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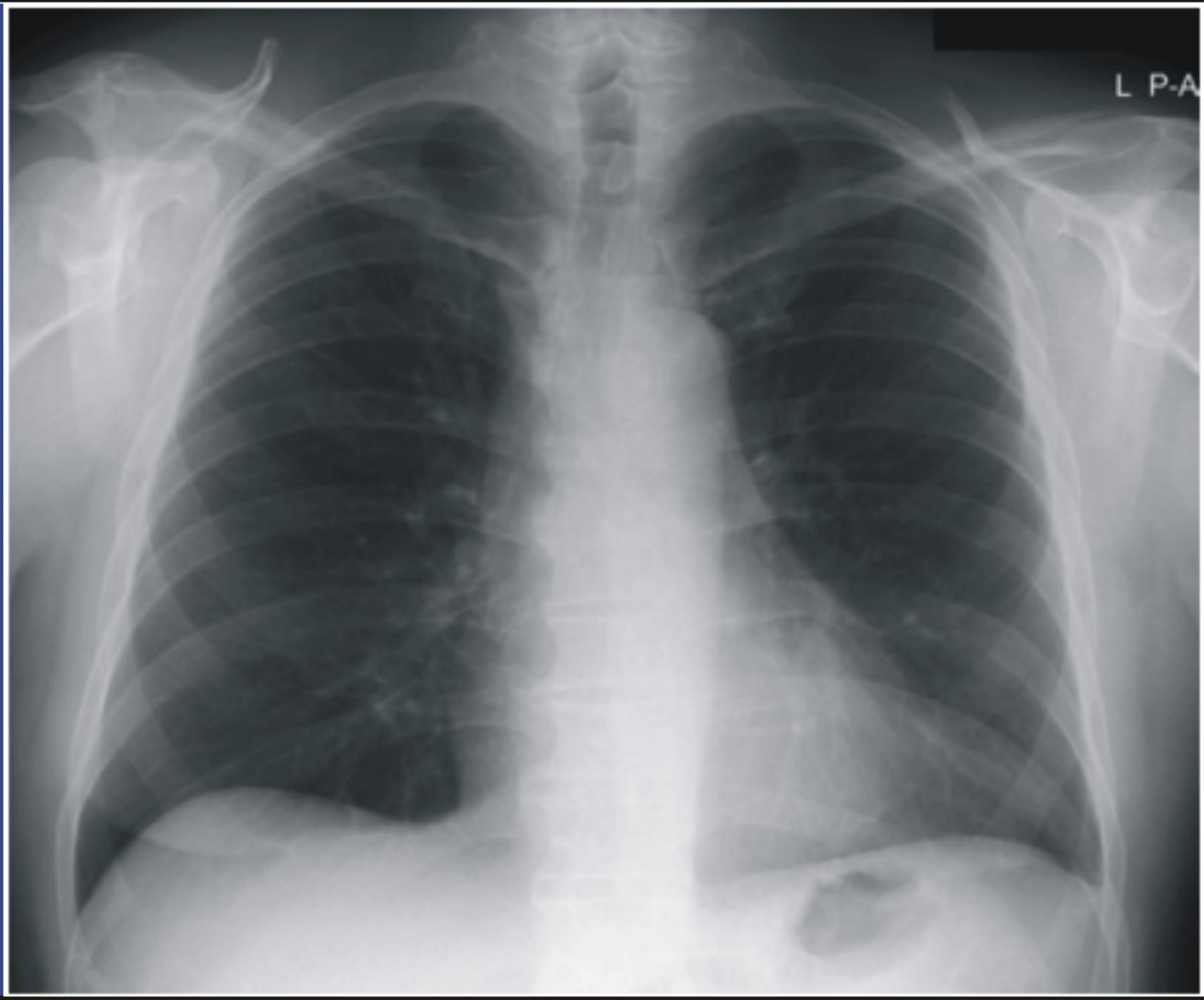

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Assessment of Quality Assurance Programs for Conventional X-Ray Equipment in Kano Metropolis

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ABSTRACT

Background: Quality assurance (QA) and quality control (QC) measures are essential in maintaining X-ray equipment in order to provide accurate diagnostic information to the referring physician, as well as guarantees that machines will emit appropriate levels of radiation at all times.

Aim: The study aims to assess the quality assurance programmes of diagnostic X-ray equipment in government hospitals and private diagnostic centers in Kano metropolis, Nigeria.

Material and methods: Twenty-two semi-structured questionnaires were administered to consenting radiographers working in Kano metropolis. The questions asked include; availability of the quality assurance committee, types of quality control tests conducted on the equipment, personnel responsible for the tests and, personnel to which the results of the tests were submitted. Data were analyzed using descriptive statistics: frequency, mean and percentages from SPSS version 16.0.

Results: Nineteen questionnaires (86%) were returned with only 3 (15.4 %) of the respondents indicating availability of QA committee in their departments. Seven (38.5 %) indicated there were QC measures in their departments and 11 (60 %) have some quality control tests being conducted. However, only 15 (76.9 %) indicated that maintenance service was conducted on their equipment, while 11 (60 %) indicated that they kept records of past services. No centre had a Radiation Safety Officer or QA Officer.

Conclusion: Findings demonstrate poor quality assurance program in most X-ray facilities in Kano metropolis. It is recommended that X-ray centres should have quality assurance committee and routine quality control tests should be performed on the equipment.

Keywords: Quality assurance (QA), X-ray facilities, Kano metropolis.

Introduction

Quality assurance programs are primarily concerned with the maintenance of X-ray imaging equipment at the optimum operating condition for providing the required diagnostic information. The World Health Organization (WHO) defines quality assurance (QA) program in diagnostic radiology as "an organized effort by the staff operating facility to ensure that the diagnostic images produced are of sufficiently high quality so that they consistently provide diagnostic information at the lowest possible cost, and at the least possible exposure of the patient to ionizing radiation" [1].

The quality Assurance program includes both quality control technique and quality administration procedures.

Quality Control technique is the part of quality assurance program that deals with instrumentation and equipment. Quality administration procedures are those managements actions intended to guarantee that monitoring technique are properly performed and evaluated, as well as ensuring that necessary corrective measures are taken in response to monitoring results.

The responsibility of the quality administration procedure include, assignment of responsibility for quality actions, establishment of standard of quality and indicators, provision for adequate training on testing the equipments, selection for appropriate diagnostic procedure, and in large facility, formation of quality assurance programme committee, to take responsibility for total control of the quality assurance program of the facility [2].

The committee includes facility information, facility administration, radiation safety officer, head of radiology, medical physicist, chief radiographer, chairman of the quality assurance committee, service engineer, individual responsible for the entire quality assurance and quality control technologist.

A good quality assurance programme should have the following elements; responsibility, purchase specification, monitoring and maintenance, standard for image quality, evaluation, record, manual, training, committee and review. The nature and the extent of the programme will vary with the size and type of the facility, the type of the examination conducted and other factors. The owner or the practitioner in charge of the facility has the primary responsibility for the implementation and monitoring of the quality assurance programme [2].

There is no record indicating that diagnostic x-ray equipment in Kano metropolis are subjected to proper quality assurance and control measures as stipulated by the WHO standards. Such data may provide a baseline from which recommendation could be made to facilitate the development of quality assurance programmes where there are none. Therefore, this study aims to assess the quality assurance programmes in diagnostic X-ray equipment in Kano metropolis.

Material and Methods

This cross-sectional survey assessed the quality assurance programmes operated in diagnostic X-ray facilities in Kano metropolis. The study was conducted from January to April 2014. Using purposive sampling method, and a pre-tested questionnaire, five centers with functional x-ray equipment and managed by qualified and licensed radiographers, were selected. The questionnaire consisted of two sections (A and B), with A containing questions related to demographic details of the respondents, while section B explored information related to the current status of quality assurance programmes. Questions asked sought to acquire information on the availability of quality assurance committees, the types of quality control tests conducted on the equipment, personnel responsible for the tests and maintenance services of the equipment. Others covered the availability of medical physicists and quality assurance programme officers, the availability of quality assurance programme manuals, and to whom the results were submitted. Consent forms were attached to every questionnaire in order to obtain informed consent from the respondents. The collected data was organised with the SPSS version 16.0.

Results

Demographic information of the respondents

The ages of the respondents ranged from 26 to 50, with a mean value of (33.2 ± 9.6) years. The respondents were made up of 16 (84 %) males and 3 (16 %) females. Fourteen (74 %) respondents had 0 - 5 years working experience; four (21%) had 6 - 10 years working experience and only one (5 %) had working experience above ten years as shown in Figure 1. The qualifications of the respondents are shown in Figure 2.

Only one (5 %) of the respondent had a masters degree, while three (16 %) possesed a Diploma of the College of Radiographers (DCR) and fifteen (79 %) of them had bachelor's degree qualification as shown in Figure 2. Out of the nineteen properly filled questionnaires, 8 (42 %) were filled by Radiographers at facility A, 4 (21 %) by Radiographers at B, 3 (16 %) by the Radiographers at C, 2 (11 %) questionnaires were filled by Radiographers at D and 2 (11 %) by radiographers at E. This is shown in as Figure 3.

Presence of quality assurance committee and measures

Results show that out of the nineteen respondents, only 3 (16 %) indicated that they had quality assurance committee in their institution whilst 16 (84 %) indicated they did not have QA committee in their institution. Results show that only 4 (21 %) indicated the availability of quality assurance measures in their departments, 9 (47 %) indicated that there were no quality assurance measures in their departments and 6 (32 %) indicated that they did not know whether there was quality assurance measure in their department, as shown in Fig 4.

Quality control tests carried out by the centres

As shown in Figure 5, 13 (68 %) of the respondents indicated that beam alignment and collimation (BAC), darkroom lightening efficiency (DLE) and film-screen contact (FSC) were the only quality control tests being conducted on their equipment. Three (16 %) of them indicated darkroom lightening efficiency (DLE) as the only quality control test being conducted on their equipment, while the remaining 3 (16 %) respondents indicated tube warm-up (TW) and reject-repeat (RRA) analysis as the only quality control tests being conducted on their equipment. None of the respondents indicated the availability of the records of samples of the quality control test being conducted on the equipment.

Personnel responsible for quality control tests

The results show that 10 (53 %) of the respondents indicated that radiographers in-charge (RC) were responsible for the quality control tests activities. 7 (37 %) of the respondents indicated that the chief radiographers (CR) were the personnel responsible for quality tests and the remaining 2 (10 %) of the respondents indicated electro-medical engineers (EME) as the personnel responsible for quality control tests. None of the respondents indicated the involvement of medical physicist (MP) in quality control tests in the entire study population as shown in Figure

Reporting of the results of the quality control tests

As shown in Figure 7, thirteen (68 %) of the respondents indicated that the results of the quality control tests are being reported to chief radiographer (CR). 2 (11 %) respondents have indicated that the results of the quality control tests were being reported to the Head of Department (HOD), while the remaining 4 (21 %) indicated that they don't know to whom the report of the quality control tests were being reported as shown in fig 7 below.

Discussion

Findings show that only 3 (16 %) respondents reported availability of a quality assurance committee in their centre. This is similar with the findings of a previous study [3] on analysis of the status of x-ray diagnosis which revealed that, there is no formal policy on quality assurance committee for radiological services. It also agrees with another study in Malawi [4] which reported absence of hospital quality assurance committees in 11 of hospitals out of 12.

The lack of QA programs for radiological equipments discovered in this study can perhaps be attributed to an extension of general poor attitude towards preventive maintenance culture.

A direct link to this is lack of administrative cum institutional zeal to appoint a qualified staff to periodically check the status of this regularly used equipments as reported by [5], where it was stated that to have a comprehensive quality management program, there must be administrative responsibilities which look at various activities of the program and ensure that the processes of the program are running smoothly.

Previous studies indicated that a QA committee was essential for monitoring of quality control activities and ensuring that financial resources are secured for quality assurance program implementation [5, 6], and subsequent recommendations that a quality assurance program should be led by a radiation safety officer (RSO) or quality assurance program officer (QAPO) was made [7,8].

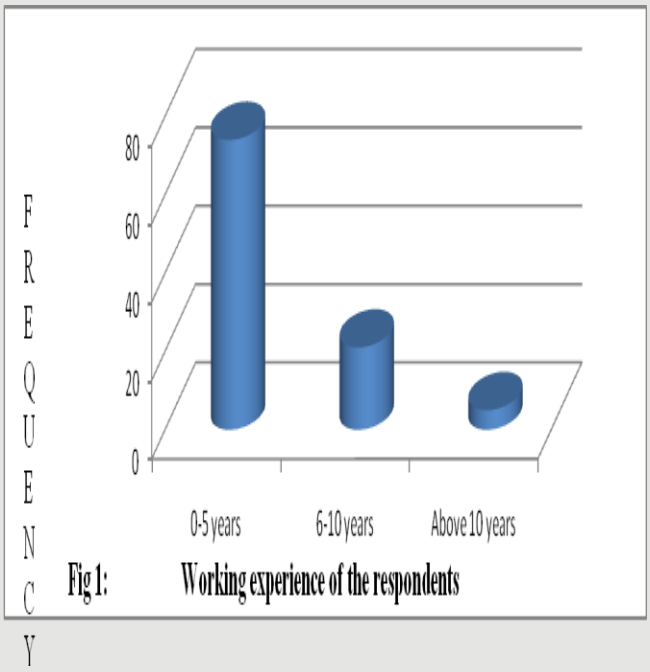

Fig 1: Working experience of the respondents

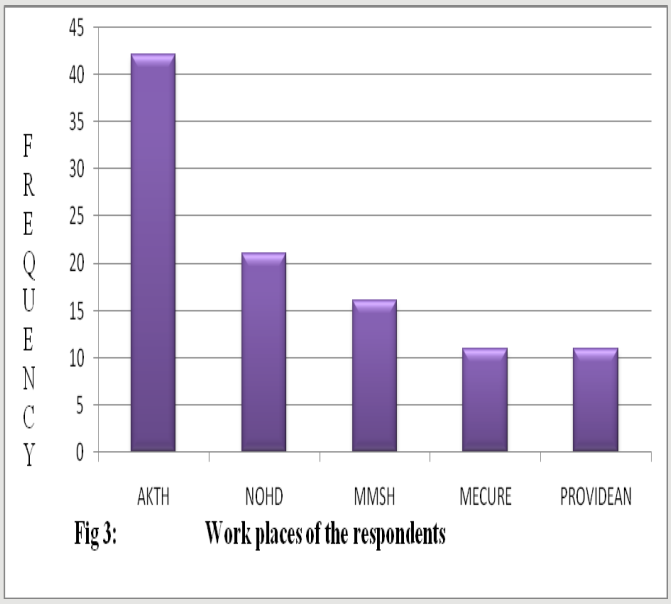

Fig 3: Work places of the respondents

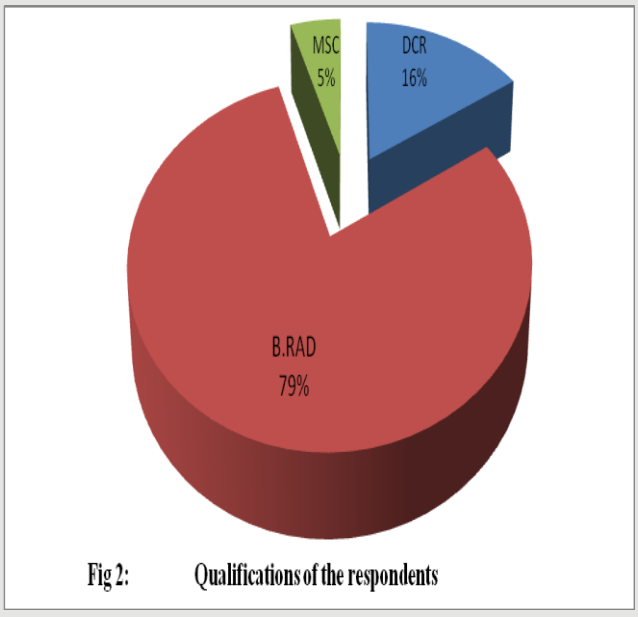

Fig 2: Qualifications of the respondents

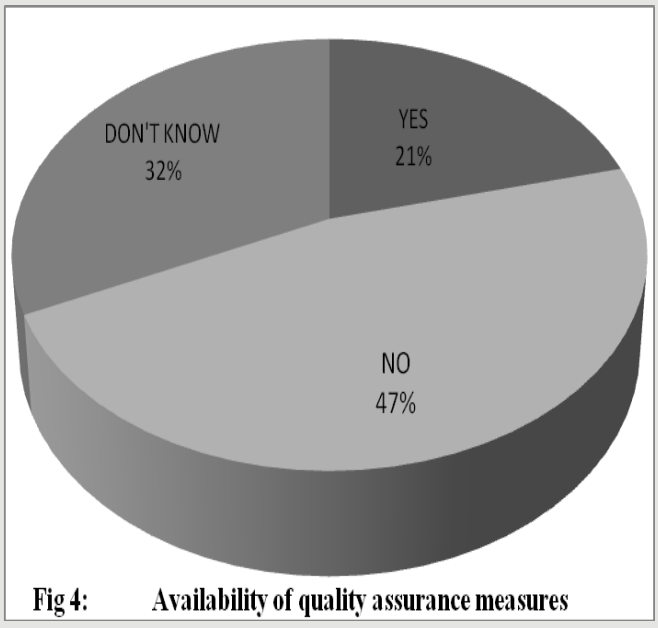

Fig 4: Availability of quality assurance measures

However, none of the facilities surveyed had an RSO or QAPO officer. The findings of the current study are contrary to an earlier study conducted in Ghana [3] where it was reported that the Chief Radiographer or Senior Radiographer was responsible for QA program activities.

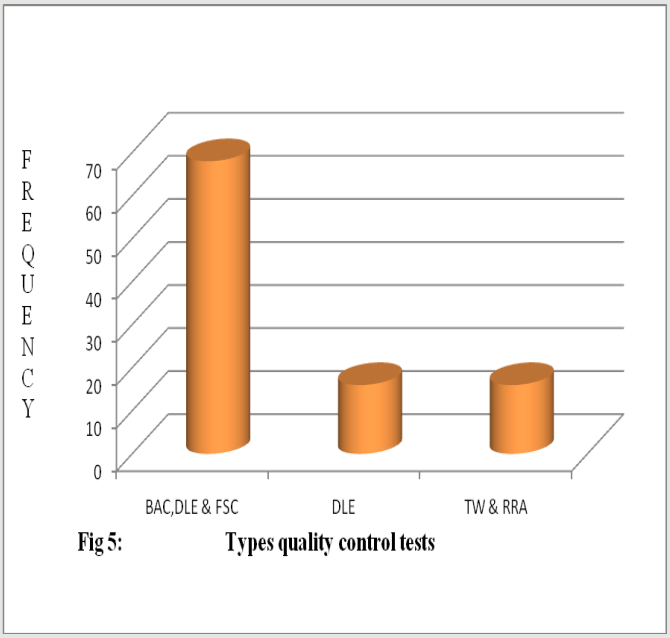

Fig 5: Types quality control tests

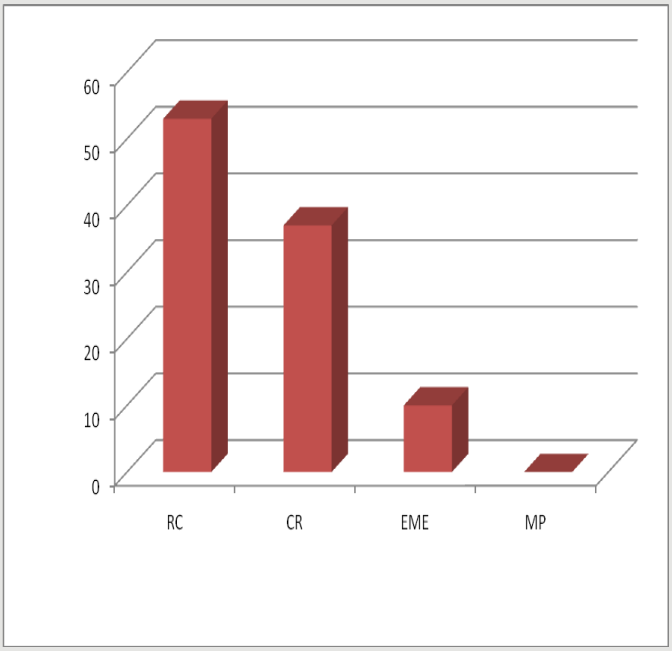

Fig 6: Personnel responsible for quality control tests

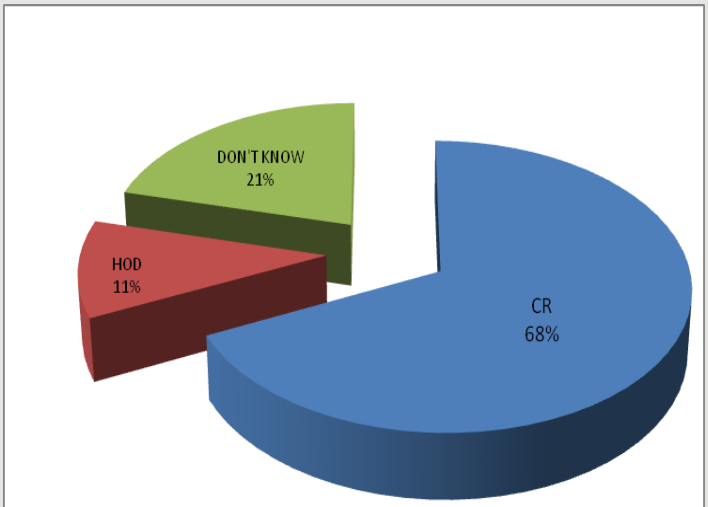

Fig 7: Personnel to whom the results on QC tests were reported

The current work shows that 10 of the respondents had indicated that, the department had an equipment acceptance procedure on completion of installation of new equipment (equipment acceptance test). On instillation of new x-ray equipment an acceptance test should be performed to ensure that the desired performance specification and the state regulatory standards have been fulfilled. The results of the acceptance should be kept in record throughout the life of the equipment, and the results of routine quality control test will be compared with the results of the acceptance tests in record.

The findings of the study showed that only 4 of the respondents had indicated that the equipment was serviced whereas 10 respondents answered in the negative and the remaining 5 respondents indicated that the equipment is only being serviced when they developed fault. The study is in keeping with the one undertaken by Harvest [4] on an investigation into the status of quality assurance and quality control measures in diagnostic x-ray department in Malawi, where 3 out of 5 hospitals indicated that servicing was done only when the equipment developed faults.

In one hospital the equipment was serviced annually, while this was on a 2 to 3 years basis in another. To have an optimal performance of x-ray equipment it must be serviced in accordance with manufacturer's instructions.

Poor quality assurance programme in most X-ray facilities in Kano metropolis might lead to unnecessary exposure patients, personnel and other members of the public to ionizing radiation. It could also increase the patients' waiting time, it might also decrease the efficiency of the departmental and probably increase its running coast.

Conclusion

Data produced show that there are poor quality assurance programme in the X-ray facilities in Kano metropolis. In most X-ray facilities, quality control tests and servicing of the equipment are not conducted in accordance with manufactures' specifications.

Recommendations

Quality assurance committees should be put in place in X-ray facilities in Kano metropolis in order to develop effective quality assurance program. In addition, quality control tests should be conducted regularly to ensure optimal performance of the equipment. Furthermore, equipment should be serviced in accordance with manufactures' specifications so that minor fault on the equipment could be detected and corrected before major ones develop.

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