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# Knowledge, Attitude and Practice of Radiology among Physicians in a Tertiary Hospital in North-Central Nigeria

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***Authors' contributions***

*This work was carried out in collaboration among all authors. Authors AJS, KOL, SMD, BOE, YFT, EOI and AEG designed the study, and wrote the protocol. Author AAS performed the statically analysis and analyses of the study. Authors EOM and HOKY managed the literature review. All authors read and approved the final manuscript*

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## ABSTRACT

**Objective:** To assess physicians' knowledge, attitude and practice of radiology.
**Materials and Methods:** Cross-sectional study utilizing an anonymous questionnaire responded to by physicians, divided into parts as follows: one with questions about the physicians' knowledge of imaging modalities, availability of the modalities at the Jos University Teaching Hospital (JUTH), modalities with ionizing radiation, radiologist reports and way forward in improving services at radiology department.
**Results:** A total of 123 physicians participated in the study. Majority of the physicians (65.0%) were males. Male to female ratio was nearly 2:1. Concerning the impression about radiology, the

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study showed that 101(82.1%) like radiology as a specialty. There was however poor knowledge about the risks and hazards associated with radiological imaging modalities.
**Conclusion:** The non-radiologist physicians' knowledge is heterogeneous and, in some aspects, needs to be improved. Multidisciplinary clinical meetings and teaching activities are important ways to disseminate information on the subject.

*Keywords: Attitude; knowledge; physicians; practice; radiology.*

## 1. INTRODUCTION

There has been a heightened awareness regarding the poor knowledge of referring doctors about diagnostic radiological procedures and investigation modalities. The use of imaging equipment is a vital part of any hospital and every medical specialty. In recent years, the use of radiological imaging modalities has continually increased as a means of accurately diagnosing patients' condition to render the most appropriate treatment available [1]. The availability of X-rays, Computed tomography (CT) and Magnetic Resonance Imaging (MRI) scans in our public and private hospitals has increased considerably. Modern medicine has become increasingly characterized by procedures that routinely rely on radiology [2]. As a result, physicians are repeatedly required to interpret a radiological investigation, or at least explain the importance of a radiological modality, to his patients and/or clients as the case may be. The interpretations of images acquired by these machines should be done by qualified radiologists. However, due to the lack of sufficient radiologists in hospitals in Nigeria, other medical specialists, including physicians, are required to be conversant with the radiological modalities, their safety and basic interpretations. These will not only ensure the highest quality of care, but will also prevent unnecessary exposure of patients to inappropriate investigations and possibly radiation.

This survey was designed to determine the knowledge, attitude and practice of radiology among physicians in a tertiary institution to ascertain the areas of deficiency in their knowledge, as well as their attitudes towards radiological imaging; and to reinforce the need for proper education for medical professionals intimately associated with these forms of images in their various consultation rooms.

## 2. METHODOLOGY

A cross-sectional survey of physicians working within Jos University Teaching Hospital (JUTH), whose work required referring patients for various radiological investigations in order to make and confirm diagnosis, was carried out. Convenience sampling method was used to select participants. A total of 237 questionnaires were distributed among participants in four specialties as follows: Internal Medicine, Surgery, Paediatrics and Obstetrics and Gynaecology. One hundred and twenty three questionnaires were returned, giving a response rate of 52%. A total of about 500 doctors` are employed at JUTH.

The questionnaire contained questions about the characteristics of the groups of participating physicians, including age, gender, specialty, academic degree, duration of practice and frequency of request for imaging studies. Other questions in the questionnaire included a list of multiple imaging methods and those which utilize non-ionizing radiation. Knowledge of satisfaction and means of improving the practice of radiology was obtained.

For the statistical analysis, the Statistic Package for Social Sciences for Windows version 20 was utilized. The questions which were not responded to, or for which more than one option was selected (when more than one option was not permitted), were invalidated and, therefore, excluded from the statistical analysis. The results were expressed in means and standard deviation for the quantitative variables and in frequency tables for the categorical variables. The Student's t-test was utilized for comparison of the quantitative variables, while the exact Fisher's test was utilized for comparing the categorical variables. The value of $p \leq 0.05$ was considered as being statistically significant.

## 3. RESULTS

This chapter describes the analysis of data followed by the discussion of the research findings. The findings related to the research objectives that guided the study were analyzed. Means and standard deviations were computed for age distribution.

### 3.1 Age and Sex Distribution of Physicians

Age of participants ranged between 28 to 62 years. Overall mean age was 40.9±9.4, with 39 as modal age. Majority of the physicians (40.7%) were between 29-38 years. Only few (4.9%) were below 29 years.

About imaging modalities in JUTH, the study revealed that the majority, 115(93.5%), opined that ultrasound and MRI were used in JUTH as imaging modalities. According to the physicians, other imaging modalities used in JUTH include: X-Ray (93.5%), Fluoroscopy (82.9%) and Mammography (66.7%) (Table 3).

Physicians' knowledge about imaging modalities that utilize ionizing radiation includes X-ray (86.2%), Fluoroscopy (46.3%), CT scan (70.7%), Mammography (9.8%) and Nuclear imaging (4.1%). (Table 4).

About the choice of radiology as a specialty, only 13(10.6%) of the physicians would like to specialize in radiology, because they found radiology interesting, and it would help them improve their capacity, improve patient care and clinical practice. On the other hand, majority (89.4%) would not like to specialize in radiology because 41.5% were already specialized in other specialties, 17.6% feared the risk of radiation exposure and 27.6% lacked interest in Radiology as a specialty (Table 5).

With regards to the practice of radiology among physicians, 75(61.0%) frequently used USS, 4.1% used CT, 30.1% used X-Ray, 0.8% used Specials, 1.6% used MRI while 2.4% used Mammography respectively. Some of the reasons for using modalities in investigation was low cost (5.7%), relevance to pecialty (78.0%) and posting (16.3%) (Table 6).

When asked whether physicians were satisfied with radiological services in JUTH, 49(39.8%) of the physicians were satisfied, 64(52.0%) were not satisfied while 10(8.1%) were undecided. Reasons for not being satisfied with the services included long waiting time (15.6%), no efficiency (25.0%), pathology often missed (9.4%),

**Table 1. Age and Sex distribution of Respondents**

| Variables | F | % | Mean ± Std. Dev. |
|---|---|---|---|
| **Age group (years)** | | | |
| <29 | 6 | 4.9 | 40.9±9.4 |
| 29-38 | 50 | 40.7 | |
| 39-48 | 47 | 38.2 | |
| 49-58 | 10 | 8.1 | |
| ≥59 | 10 | 8.1 | |
| Total | 123 | 100.0 | |
| **Sex** | | | |
| Male | 80 | 65.0 | |
| Female | 43 | 35.0 | |
| Total | 123 | 100.0 | |

*The gender distribution revealed that majority of the physicians (65.0%) were males, with a male to female ratio of nearly 2:1*

**Table 2(A). Distribution of Physicians by Knowledge about the imaging modalities in Radiology**

| Knowledge | F | % |
|---|---|---|
| **Plan radiography (X-ray) as imaging modality in radiology** | | |
| Yes | 119 | 96.7 |
| No | 4 | 3.3 |
| **Computed Tomography (CT) as imaging modality in radiology** | | |
| Yes | 115 | 93.5 |
| No | 4 | 3.3 |
| Undecided | 4 | 3.3 |
| **Magnetic Resonance Imaging (MRI) as imaging modality in radiology** | | |
| Yes | 116 | 94.3 |
| No | 4 | 3.3 |
| Undecided | 3 | 2.4 |

**Table 2(B). Distribution of Physicians by Knowledge about the imaging modalities in Radiology contd**

| Imaging modalities | F | % |
|---|---|---|
| **Ultrasonography (USS) as imaging modality in radiology** | | |
| Yes | 119 | 96.7 |
| No | 4 | 3.3 |
| **Nuclear Imaging/Studies as imaging modality in radiology** | | |
| Yes | 51 | 41.5 |
| No | 53 | 43.1 |
| Undecided | 19 | 15.4 |
| **Mammography as imaging modality in radiology** | | |
| Yes | 80 | 65.0 |
| No | 39 | 31.7 |
| Undecided | 4 | 3.3 |
| **Fluoroscopy as imaging modality in radiology** | | |
| Yes | 57 | 46.3 |
| No | 51 | 41.5 |
| Undecided | 15 | 12.2 |
| **Other modalities (specify) as imaging modality in radiology** | | |
| PET Scan | 2 | 1.6 |
| Special | 15 | 12.2 |

**Table 3. Distribution of Physicians by Knowledge about the imaging modalities in JUTH**

| Knowledge | F | % |
|---|---|---|
| **Ultrasound and MRI as Imaging modalities used in your centre** | | |
| Yes | 115 | 93.5 |
| No | 4 | 3.3 |
| Undecided | 4 | 3.3 |
| **X-ray as an Imaging modality used in your centre** | | |
| Yes | 115 | 93.5 |
| No | 4 | 3.3 |
| Undecided | 4 | 3.3 |
| **Fluoroscopy as an Imaging modality used in your centre** | | |
| Yes | 102 | 82.9 |
| No | 17 | 13.8 |
| Undecided | 4 | 3.3 |
| **Mammography as an Imaging modality used in your centre** | | |
| Yes | 82 | 66.7 |
| No | 37 | 30.1 |
| Undecided | 4 | 3.3 |

poor facilities (21.9%), poor staffing (10.9%) and power outage (17.2%). (Table 7).

With regards to ways of improving radiological services in JUTH, 21(17.1%) recommended improvement in manpower, 31(25.2%) recommended Incentives/motivation, 34(27.6%) recommended modern/newer machines, while 36(29.3%) recommended training and re-training of staff. (Table 8).

## 4. DISCUSSION

This observational study was conducted in a teaching hospital located in North-Central Nigeria which has doctors in various medical specialties. One hundred and twenty three physicians working in JUTH were included in the study.

Majority of the doctors (65%) in this study were males. This is consistent with the finding in a study by Salaam et al [3] in which there were more males, with a male to female ratio of almost 2:1. Other researchers' observations were however different. Potterton et al. [4] noted that females were approaching 50%. Vital et al. [5] reported 70% being females. The male to female ratio may be due to the fact that more males prefer to study medicine because it is perceived

to be a difficult aspect of the sciences and also time-consuming in our environment.

Majority of the physicians (40.7%) were between 29-38 years. Only a few (4.9%) were below 29 years. This is in contrast to the findings of Salaam et al. [3], in which majority of the respondents were medical students and therefore younger.

This study revealed that majority of the physicians have appropriate knowledge and a positive attitude about radiological modalities. Majority 115(93.5%) opined that ultrasound and MRI were used in JUTH as imaging modalities. According to the physicians, other imaging modalities used in JUTH include: X-Ray (93.5%), Fluoroscopy (82.9%) and Mammography (66.7%). These results are in contrast with the level of radiological knowledge found in other studies from a university hospital emergency department, which found that knowledge of radiological modalities was inappropriate [6]. The high level of knowledge in our study may be due

**Table 4. Distribution of Physicians by Knowledge about the imaging modalities that utilize ionizing radiation**

| **X-ray as imaging modality that utilize ionizing radiation** | **F** | **%** |
|---|---|---|
| Yes | 106 | 86.2 |
| No | 10 | 8.1 |
| Undecided | 7 | 5.7 |
| **Fluoroscopy as imaging modality that utilize ionizing radiation** | | |
| Yes | 57 | 46.3 |
| No | 53 | 43.1 |
| Undecided | 13 | 10.6 |
| **CT as imaging modality that utilize ionizing radiation** | | |
| Yes | 87 | 70.7 |
| No | 20 | 16.3 |
| Undecided | 16 | 13.0 |
| **Mammography as imaging modality that utilize ionizing radiation** | | |
| Yes | 12 | 9.8 |
| No | 56 | 45.5 |
| Undecided | 55 | 44.7 |
| **Nuclear imaging as imaging modality that utilize ionizing radiation** | | |
| Yes | 5 | 4.1 |
| No | 69 | 56.1 |
| Undecided | 49 | 39.8 |

**Table 5. Physicians' Perception about choice of Radiology as a specialty**

| **Would you like to specialize in radiology** | **F** | **%** |
|---|---|---|
| Yes | 13 | 10.6 |
| No | 110 | 89.4 |
| **Reasons for your choice** | | |
| Already specialized | 51 | 41.5 |
| I just find it interesting | 1 | 0.8 |
| Improve my capacity | 1 | 0.8 |
| Improve patient care and clinical practice | 2 | 1.6 |
| It is very interesting | 5 | 4.1 |
| It's like any other specialty | 1 | 0.8 |
| No reason | 3 | 2.4 |
| Not interested/Not my choice | 34 | 27.6 |
| Poor facility | 1 | 0.8 |
| Radiation risk | 21 | 17.1 |
| See images that speaks for themselves | 3 | 2.4 |

**Table 6. Practice of radiology among physicians**

| Which imaging modalities do you frequently request for investigating your patients? | F | % |
|---|---|---|
| USS | 75 | 61.0 |
| CT | 5 | 4.1 |
| X-RAY | 37 | 30.1 |
| Specials | 1 | .8 |
| MRI | 2 | 1.6 |
| Mammography | 3 | 2.4 |
| **Reasons for your choice** | | |
| Low cost | 7 | 5.7 |
| Depend on posting | 20 | 16.3 |
| Most relevant to my specialty | 96 | 78.0 |

**Table 7. Perception about physicians' satisfaction with radiological services at JUTH**

| Are you satisfied with radiological services in this hospital? | F | % |
|---|---|---|
| Yes | 49 | 39.8 |
| No | 64 | 52.0 |
| Undecided | 10 | 8.1 |
| **If no, reasons** | | |
| Long waiting time | 10 | 15.6 |
| No efficiency | 16 | 25.0 |
| Pathology often missed | 6 | 9.4 |
| Poor facilities | 14 | 21.9 |
| Poor staffing | 7 | 10.9 |
| Power outage | 11 | 17.2 |
| Total | 64 | 100.0 |

**Table 8. Ways of improving Radiological services in JUTH**

| How can the radiological services be improved in JUTH? | F | % |
|---|---|---|
| Improved manpower | 21 | 17.1 |
| Incentives/motivation | 31 | 25.2 |
| Acquire modern/Newer machines | 34 | 27.6 |
| Training and re-training of staff | 36 | 29.3 |
| Others | 1 | 0.8 |
| Total | 123 | 100.0 |

to the fact that physicians are more exposed to radiology during their residency training, compared to emergency department doctors who are mainly interns and medical officers. According to a study by Osward Bwanga [7], only 35.3% and 13.2%, of the respondents identified MRI and USS as no radiation dose investigations respectively. This contrasts with the findings in the present study. The difference in the findings, especially about the knowledge on MRI, may be due to the fact that there was no MRI scanner at the hospital in Zambia where Osward Bwanga carried out his study, unlike in this study where the MRI scanner was available.

Physicians' knowledge on imaging modalities that utilize ionizing radiation was found to be poor in this study. While 86.2% and 70.7% were able to identify plain radiography and CT as modalities that utilize ionization radiation, only 9.8% and 4.1% knew that Mammography and nuclear medicine respectively are associated with ionizing radiation. These results are consistent with those obtained in a study in Sagar, Madhya Pradesh which indicate a lack of knowledge among physicians and junior residents regarding the basic radiation dose and possible risks of radiological examinations [8]. Lee et al. [9] and Arslanoğlu et al. [10], also demonstrated that most physicians were unable to provide an accurate estimate of the relative radiation dose of commonly performed radiological investigations. Shialkar et al. [11] also reported that 97% of physicians studied

were not aware of the radiation doses received by patients during radiological investigations. This is in contrast with a survey conducted in Northern Ireland, where there was an improved awareness of the doctors in comparison with the result of the present study. The improved awareness in the Northern Ireland study was attributed to the formal training about ionizing radiation [12].

Regarding the choice of radiology as a specialty, only 13(10.6%) of the physicians would like to specialize in radiology, because they found radiology interesting and it would also help them improve their capacity, improve patient care and clinical practice. On the other hand, majority (89.4%) would not like to specialize in radiology, because 41.5% were already specialized in other specialties, 17.6% feared the risk of radiation and 27.6% lacked interest in Radiology as a specialty. This is similar to what was reported by Adeyekun [13]. Majority of the doctors didn't want to specialize in radiology because they were already specialists in other fields of medicine. The other reasons include its being too demanding as well as the fear of ionizing radiation. These reasons were also similar to the reasons given for not specializing in radiology in a study by Vidal et al. [5]

Regarding practice of radiology among physicians, 75(61.0%) frequently used USS, 4.1% uses CT, 30.1% used X-Ray, 0.8% used Specials, 1.6% used MRI while 2.4% used Mammography respectively. Some of the reasons for using modalities in investigation was low cost (5.7%), relevant to specialty (78.0%) and posting (16.3%).

This study revealed that physicians had a positive attitude toward ordering radiological investigations. This is consistent with the observation by Zafar et al. [14]. Osward Bwanga7 also demonstrated that a large majority of respondents (74.6%) had positive attitudes towards radiology, only 15.5% had a negative attitude.

Majority of the physicians 64(52.0%) were not satisfied with radiological services in JUTH. Reasons for not being satisfied with the services included long waiting time (15.6%), lack of efficiency (25.0%), pathologies often missed (9.4%), poor facilities (21.9%), poor staffing (10.9%) and power outage (17.2%). Only 36% admitted they were satisfied with the services at the department.

With regards to ways of improving radiological services in JUTH, majority of the participants recommended training and re-training of staff as a way of improving services at the Radiology department. The need for interdisciplinary interactions (between radiology and other disciplines) was identified as an avenue through which radiology practice can be beneficial in improving quality of services in the hospital.

## 5. CONCLUSION

There is appropriate knowledge of imaging modalities and positive attitude of physicians in JUTH, as well as good practices towards radiological modalities. However, majority of the physicians have poor knowledge about hazards associated with radiological modalities that utilize ionizing radiation.

## CONSENT

As per international standard or university standard written patient consent has been collected and preserved by the author(s).

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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