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RESEARCH ARTICLE

ASSESSEMENT OF RADIATION LEVES AROUND X-RAY ROOMATFOUR HOSPITAL NEAR WOLKITE TOWN, ETHIOPIA

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ABSTRACT

Measurement radiation level at Atati, Butajera, Mercy and Woliso hospital was carried out using THERMO/RadEye PRD (personal radiation detector). The radiation level results obtained range from 3.074±0.144623mSv/y to 4.179±0.141461mSv/y with an average of 3.6205±0.13417mSv/y respectively. These results showed that the radiation levels in all of the internal (inside) radiation room were higher than the recommended values for patient that 1 mSv/y maximum permissible limit for the public set by International Commission on Radiological Protection (ICRP).

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INTRODUCTION

After the discovery of X-ray by Wilhelm Roentgen in 1895, there is a linear development in medical imaging and increase in number of X-ray machines, especially, those used for diagnosis. It is used as the source of dependence for crucial medical decisions. The benefits are immense and certainly exceed the risks. However, although diagnostic X-ray provides great benefits that their use involves some risks of developing human carcinogen is generally accepted (Damilakis *et al.,* 2010). It cannot be ignored that the diagnostic X-ray procedures contribute maximum population dose as compared to other man made radiation sources. Therefore, X-ray beam must be constricted to outside (both controlled and uncontrolled area) of X-ray departments by protecting them with high shielding materials such as lead. Patients, clinical staffs and public must be carefully protected from un-useful beam of X-ray. Patients are protected by installing good and carefully calibrated X-ray machines, while clinical staffs and public are protected by building high protected X-ray rooms. Photons penetrating through of X-ray room may be divided into two groups; photons that are generated from primary beam scattering that is used for diagnosis and photons that penetrate the X-ray tube (leakage) (Wahlstroem, 1997).both groups contribute the dose at the control and uncontrolled areas which depends on the thickness, elemental composition, and density of the concrete walls as well door and window of the room. Ionizing radiation has been increasingly applied in medicine and is now firmly established as an essential tool for diagnosis and therapy. The overwhelming benefits accruing to patients from properly conducted procedures have fostered the widespread practice of medical radiology, with the result that medical radiation exposures have become an important component of the total radiation exposure of populations. In most developed countries with an advanced health care system, medical exposures are now the most important single source of ionizing radiation (UNSCEAR, 2000). Ionizing radiation has the ability to affect the chemical state of a material and so cause changes which are biologically important (Jwanbot *et al.,* 2013). Exposure to ionizing radiation can cause injuries and clinical symptoms; which may include a chromosomal transformation, cancer induction, free radical formation, bone necrosis and radiation catractogenesis (Norman and Kagan, 1997). The injuries and clinical symptoms could be caused by both chronic and acute dose exposure. Even if there are many documents and scenario used to express the harmfulness of ionizing radiation but it was not given adequate consideration in our country. In Ethiopia including the study area, radioactive materials are also used in medical institutions for various purposes. So far, there was no adequate report or awareness on the type of radioactive materials and their effect. Thus, the current study has determined their background radiation level in Atat, Butajira, Mercy and Woliso hospitals near to Wolkite town. In this study the whole gathered data were interpreted by SPSS. The data also compared with the standard of the International Commission on Radiological Protection (ICRP) and International Atomic Energy Agency.

MATERIALS AND METHODS

Radiation level was measured in x-ray room four Hospitals around Wolkite town using a portable radiation measuring instrument RadEyePRD (personal radiation detector). Measurement was performed during the day time between 4AM to 11.30PM local time. The background radiation was measured inside and outside of the X-ray room before the machines was switched on in respective rooms. Subsequently after the exposure to the radiation, the fallout radiation was measured in four different corner of the X-ray room of the four hospitals. Statistical analyses were performed using SPSS version 16 in order to setup mean, median, standard deviation and range of the result. The measured radiation level were compared manually with International Atomic Energy Agency standards level of back ground radiation. The results of the levels of radiation are given for four study areas according to their sample names. These results are given in Table 1.

Table 1. Measured radiation levels of four Hospital

ID. Hospitals	Mean± SD (mSv/y)	
	Internal	External
A-Hospital	4.0092±0.143579	0.96175±0.172721
B-Hospital	3.219044±0.107022	0.70128±0.092881
M-Hospital	3.074280±0.144623	0.81855±0.183842
W-Hospital	4.179752±0.141461	1.0013±0.483743

RESULTS AND DISCUSSION

The dose obtained at each point is presented in table 1. For all Hospitals those are selected in our study, the radiation level varies from3.074 mSv/yto 4.179mSv/y. In all hospitalsthe measured radiation levels was below the standard values both for occupational and higher than the recommended value for the patients. Based on International Commission on Radiological Protection (ICRP, 1991; ICRP, 2004) and International Atomic Energy Agency (IAEA, 1997) recommendations for the annual limit of effective dose to members of the general public that are in uncontrolled areas such as patients, visitors to the facility, and employees who do not work routinely with radiation sources, shielding designs should limit exposure to an effective dose that does not exceed 1 mSv per single year (Simpkin and Dixon, 1998). Radiologists are occupationally exposed to low level of ionizing radiation during normal working. However, the dose level should not exceed 1 mSv in a single year with the maximum possible limit of 20 mSv per year (IAEA, 1997; National Council on Radiation Protection and Measurements, 2004). As the dose level exceed limit the probability of occurring cytogenetic abnormalities and fatal cancer risk for the clinical staffs performing diagnostic procedures would increase (Radiological Protection Institute of Ireland, 2009). The dose received by the clinical staff changes from machine to machine, number of patients and working hours per day and safety precautions followed. The best way to ensure that personnel are following effect safety rules is with personnel monitor and this is recommended by all radiation protection agencies. The dosimeter must be fixed so that it measures good indication of the radiation dose uniformly received on the body. According to International Commission on Radiological Protection (ICRP, 1991; ICRP, 2004) and International Atomic Energy Agency (IAEA, 1997) recommendations for the annual limit of effective dose for occupational were does not exceed the recommended values and but higher for patients.

Conclusion

The dose received by the clinical staff changes from machine to machine, number of patients and working hours per day and safety precautions followed. The best way to ensure that personnel are following effect safety rules is with personnel monitor and this is recommended by all radiation protection agencies. The dosimeter must be fixed so that it measures good indication of the radiation dose uniformly received on the body. The measurement of radiation level Atati, Butajera, Mercy and Woliso Hospital, was carried out using a well calibrated radiation. The study showed that the mean raiation levels are higher than the standard permissible limits set for patient by the International Commission on Radiological Protection (ICRP).

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