Available online at www.worldscientificnews.com

World Scientific News

An International Scientific Journal

WSN 92(2) (2018) 378-384 EISSN 2392-2192

SHORT COMMUNICATION

Background Radiation in Najaf city, Iraq

Laith Saheb

Department of Ecology, Faculty of Science, University of Kufa, Najaf Governorate, Iraq

E-mail address: alhusseini20100@gmail.com

ABSTRACT

Gamma-ray absorbed dose rates of the background radiation found in some selected areas of Najaf city, Iraq. Gamma-ray absorbed dose measurements are made using a portable survey meter (Gamma-Scout). The frequently recorded readings of the gamma dose rate observed of about 60.00 and 116.67 $nGyh^{-1}$ in this work. The lowest gamma dose rates found to be 60 $nGyh^{-1}$ in ALSEHLE and ALGADIR sites and the highest found to be 116.67 $nGyh^{-1}$ in ALKARAMA site. Overall, the background gamma radiation rates are within the range in listed regions of worldwide. The selected locations in the Najaf city have standard values of the background gamma radiation rates and not harmful and not effects on people living in these areas.

***Keywords*:** Background radiation, Gamma-Scout, Najaf city

1. INTRODUCTION

Radiation is one of the environmental factors affecting humans. The cosmic rays are considered one of the types of radiation as a result of cosmic radiation interact with the nuclei of air atom emit electromagnetic radiation with high energy called a gamma-ray with a severe impact on human life. The Geiger and scintillation counters are nuclear devices use for detect

(Received 08 January 2018; Accepted 23 January 2018; Date of Publication 24 January 2018)

radiation. In this research, the Geiger counter was used to detect the dose in Sievert unit that is exposed man in the city of Najaf. The reading of the Geiger counter called background cosmic radiation. The level of natural background radiation varies from location to location because of rock formations as well as soil type. Therefore, different concentrations of radionuclides produced by cosmic radiation or soil, which changes with height and width [1].

The radiation dose rate is affected by gamma radiation emitted from radionuclides that occurs naturally in soil, geological and geological areas [2,3]. Studies or research related to environmental gamma radiation indicate that further research needed on radioactive contamination in Iraq [4-8]. This study done in Najaf area because of these regions has limited studies and need to more reviews of background radiation. The present study aimed to measure background radiation of gamma in Najaf city, Iraq.

2. MATERIALS AND METHODS

Najaf is located in Iraq country, at the longitude and latitude coordinates of 43.83 and 31.25, respectively, as shown in Fig. 1.

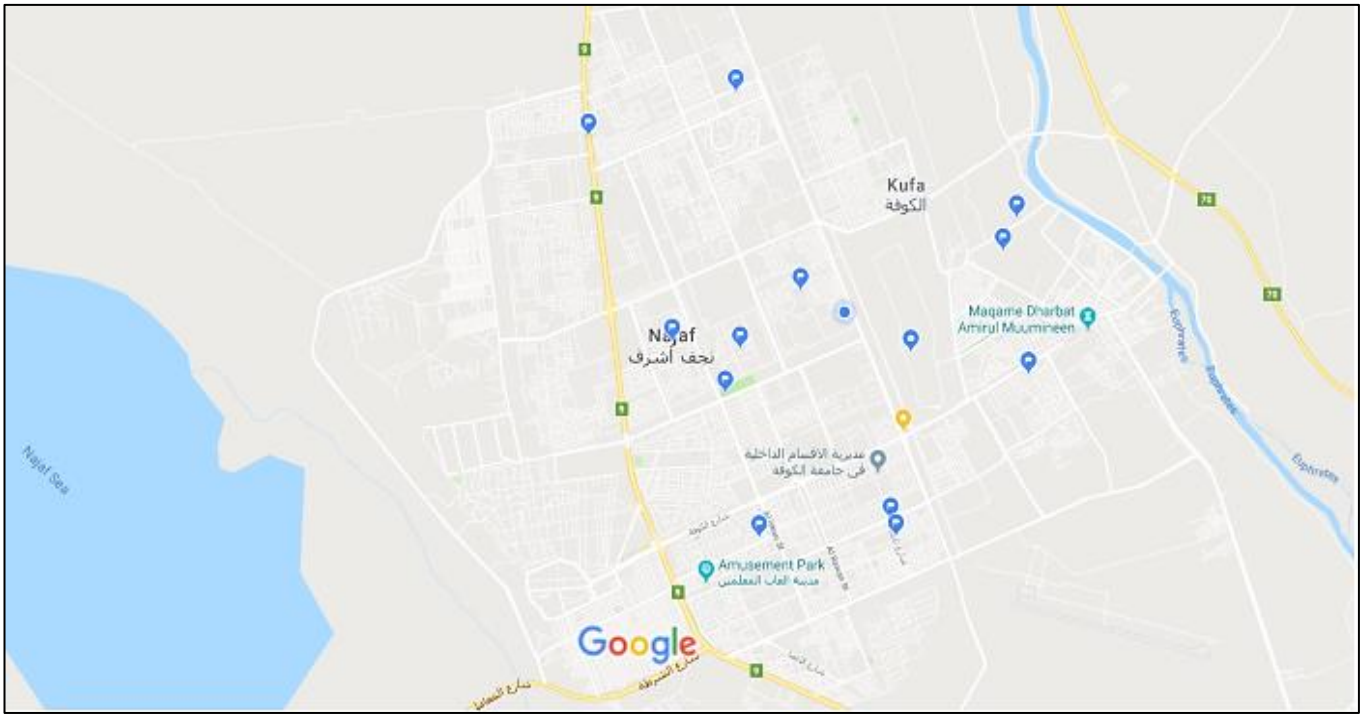

Fig. 1. Najaf administrative map with sampling sites

Background radiation of some sites in Najaf city at different distances surveyed of duration 2017 to 2018. The results were done using a GM survey meter [Gamma-Scout GmbH & Co. KG, Abtsweg 15, D - 69198 Schriesheim, Germany]. ^{137}Cs and ^{60}Co sources used to calibrate a GM meter. The dose rate versus the distance between sources and detector plotted. The total gamma radiation from the soil and air measured of 5 min at ten readings per

site at a level of 1m above the ground level [9,10]. The coordinates for all locations in this study were determined using GPS STATUS (Global Position System, Samsung Galaxy J5).

3. RESULTS

130 gamma dose rate readings obtained by a survey meter (GM). The all readings showed in the $nGyh^{-1}$ unit as shown in Table 1. The gamma dose found at all study areas ranged between 60.00 $nGyh^{-1}$ to 116.67 nGy h^{-1}. The highest mean dose of gamma-ray found to be 116.67 $nGyh^{-1}$ in ALKARAMA site, which is about two times higher than the world dose rates of 59 $nGyh^{-1}$. The lowest gamma dose rate was observed about 60 $nGyh^{-1}$ in ALSEHLE and ALGADIR sites, which is lower than the world average. The gamma mean dose in this study found to be 84.62±5.21 $nGyh^{-1}$. The dose equivalent radiation obtained to be ranged of 0.06 μSvh^{-1} to 0.12 $\mu Sv\ h^{-1}$ (0.08±0.01 μSvh^{-1}) in Najaf city. Table 1 showed that the altitude at sea level (ASL) does not affect gamma mean dose.

Table 1 Gamma rate *in-situ* at 1m above the area

SC	Location	Gamma dose (nGy h^{-1})			Dose equivalent ($\mu Sv\ h^{-1}$)	Altitude (ASL)	Measuring Time
		Min.	Max.	Mean	Mean		
D1	ALKARAMA	110	120	116.67	0.12	43	20
D2	ALAMER	90	110	100.00	0.10	44	23
D3	INDUSTRIAL	70	90	80.00	0.08	44	22.12
D4	ALABSALAM	60	80	70.00	0.07	48	22.52
D5	ALWEFAA	90	100	96.67	0.10	38	9.1
D6	KUFABELAL	100	120	110.00	0.11	35	12.37
D7	ALSEHLE	50	70	60.00	0.06	28	13.38
D8	ALGADIR	50	70	60.00	0.06	34	21.41
D9	ALFAO	70	80	76.67	0.08	44	19.21
D10	ALMUTHANA	60	70	66.67	0.07	50	20.27
D11	ALSELAM	60	80	73.33	0.07	44	21.08
D12	ALJAMEHA	90	100	93.33	0.09	39	22.37
D13	ALSEWAK-ZEHRAA	90	100	96.67	0.10	42	23.17
Min.				**60.00**	**0.06**		
Max.				**116.67**	**0.12**		
Avg.				**84.62 ±5.21 (SE)**	**0.08±0.01 (SE)**		

SC: Site Code; SE= Standard Errors

The gamma-ray dose rate contour map done in Fig. 2. Fig. 2 shows the is dose map of gamma radiation measured is drawn to present environmental radiation value distribution in

Najaf area. A comprehensive understanding of the delivery of gamma dose is essential in assessing the potential human risk associated with soil and air contamination by the radionuclides. It is necessary for determining gamma dose rates to the population as a whole.

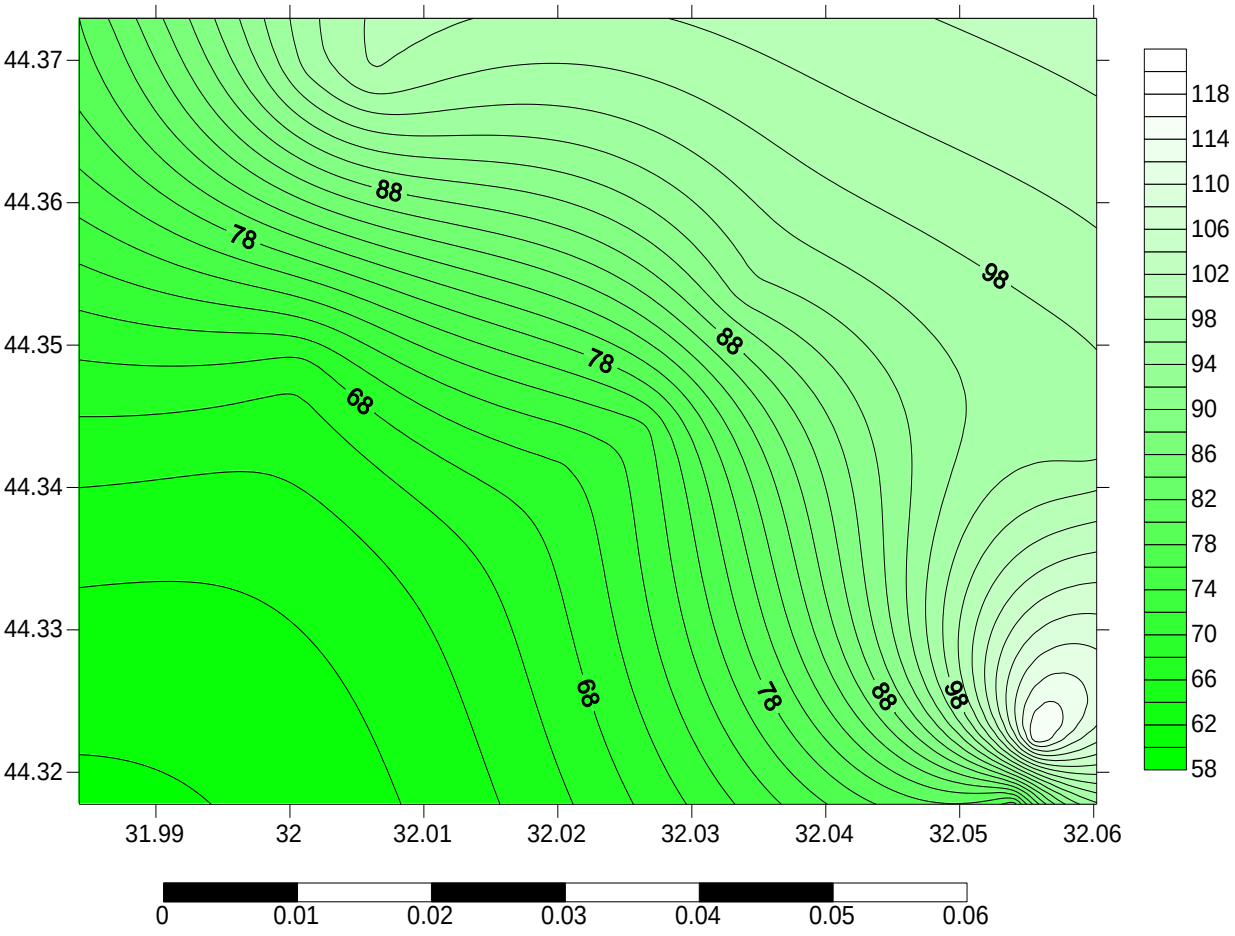

Fig. 2. Contour map of gamma-ray dose rates by a dosimeter

4. DISCUSSION

The gamma dose rate value obtained in this study matching with Ireland and Portugal [11,12]. Some values in other parts of the world are higher than those in Najaf city, Germany, Kufa University, Malaysia, India, Iran, Turkey, and Nigeria [6,12-19]. Other countries are provided results lower than the observations in the present work. The maximum and minimum values of gamma-ray dose rates were within the ranges reported for different listed regions, as shown in Table 4. Najaf city could classify as a typical location of background radiation. Table 2 summarizes the natural gamma dose rates (background radiation) measured from various regions at worldwide and the levels obtained in this study. The natural gamma absorbed dose rates in the present study were within the ranges of gamma dose rates in other listed regions as shown in Table 2.

Table 2. The gamma-ray doses in the air in this study compared with those in other countries

Location	Gamma dose ($nGy\ h^{-1}$)
Germany [13]	91
Italy [13]	72
Switzerland [11]	74
Ireland [11]	82
Kufa University [4]	67
Kufa University [6]	99
Malaysia [12]	92
China [10]	62
India [14]	117
Japan [10]	53
United States [10]	47
Egypt [10]	22
Greece [10]	56
Portugal [12]	84
Russia [10]	65
Spain [10]	76
Iran [17]	113
Turkey [16]	253
Nigeria [15]	153
World [3]	59
Present Study	**84.62±5.21**

5. CONCLUSION

The obtained results of the background radiation of gamma ray of all sites are low and no cause dangerous effect or impact on human and animal health, as compared with other results from global studies. This study is useful for determining the background radiation of the population within the Najaf area for radiological protection and prevention from extreme exposure.

Acknowledgement

The author acknowledges the financial support of the University of Kufa, Iraq. The author is grateful to Dr. Basim A. Almayahi, Department of Ecology, College of Science, University of Kufa (basimnajaf@yahoo.com) for assisting me throughout conducting the present research.

References

[1] Dragović S, Janković L, Onjia A. Assessment of gamma dose rates from terrestrial exposure in Serbia and Montenegro. *Radiation Protection Dosimetry.* 2006 Aug 8; 121(3): 297-302.

[2] Florou H, Kritidis P. Gamma radiation measurements and dose rate in the coastal areas of a volcanic island, Aegean Sea, Greece. *Radiation Protection Dosimetry.* 1992 Dec 1; 45(1-4): 277-9.

[3] United Nations. Scientific Committee on the Effects of Atomic Radiation. Sources and effects of ionizing radiation: sources. United Nations Publications; 2000.

[4] Almayahi B. Exposure rate measurements of the natural background radiation in the colleges of science and agriculture - Kufa University. *J. Baby. Univ.* 2008; 15(3): 1-4.

[5] Al-Mayahi BA. Exposure rate measurements of the natural background radiation in some Najaf regions. *Journal of Al-Qadisiyah for Pure Science.* 2010; 15(4): 1-8.

[6] Kawther HM., Zyughir LS, Jaafar AA, Almayahi BA. Biological effects of background radiation and their risk of humans. *Maghrebian Journal of Pure and Applied Science.* 2017 Feb 5; 2(2): 2-2.

[7] Almayahi B. NaI (Tl) Spectrometry to Natural Radioactivity Measurements of Soil Samples in Najaf City. *Iranica Journal of Energy Environment,* 2015, 6 (3): 207-211.

[8] Makki NF, Kadhim SA, Alasadi AH, Almayahi BA. Natural Radioactivity Measurements in different regions in Najaf city, Iraq. *International Journal of Computer Trends and Technology,* 2014, 9 (6), 286–289.

[9] Almayahi BA, Tajuddin AA, Jaafar MS. Effect of the natural radioactivity concentrations and 226 Ra/238 U disequilibrium on cancer diseases in Penang, Malaysia. *Radiation Physics and Chemistry.* 2012 Oct 31; 81(10): 1547-58.

[10] Almayahi B. Gamma spectroscopic of soil samples from Kufa in Najaf governorate, Iraq. *Word Applied Science.* 2014; 31(9): 1582-1588.

[11] McAulay IR, Colgan PA. γ-ray background radiation measurement in Ireland. *Health physics.* 1980; 39(5): 821-6.

[12] United Nations Scientific Committee on the Effects of Atomic Radiation. Sources, effects, and risks of ionizing radiation. Report to the General Assembly, with Scientific Annexes, United Nations, New York, 1988.

[13] Stranden E. Population Doses from Environmental Gamma Radiation in Norway. *Health physics.* 1977 Oct 1; 33(4): 319-23.

[14] Prasad NG, Nagaiah N, Ashok GV, Karunakara N. Concentrations of ^{226}Ra, ^{232}Th, and ^{40}K in the soils of Bangalore region, India. *Health physics.* 2008 Mar 1; 94(3): 264-71.

[15] Olarinoye IO, Sharifat I, Baba-Kutigi A, Kolo MT, Aladeniyi K. Measurement of Background gamma radiation levels at two Tertiary Institutions in Minna, Nigeria. *Journal of Applied Sciences and Environmental Management.* 2010;14(1):59-62.

[16] Merdanoğlu B, Altınsoy N. Radioactivity concentrations and dose assessment for soil samples from Kestanbol granite area, Turkey. *Radiation Protection Dosimetry.* 2006 May 12; 121(4): 399-405.

[17] Gholami M, Mirzaei S, Jomehzadeh A. Gamma background radiation measurement in Lorestan province, Iran. *Iranian Journal of Radiation Research.* 2011 Sep 15; 9(2): 89-93.

[18] P. A. Fedirko, I. Kadoshnikova, Risks of eye pathology with the victims of the Chernobyl catastrophe. *World News of Natural Sciences* 3 (2016) 12-18

[19] O. Karar Abdali, Mohsin Kadhim, Test of Gamma Radiation in Synthetic Water Absorbed Rubber. *World News of Natural Sciences* 6 (2017) 1-11