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RADIATION LEVEL MEASUREMENT IN DELTA STATE POLYTECHNIC, OZORO, NIGERIA

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ABSTRACT

Radiation level measurement has been conducted in Delta State Polytechnic, Ozoro, in Isoko North Local Government Area. Outdoor and indoor survey was conduction. The result obtained shows the background radiation in the study area. A total of 10 outdoor and 10 indoor points was surveyed. The outdoor and indoor mean dose rate of surveyed area are to be 0.24uSv/hr and 0.16uSv/irrespectively. The results show that there is no trace of deposit of radioactive mineral around the survey areas. The dose rate value obtained are lower when compared to values from indoor and outdoor to the global average; their effective annual dose is still lesser that the dose limit recommended by the International Commission on Radiation Protection(ICPR). These kinds of studies are useful to serve as baseline data of natural background radiation levels.

INTRODUCTION

Radiation from many sources is omnipresent on the earth surface consequently man is continuously irradiated. The basic difference between ionizing (nuclear) radiation and other common types of radiation in the environment such as heat is that it possesses sufficient energy to cause ionization (Agba, 2011). Radiation as energy travelling thought space. Sunshine is one of the most familiar forms of radiation. It delivers light, heat and suntans. We control its effect on us with sunglasses, shade, air conditioners, hats clothes and sunscreen. There would be no life on earth without lots of sunlight, but we have increasingly recognized that too much of it on our persons is not a good thing. In fact it may be dangerous, so we control our exposure to it. Sunshine consists of radiation in a range of wavelengths from long-wave infra-red to shorter wavelength ultraviolet. Beyond ultraviolent are higher energy kings of radiation which are used in medicine and which we all get in low doses from space, from the air and from the earth. Collectively we can refer to those kind or radiation as ionizing radiation. It can cause damage to

matter, particularly living tissue. At high level it is therefore dangerous, so it is necessary to control our exposure (Umoren 2006).

Living things have evolved in an environment that has significant level of naturally occurring radiation. Furth more, many of owe our lives and health to man-made radiation, sometimes called artificially produced medical and dental X-rays discern hidden problems. Other radiation is used to diagnose ailments and some people are treated with radiation to cure disease. We all benefit from multitude of products and services made possible by the careful use of radioactive materials (Agba, 2011). In water of which cell are largely composed, ionization can lead to molecular changes and to the formation of chemical species of a type which are damaging to the chromosome material. Ionizing radiation injury is dependent on a number of factors including: The nature (alpha (a), beta (β), and gamma (Y)) and energy of the radiation, the dose, time of exposure, homogeneity of dose and shielding. When the dose and dose rate is within the accepted level, the effect of radiation is small and most time no effect is noticed, although the effect of low level radiation are not yet completely understood (ICRP, 1990).

Human body is permanently irradiated from two ionizing radiation source: External and internal. External radiation source san either be nature (cosmic, earth) or artificial (e.g. radiation generators), both of equal risk to man. Inside the body, the K-40 is, by its nature present throughout human life. In the case that anyhow (ingestion, inhalation ect), other radionuclide (such as radon in air) enter inside the body, the body becomes internally contaminated (ICRP, 2006). The level of the natural radioactivity in the soil and in the surrounding environment as well as the association external exposure due to the gamma radiation depends primarily on the geological and geographical condition of the region (UNSCEAR 2000). The geological and geographical definition of an environment dictate to a good degree the radionuclide contained in the soil contains small quantities of radioactive elements along with their progeny. The main source of the external gamma-radiation is from the primordial radio nuclides like uranium-238, Thorium-232 and potassium-40 that are present in the earth since its formation. The amount of background radiation in an environment also depends though to a lesser extent upon man activities and soil uses. Consequently, the soil of barren area should show different amount of radioactivity when compared with that of the cultivated soil (Agba, 2011).

The objective of this study is to measure the background radiation level and the absorbed dose rate to the students, staffers and member of the general public within Delta State Polytechnic, Ozoro. The values obtained for background radiation from this work will form part of the baseline data for environment radiation in the study area.

MATERIALS AND METHOD

Study Area

The study was conducted in Delta State Polytechnic Ozoroin Isoko North Local Government Area of Delta State. The area chosen for background radiation measurement in the institution were randomly selected but evenly distributed to cover the campus. They include areas which record high population flux throughout the day. These include: Agric lecture hall (ALH) General Workshop Hall (GWH), School of Science lecture hall (SSLH), and Administrative block (AB), school of engineering lecture hall (SELH), Office of the Dean of Engineering (ODE),), school of Business Lecture Hall (SBLH), Physics laboratory (PL), Male hostel (MH) Security Office (SO). Ozoro lies between latitudes 5°31.157'N and 5°33.379'N and longitude 6°13.558'E and 6°15.558'E. The population of Ozoro has increased tremendously over recent years due to many factors like relative peace, increase in business activity in the town due to the increasing numbers of students being admitted each year. Ozoro has a tropical climate, which is marked by the two distinct seasons; the dry season and the rainy season. The dry season is between November and March, while the rainy season usually begins in April and last till October. The average annual rain fall is about 270cm. Rainfall is heaviest in the months of July/August. Isoko North has high temperature ranging between 40°C and 45°C.The vegetation of the area is mangrove swamp/forests. The major economic trees are palm and rubber with few others like Iroko, Obeche, Abora, Raffia and Mahogany. The map of Delta State indicating the study area is shown in Figure 1.

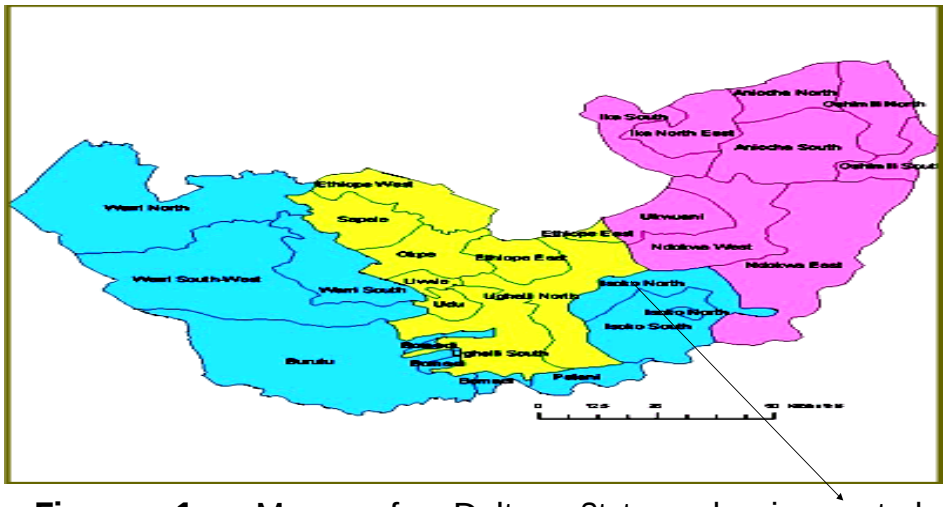

Figure 1: Map of Delta State showing study area. Study Area

METHODS

Radiation levels monitor FS2011⁺was used to measure the radiation and Global Position System (GPS) was used to determine the coordinate of the sample area. The instrument is capable of measuring gamma dose rates in the range 0-20mR/hr. This is because of its high sensitivity. The monitor was suspended in air via a retort stand at one meter above ground level (EML, 1983) at open and undisturbed level ground surface. At each point, the total count for 30 minute was recorded. Five successive readings were taken for each point. The average total count was converted to count per minute (cpm) by dividing it by 30 minute. The average dose rate (uSv/hr) for each point was obtained by multiplying the average total count (cpm) by a factor of 10-2.

DATA PRESENTATION, RESULTS AND DISCUSSION

Data Presentation

Table 1 and .2 shows the Radiation Field Data. Table1 shows the outdoor radiation level while table 2 shows the indoor radiation level.

Date: 08/06/2019

Observer: Mrs. Osiga-Aibangbee Site Location: Delta State Polytechnic, Ozoro.

Instrument: Radiation levels monitor FS2011⁺ and ETREX Germin GPS

RESULTS

The results obtained in this study are presented in Table 1 and 2 and Figures 1, 2 and 3.

Table1: Outdoor Radiation Level

S/N	Geographical Location	Elevation (m)	Sample Location	Dose Rate (mSvh^{-1})
1.	N05°33.324 E006°13.105	9	GHW	0.19
2.	N05°33.313 E006°13.101	8	SSLH	0.24
3.	N05°33.328 E006°13.115	8	ALH	0.24
4.	N05°33.142 E006°13.100	9	AB	0.25
5.	N05°33.357 E006°13.14	8	SELH	0.18
6.	N05°33.374 E006°13.125	10	ODE	0.28
7.	N05°33.364 E006°13.142	8	SBLH	0.26
8.	N05°33.192 E006°13.151	9	PL	0.25
9.	N05°33.348 E006°13.153	9	MH	0.27
10.	N05°33.276 E006°13.121	8	SO	0.24
Mean				0.24

Table 2:Indoor Radiation Level

S/N	Geographical Location	Elevation(m)	Sample Location	Dose Rate $mSvh^{-1}$
1.	N05°33.326 E006°13.107	10	GHW	0.12
2.	N05°33.315 E006°13.104	10	SSLH	0.21
3.	N05°33.330 E006°13.113	9	AGL	0.16
4.	N05°33.142 E006°13.100	9	AB	0.15
5.	N05°33.354 E006°13.141	9	SELH	0.15
6.	N05°33.377 E006°13.123	11	ODE	0.15
7.	N05°33.361 E006°13.145	10	SBLH	0.16
8.	N05°33.196 E006°13.153	10	PL	0.14
9.	N05°33.342 E006°13.156	9	MH	0.16
10.	N05°33.272 E006°13.125	10	SO	0.16
Mean				0.16

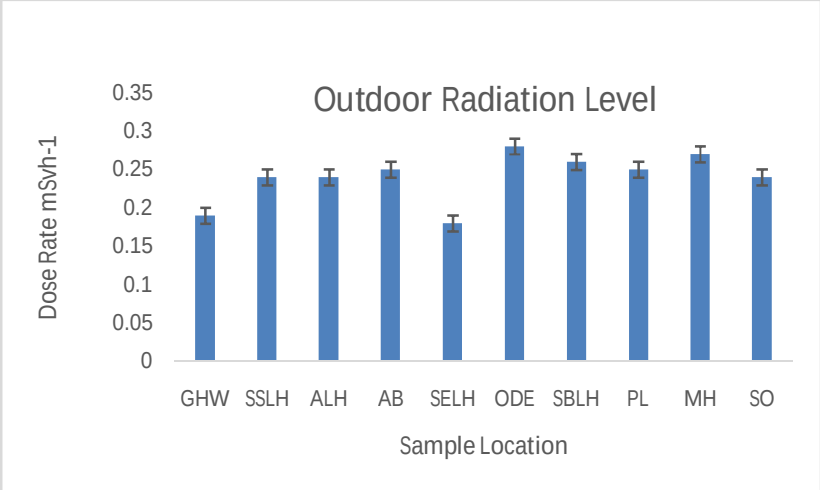

Figure 2: Outdoor Dose rate for locations at Delta State Polytechnic, Ozoro

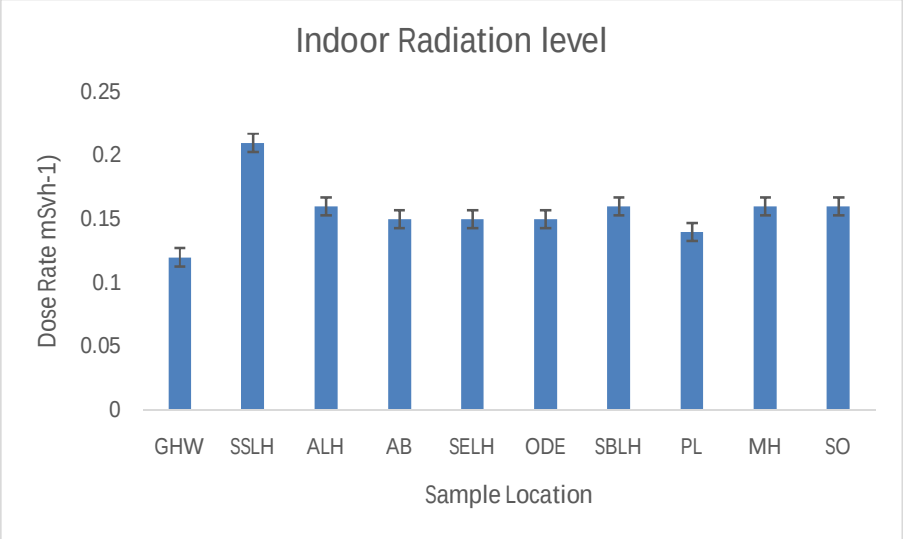

Figure 3: Indoor Dose rate for locations at Delta State Polytechnic, Ozoro

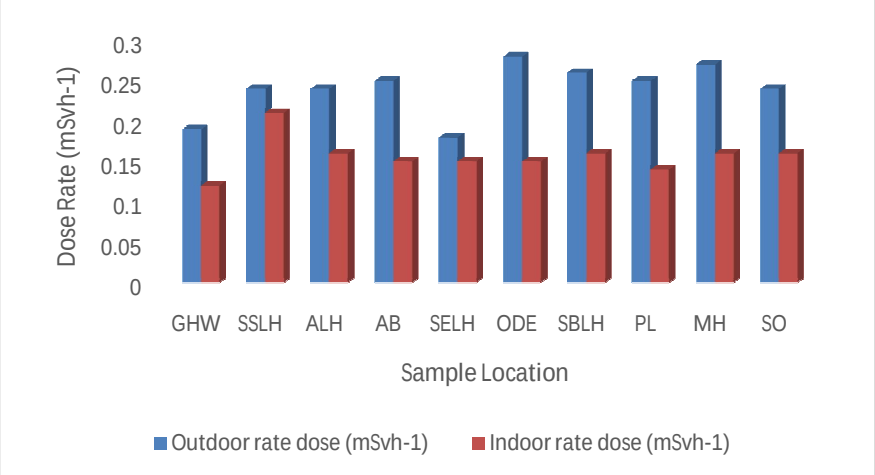

Figure 4: Comparison on Outdoor and Indoor Dose rate for locations at Delta State Polytechnic, Ozoro

DISCUSSION

A total of 20 point was surveyed, 10 outdoor and 10 indoor across the camps for background environment radiation. The dose rate obtained at each point is presented in table 1 and 2. The outdoor dose rate varies

from 0.18uSv/hr to 0.28usv/hr at as shown in Table 1 and figure 2. The indoor measurement dose rate has a minimum value of 0.12uSv/hr and maximum dose rate 0.16uSv/hr at as show in Table 2 and Figure 3.

Generally, the outdoor dose rate and the indoor dose rate are compared to one another and could simply be attributed to natural sources as there are no radiation generators around the campus. The outdoor and the indoor mean dose rate of the surveyed areas are found to be 0.24uSv/hr and 0.16uSv/hr respectively. The ratio of the average outdoor radiation to the average indoor radiation is 1.5. This high value is due to fact that the wall of the house may be acting as a barrier that tend to reduce the radiation level. Most radiation biology researches outlines the quantitative relationship between the radiation dose and biological effect indicates a threshold dose level below which no health side-effect occurs (Ballinger, 1991). The results of the exposure rate in the study area show that the radiation level did not exceed the normal background level which is still lower than the recommended limit of 1mSv/annum by International Commission on Radiation Protection (ICRP, 1990). The average effective dose for the outdoor and indoor point studied of 0.23uSv/hr and 0.16uSv/hris less than the ICRP limit value for non occupational population exposure. Hence, the radiation poses no health risk to the environment.

CONCLUSION

Radiation level measurement has been conducted in Delta State Polytechnic, Ozoro, in Isoko North Local Government Area of Delta State. The result obtained shows the background radiation in the study area does not pose serious health risk. The background radiation observed at the surveyed area could be attributed only to natural sources. The dose rate values obtained are lower when compared to values from indoor and outdoor to the global average. Their effective annual dose is still lesser than the dose limit recommended by the ICRP.

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