Measurement of Gamma Radiation dose for selected samples of Kufa University at Al-Najaf Governorate, Iraq

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abstract

A background radiation dose at indoor and outdoor of medicine and engineering faculties laboratories were calculated in Kufa University at Al-Najaf governorate, Iraq. Measurements were obtained using a portable dosimeter survey "Inspector Alert model RAP RS1, S.E. international, Inc,USA". Amount of minimum and maximum mean dose radiation were ranged from (19.622 to 69.904nGy/h) and from (8.277 to 16.249nGy/h) respectively. The Annual Effective Dose indoor and outdoor were calculated between (4.466 and 0.259mSv/y) successively. So, it's found lower than 1 µSv/y ,Which is recommended by UNSCEAR (2000) ; therefore, these values are found to be safe.

Keywords: Radiation Dose, portable dosimeter, Annual Effective Dose, kufa university, iraq.

I. INTRODUCTION

There are two main types of radiation sources that human beings exposed in earth which are natural radio sources and artificial radioactive source. The first one is either from cosmic ray or terrestrial radio nuclides ,the second is either from nuclear explosions or nuclear power production(1). Because of the component of earth , nuclides radioactivity that represent in soil, air, water, rock and building material with values that vary significantly (2,3).

There are many international studies reported about measurements of terrestrial radiation levels to assess the effective dose of population (4, 5).

Many studies in field of gamma background radiation were made in different area of Iraq (6, 7, and 8).

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The idea of this study is to determine gamma background radiation in the region of (medicine and engineering facilities) and calculate the Annual Effective Dose for residents and risks in human health.

II. Materials and Method

In this study twenty regions were chosen in facilities of medicine and engineering (eleven laboratories in Medicine Faculty and nine laboratories in engineering faculty). A topographic map of selected region was obtained from Department of Geological Survey of Al-Najaf governorate as show in fig.(1).

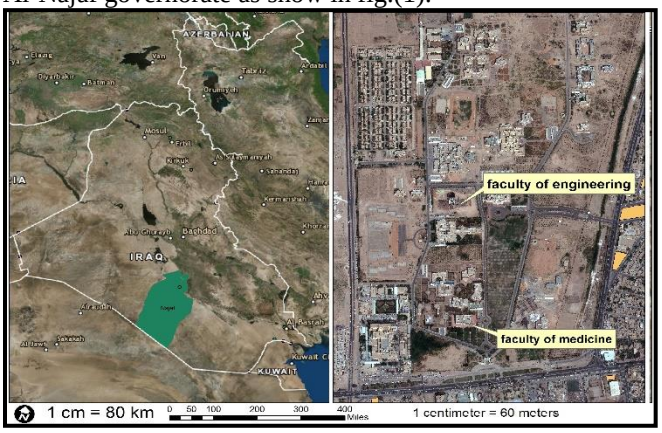

Figure (1) Map of An Najaf Governorate and the study regions.

The rate of gamma background radiation level in the selected locations measured by using portable dosimeter survey "Inspector Alert model RAP RS1, S.E. international, Inc, USA". This device supplied with a mica window, sensitive to Alpha, Beta and (X-

ray and Gamma ray).The G.M. detector calibrated by Germany Secondary Dosimeter laboratory.

Indoor and outdoor radiation measurements were outright by putting the detector at least one meter away from the ground. Gamma background radiation measurements were counted both indoor and outdoor in (20) regions, three readings were listed at each place (laboratories).

The standard deviation is assumed as below (9):

$$\sigma n\ (S.D) = \sqrt{\frac{\sum_i^n (Xi-X)2}{n-1}} \quad \text{.....(1)}$$

Amount of indoor and outdoor Gamma background radiation calculated using (OF), the occupancy factor which is 20% and 80% respectively. Annual Effective Dose was determined as follow (10):

$(AED)_{\textbf{Indoors}} = D_{in} \times T \times OF \times$ the conversion coefficient .....(2)

$(AED)_{\textbf{Outdoors}} = D_{out} \times T \times OF \times$ the conversion coefficient ....(3)

Where D_{in} and D_{out} are the mean absorbed dose rates in air (indoor & outdoor). The conversion coefficient which is reported by UNSEAR 1993 is (0.7 Sv / Gy) to convert absorbed dose in air to the Effective Dose received by mature.

III.RESULTS

Radiation scanning had been done to the selected regions (medicine & engineering laboratories), where mean dose rate, Annual Effective Dose and standard diviation were calculated. Fig.(2) showed the indoor and outdoor mean dose of Gamma radiation in selected region .The minimum and maximum indoor mean dose were (19.622 nSv/h) and (69.904 nSv/h) in (traffic and Microbiology) laboratory respectively. The average of indoor mean dose was (39.8574 nSv/h).Also, the minimum and maximum outdoor mean dose were (8.277 nSv/h) and (16.249 nSv/h) in (Laser and Anatomy) laboratory. The average of outdoor mean dose was (11.86475 nSv/h).

Table (1) Mean rate dose in selected regions and the annual effective dose.

College name	laboratory name	Indoor Mean Dose (nSv/h)	Outdoor Mean Dose (nSv/h)	Annual Effective Dose indoor(mSv/y)	Annual Effective Dose outdoor(mSv/y)
medicine college	Medical Physics for Preliminary Studies	47.829	10.424	3.057	0.166
	Medical Physics for Postgraduate Studies	34.339	10.424	2.194	0.166
	Branch of diseases and forensic medicine	49.056	10.424	3.134	0.166
	Laser Research	39.244	8.277	2.507	0.132
	pharmaceutical	36.791	12.263	2.35	0.195
	Microbiology	69.904	12.263	4.466	0.195
	Anatomy	28.207	16.249	1.802	0.259
	Chemistry	45.376	15.636	2.899	0.249
	Genetics	39.244	15.636	2.507	0.249
	cancer	24.527	15.636	1.567	0.249
	Fabrics	51.508	15.636	3.29	0.249
Engineering college	Concrete	40.471	11.037	2.586	0.176
	Building materials	45.376	11.037	2.899	0.176
	Fluids	31.886	11.037	2.037	0.176
	Soil	38.018	11.037	2.42	0.176
	Mechanical Engineering	30.659	11.037	1.95	0.176
	Refractories	31.886	11.037	2.037	0.176
	Roads	40.47	11.037	2.586	0.176
	The nano unit	52.735	8.584	3.369	0.137
	The traffic	19.622	8.584	1.253	0.137
Average		**39.8574**	**11.86475**	**2.5455**	**0.18905**
Min		**19.622**	**8.277**	**1.253**	**0.132**
Max		**69.904**	**16.249**	**4.466**	**0.259**

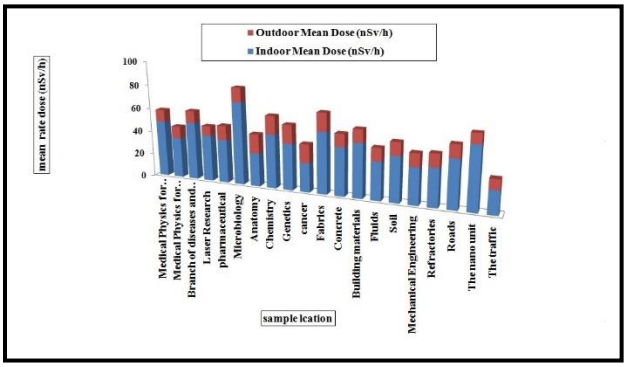

Fig. (2) indoor and outdoor mean rate Dose in selected region .

The minimum and maximum indoor were (1.253mSv/y) and (4.466mSv/y) in (traffic and Microbiology) laboratory respectively. The average of indoor mean dose was 2.5455mSv/y).Also, the minimum and maximum outdoor mean dose were (0.132mSv/y) and (0.259mSv/y) in (Laser and Anatomy) laboratory. The average of outdoor mean dose was (0.18905mSv/y).

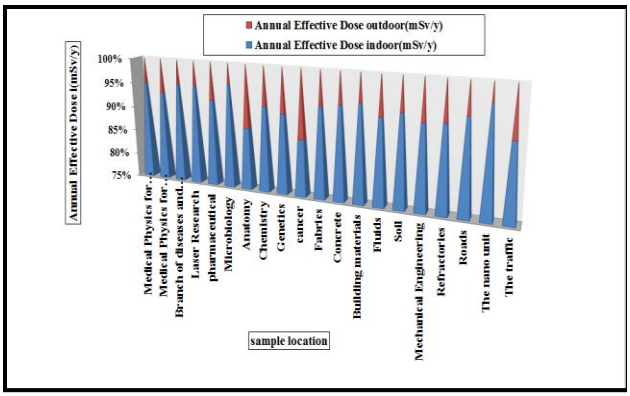

Figure (3) Indoor and outdoor of Annual Effective Dose in selected region.

IV.DISCUSSION

Radiation scanning for the selected area shows that higher impact of gamma radiation was in Microbiology laboratory. It's may be because of Radioactive sources and Hazardous chemicals effect on human inside building.

V.CONCLUSION

The people in charge of these sources or working there must made Signals and contraindications around it in a specific distance to prevent students and colleagues who worked near to these buildings to reduce the side effects from Caused by these radiation and their interactions.

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REFERENCES

[1]. Frank B.Mc.Donald and Vladimir S.Ptuskin Galactic Cosmic Rays,The Century of Space Science, Kluwer Academic Publishers 2001; p. 677–697 .

[2]. Erol kam and ahmet bzkurt Environmental radioactivity measurements in Kastamonu region of northern turkey, Applied radiation and isotopes 2007; 65:440 – 444

[3]. Ahmet Bozkurt, Nuri Yorulman, Erol Kam and t al Assessment of enviromental radioactivity for Sanliurfa rgion of southeastern, Turkey, Radiation measurement 2007;42:1387-1391.

[4]. Diab, H.M. Nouh, S.A,Hamdy, A.El-faki, S.A. Evaluation of Natural radioactivity in a Cultivated Area around Fertilizer Factory, Journal of Nuclear and radiation physics2008 ;Vol.3No.4 ,pp.53-62.

[5]. Sohrabi M, Bolorchi H, Beitollahi S Natural radioactivity of soil sample in the high level radiation areas of Iran. Proceeding of the 4th International Conference on High Levels.Bejjing China 1996; pp. 129-132.

[6]. Allawi Hamed, Alaadi,Azhar, S.Alaboodi,Lubna A. Alasdi and Ali Abid Abojassim Survey of Absorbed Dose Rates in air of Buildings Agriculture and Sciences in University of Kufa at Al-Najaf Governorate, Iraq. Journal of chemical and pharmaceutical research,USA 2016; 8(4)pp:1388 – 1392.

[7]. Rabee B. Khader measure the background radiation in some parts of Nineveh. Journal Al-Rafeadeen Science, Iraq 2010; 12(6)pp.92-104.

[8]. AlMayahi B. Exposure rate measurements of the natural background radiation in the facultys science & agriculture, Kufa University, Iraq 2008; jour. Of baby. Univ.,15(3)pp. :1-4.

[9]. Ali Abid Abojassim, Hussien Abid Ali Mraity, Afnan Ali Husain, Mike Wood Estimation of The Excess Lifetime Cancer Risk From Radon Exposure in Some Buildings of Kufa Technical Institut Iraq 2017; journal NUCLEAR PHYSICS AND ATOMIC ENERGY,18(3)pp. :276-285.

[10].M.Gholami, S.Mirzaei and A.Jomehzadeh Gamma background radiation measurements