



Preliminary Investigation on Natural Background Radiation Levels in and around Karimnagar, Telangana State, India

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General Note

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ABSTRACT

Natural background radiation levels are measured in 17 dwellings selected randomly in and around Karimnagar city of Telangana using a portable μ R-survey meter for a period of one year on quarterly basis. These levels are found to be minimum at Gangadhara village and maximum at Peddur village. Elevated levels of radiation at Peddur village can be attributed to the uraniferous rocks present in that area. The ratio between the indoor to outdoor radiation levels is varying between 0.68 and 1.22 against the world average of 1.2. Variation of natural background gamma radiation levels with different types of buildings is also discussed.

Keywords: About Natural background gamma radiation levels, μ R-survey meter, Karimnagar Granitic Terrain.

1. INTRODUCTION

Exposure to the natural background radiation is inevitable since the dawn of time. These levels of radiation vary from place to place depending upon the geological formation of the earth. In general, the lower levels of natural background radiation are associated with sedimentary rocks while the higher levels are associated with the igneous rocks such as granites. However, some exemptions to this are also possible [1].

Karimnagar (nickname: town of granites) is a district of Telangana state in India which falls under the Karimnagar Granitic Terrain (KGT) [2], [3]. The Karimnagar city is about 165 kilometers away from the state capital Hyderabad towards north. The city is located on the banks of Manair River, which is a tributary of Godavari river. The temperature of the district varies from as low as 15°C to the maximum of 45°C. Karimnagar is well known for the numerous types of granites, viz. Tan Brown, Mapple Red, etc [4], [5]. The occurrence of high grade uraniumiferous rocks in some of the areas of Karimnagar district is also reported [6], [5].

Earlier our research group has carried out the studies on the environmental radiation levels in and around Hyderabad city, Khammam and Nalgonda districts. The estimated natural background radiation levels in these areas are relatively high as compared to national and international average values. Keeping in view the previous results in the state and the geology of the present study area, it is proposed to carry out the studies on natural background radiation levels in and around Karimnagar, Telangana state for a period of one year on quarterly basis. Present paper deals with the preliminary results of the natural background gamma radiation levels in and around Karimnagar city.

2. EXPERIMENTAL

A total 17 number of dwellings were selected randomly by covering places in and around Karimnagar city for this study. The natural background gamma radiation levels were measured inside and outside the dwellings at the ground level and at a height of one meter from ground level over a period of one year from June 2013 to May 2014 on quarterly basis using a portable NaI crystal based μR -survey meter (Ms. Nucleonix systems limited, Hyderabad make). It is reported earlier by our research group that the results of natural background gamma radiation levels estimated by using μR -survey meter and thermoluminescence dosimeters (TLDs) are in good agreement [7].

3. RESULTS

The annual average values of natural background gamma radiation levels measured at the selected locations are presented in the Table. As can be seen from the Table, these levels are found to be minimum at Gangadhara village (931 $\mu\text{Gy}/\text{y}$) while maximum at Peddur village (2323 $\mu\text{Gy}/\text{y}$) in the indoors and the same are in between 931 and 2045 $\mu\text{Gy}/\text{y}$ in the outdoors.

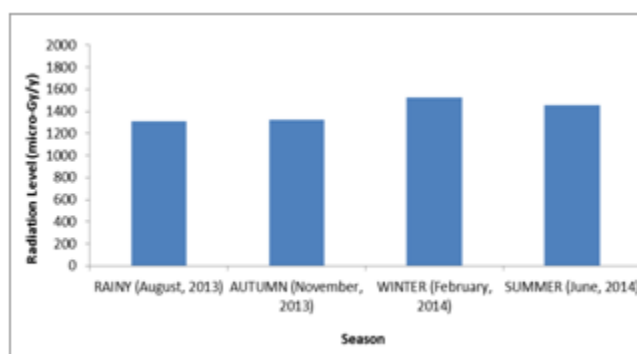


Fig.1: Seasonal variation of natural background radiation levels

Elevated levels at Peddur village can be attributed to the presence of uranium content in the local rocks [6]. The overall effect of building materials and their shielding efficiency gives rise to the indoor and outdoor ratio which is found to vary between 0.68 and 1.22 in the present study. In different countries of the world, this ratio is varying between 0.70 and 1.8 with an average of 1.2 [1]. An attempt has been made to observe the seasonal variations in the natural background gamma radiation levels (Fig.1). A little higher value in the winter season can be attributed to the behavior of the dwellers. Doors and windows are generally closed in the winter season to conserve the heat. This causes the buildup of the radioactive gases like radon and thoron, which in turn leads to relatively higher values of natural background gamma radiation levels.

A modest attempt has also been made to verify the variation of natural background gamma radiation levels with different types of houses. It is observed from the Figs.2 and 3 that bare floorings and mud walled dwellings have recorded low levels of radiation in contrary to the observations made in our earlier studies [8]. This will be investigated in detail through the elemental analysis of the local soil in a separate study which is under progress.

Table

The annual average values of natural background gamma radiation levels measured at different locations.

LOCATION	Type of Roof	Type of Wall*	Type of Floor	Annual Average Indoor Natural background gamma radiation levels ($\mu\text{Gy y}^{-1}$)	Annual Average Outdoor Natural background gamma radiation levels ($\mu\text{Gy y}^{-1}$)	Indoor to outdoor ration	
Choppadandi-1	Tiled	Mud	Limestone	1094	979	1.12	
Choppadandi-2	Tiled	PB	Limestone	1258	1046	1.20	
Choppadandi-3	Tiled	Mud	Bare	979	931	1.05	
Gangadhara-1	Concrete	PB	Granite	1430	1277	1.12	
Gangadhara-2	Concrete	PB	Marble	931	1373	0.68	
Karimnagar Town - 1	Concrete	PP	Marble	1766	1661	1.06	
Karimnagar Town - 2	Concrete	PP	Marble	1843	1728	1.07	
Karimnagar Town - 3	Concrete	PP	Marble	1450	1440	1.01	
Karimnagar Town - 4	Concrete	PB	Marble	1526	1507	1.01	
Karimnagar Town - 5	Concrete	PB	Marble	1478	1440	1.03	
Karimnagar Town - 6	Concrete	PP	Marble	1536	1421	1.08	
Manakonduru	Tiled	PB	Concrete Cement	1632	1363	1.20	
Pedduru	Concrete	PB	Limestone	2323	1901	1.22	
Podur	Tiled	PB	Limestone	1603	1392	1.15	
Rekurthy	Tiled	PB	Marble	1651	1459	1.13	
Vankayagudem-1	Concrete	PB	Limestone	1920	2035	0.94	
Vankayagudem-2	Tiled	PB	Limestone	2218	2045	1.08	
				A.M.	1567	1470	1.07
				S.D.	384	328	0.13
				Minimum	931	931	0.68
				Maximum	2323	2045	1.22

*PB: Brick Plastered, PP: Brick Plastered and Painted

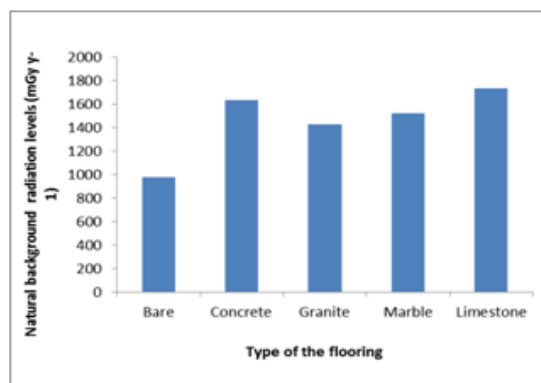


Fig.2: Variation of natural background radiation levels with different type of floorings.

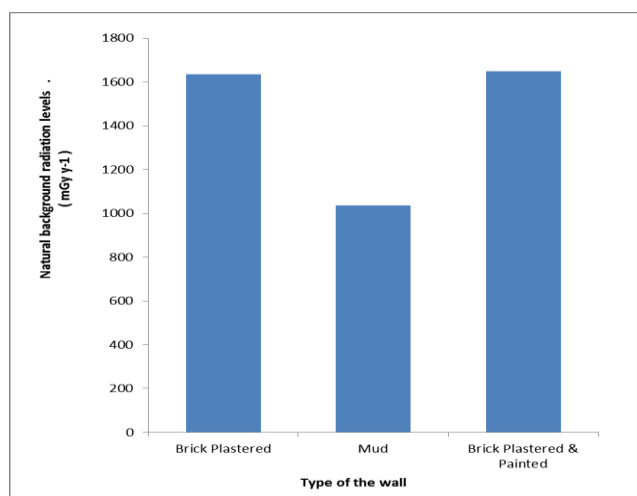


Fig.3: Variation of natural background radiation levels with different type of walls.

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