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ASSESSMENT OF OCCUPATIONAL RADIATION EXPOSURES AT SOME SELECTED DIAGNOSTICS CENTRES IN THE SOUTH WEST NIGERIA

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1. Introduction

The Nigerian Nuclear Regulatory Authority is the competent Authority charged with the responsibility of nuclear safety and radiation protection that ensures adequate monitoring of radiation workers in Nigeria. Personnel monitoring is a major way to ensure compliance with international standards and the national regulatory dose limit for safety of radiation worker in the radiological facility. The NiBIRR 2003 and the ICRP set 20mSv per year as occupational dose limit, however due to the small exposure time in diagnostic radiology procedures, it is important to set dose constraint in order to further prevent stochastic effect.

The aim of the research is to access the occupational dose of radiation workers in diagnostic centres and to propose dose constraints for radiological facilities in South West Nigeria.

2. Materials and methods

The occupational exposures of radiation workers in Diagnostics radiology facilities in the Southwest Nigeria was assessed using TLDLiF 100 badges for personnel radiation monitoring while integrated dose was measured at the control console using calibrated RDS 31 survey meters in 40 diagnostic radiology centers. This comprises of Federal government, State government and privately owned diagnostic centers.

2.1. Estimation of dose using RDS-31 survey meter

The dose rate measured at the control console with RDS-31 was used to estimate occupational dose using the following formula:

$$D = d_r \times W \times 50 \times t \qquad 1$$

Where D= annual occupational dose, d_r=dose rate in mSv/s, W=workload per week, t=exposure time in seconds. The 50 in the formula is the average number of working weeks per personnel in a year.

2.2. Measurement of dose using TLDLiF 100 badges

TLDLiF 100 badges were issued to radiation workers in some facilities for a period of three months. The badges were thereafter read using HARSHAW 4500 TLD Reader and the quarterly doses used to estimate annual occupational dose. Occupational dose was also obtained from dose records submitted to the Nigerian Nuclear Regulatory Authority by the DSPs. The Dosimetry records covered forty (40) diagnostic facilities. The DSPs also use TLDLiF 100 badges for personnel dose assessment.

3. Results and Discussion

3.1. Results

The annual dose estimated for diagnostics facility by using equation 1 ranges from 0.01 to 0.011 mSv.

The dose measured using TLDiF 100 badges is as shown in Table 1.

Table 1: Dose measurement using TLDLiF 100 badges

Type of facility	Annual Dose (mSv)		Average	Upper 3rd quartile
	Minimum	Maximum		
Private owned	0.01	2.4	0.31	0.36
Government owned	0.01	1.24		

3.2. Discussion

It was observed that the values obtained with TLD LiF 100 dosimeter in this work is slightly higher than the estimated values obtained using survey meter. The maximum value obtained with TLD LiF 100 dosimeter is slightly higher than the average personnel dose of 1.04 mSv reported by NNRA for 2012 to 2016. The maximum annual dose was 2.4 mSv while the minimum dose was 0.01 mSv.

4. Conclusion

The occupational exposure values obtained are far below the relevant national dose limit and international standards.

5. Recommendation

A practice specific occupational exposure reference value of 1mSv is hereby proposed as dose constraint for radiological facility in the South West Nigeria. A further work should be conducted to involve the whole country with the aim of proposing a National dose constraint for occupational radiation exposures in diagnostic facilities.

References

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