage of radiography equipment for some fluoroscopy procedures in some centres. This outcome further confirmed the scarcity of newer imaging equipment in the study environment [7, 12]. For mammography examination, the low frequency is attributable to poor screening tests arising from ignorance and government insensitivity to effective healthcare.

X-ray imaging techniques appraisal will boost procurement of more and newer equipment. Thereby, minimize scarcity of the same equipment and consequently accord patients accessibility and all the benefits of the modalities x-ray imaging provides. In addition, equipment appraisal will prevent equipment deterioration due to regular monitoring. Furthermore, culminating into improved quality and efficiency of the x-ray equipment. Therefore, promoting good healthcare delivery practices. More so, x-ray imaging techniques appraisal will enhance patient's health status because there is no need to seek unconventional medical care that might pose danger to their health.

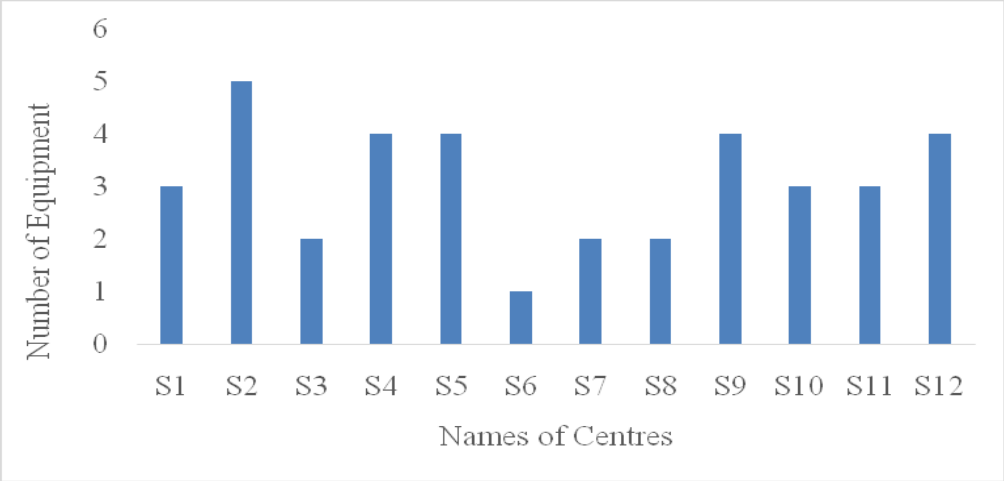

Figure 1: Number of medical x-ray equipment in each study centre

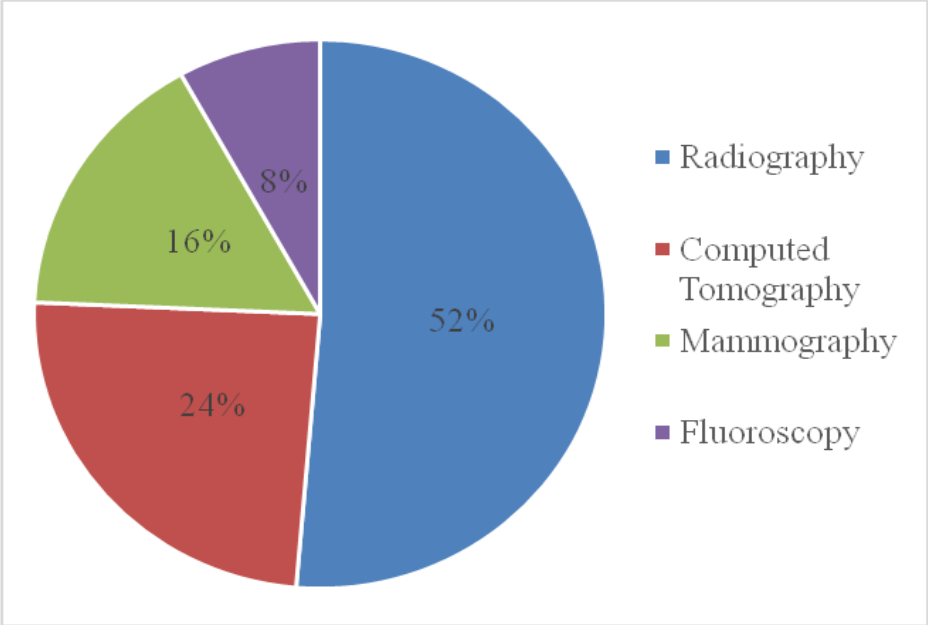

Figure 2: Categories of diagnostic x-ray facilities in the study area

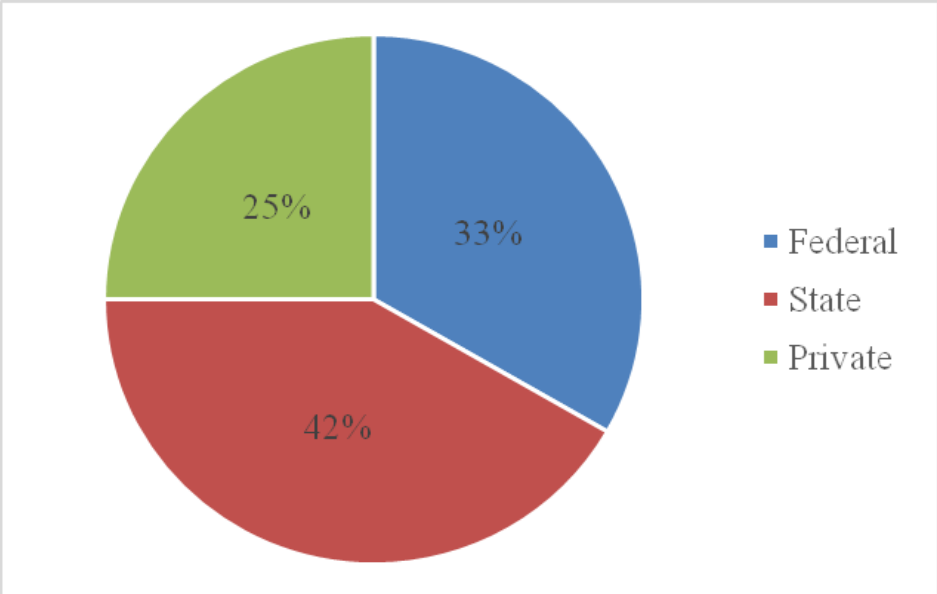

Figure 3: Categories of healthcare institutions in the study area

4. Conclusion

The outcome of this appraisal showed that diagnostic x-ray equipment and techniques are inadequate in the study area. Periodic evaluation of x-ray imaging techniques will serve as a vital tool for improvement on this sector. Therefore, harmonize joint effort of governments, parastatal organizations, private and public health stakeholders and health regulatory bodies is needed to effect sustainable healthcare delivery through diagnostic x-ray imaging.

Table1: Frequency of x-ray imaging examinations in the study centres for six months

Centres	Radiography	CT	Mammography	Fluoroscopy	Total
S1	4592	727	124	222	5665
S2	3234	408	128	NA	3770
S3	1662	351	NA	NA	2013
S4	2982	NA	105	216	3303
S5	9188	588	NA	NA	9776
S6	661	NA	NA	35	696
S7	5641	NA	NA	186	5827
S8	1380	NA	98	NA	1478
S9	860	376	NA	43	1279
S10	789	NA	NA	NA	789
S11	2204	198	68	NA	2470
S12	3561	408	NA	NA	3969
Total	**36754**	**3056**	**523**	**702**	**41035**

NA indicates Not Available

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