PP-10

Radiation Monitoring around Cancer Hospital Campus and Evaluation of Radiological Risk on Public Health

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The objective of the present work is to:

(i) Monitor the real-time dose rate around the National Institute of Cancer Research and Hospital campus (Mohakhali) and calculation of the annual effective dose on public who are living nearby the hospital;

(ii) Evaluation of the excess life-time cancer risk (ELCR) on public health based on the real-time radiation data.

Introduction:

The natural gamma radiation dose rate is an important contribution to the average dose rate received by the world's population. Various surveys of indoors & outdoors gamma radiation have been performed in advanced countries, but relatively few have been conducted in developing countries. Estimation of the radiation dose distribution is important in assessing the health risk to a population, and to serve as the reference in documenting changes to environmental radioactivity in soil due to human activities. Large variations in dose rates due to environmental gamma radiation are found depending on where the measurement is made. Human beings are exposed indoors & outdoors to the natural gamma radiation that originates predominately from the upper 30 cm of the soil materials.

Biological effects of ionizing radiation on human are evaluated based on the effective absorbed dose rate. Annual effective absorbed dose from background gamma radiation was determined using the algorithm below :

$E_{total} = E_{Out} + E_{In} = (D_{Out} \times OF_{Out} + D_{In} \times OF_{In}) \times T \times CC$

$E_{Out} = T \times D_{Out} \times CC \times OF_{out}$

$E_{In} = T \times D_{In} \times CC \times OF_{In}$

Where E_{total} is the total annual effective absorbed dose rate (mSv/y), E_{In} is the indoor annual effective absorbed dose rate (mSv/y), E_{Out} is the outdoor annual effective absorbed dose rate (mSv/y), T is time in hours (8760 hours for a year), D_{In} is the absorbed dose rate in indoor (nSv/h), D_{Out} is the absorbed dose rate in outdoor (nSv/h), OF_{In} is the indoor occupancy factor (80% for indoor), OF_{out} is outdoor occupancy factors (20% for outdoor) and CC is Conversion coefficient ($0.7\ Sv \cdot Gy^{-1}$ for adult) reported by UNSCEAR (2000) to convert absorbed dose in air to the effective dose in human.

Fig.1: In-Situ gamma-ray dose rate monitoring set up.

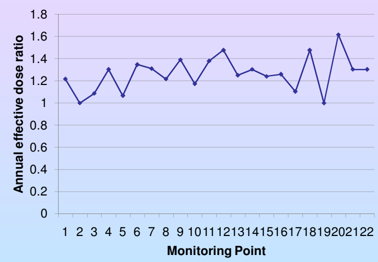

Fig.2: Outdoor annual effective dose values normalized to the minimum annual effective dose for each MPs

Materials and Methods:

A portable gamma scout detector was used. The study was conducted in the months of January-February 2021. The field measurement of environmental gamma radiation was based on the assumption that there exist laterally uniform distribution of natural radionuclides in the environment and that the vertical contribution from the soil is limited to the first horizon (10 cm to 30 cm). Measurements were performed thirty two locations around cancer hospital. The outdoor environmental gamma radiation dose was measured for 1h for each monitoring place using portable Gamma-scout detector through in-situ technique. The detector was set on a tri-pod at 1m height from the ground level.

Results & Discussion :

The measured outdoor environmental gamma radiation dose rates due to natural sources of radionuclides were ranged from 0.115 ± 0.042 $\mu Sv.h^{-1}$ to 0.186 ± 0.051 $\mu Sv.h^{-1}$ with an average of 0.145 ± 0.044 $\mu Sv.h^{-1}$. The annual effective dose to the population from outdoor environmental gamma radiation was varied from 0.201 ± 0.073 mSv to 0.326 ± 0.090 mSv with an average of 0.255 ± 0.073 mSv. No artificial radionuclides were observed in this study. From this study, it can be concluded that there is no radiation burden to environment due to man-made sources.

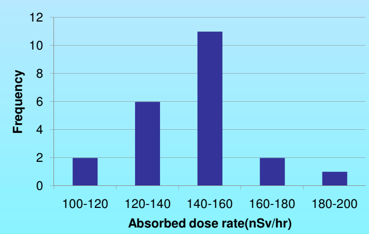

Fig.3: Frequency distribution of the absorbed dose rates ($nSv.h^{-1}$) around the Cancer Hospital in Dhaka City .

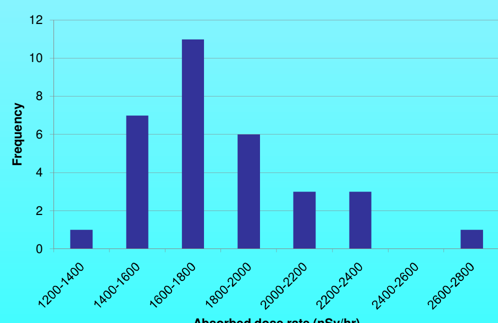

Fig.4: Frequency distribution of the absorbed dose rate (nSv/hr) around Cancer Hospital in Mohakhali.

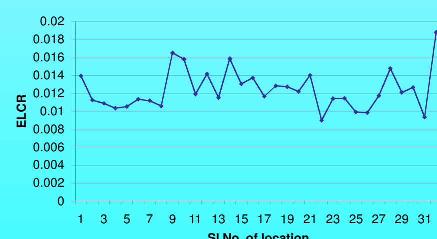

Fig.5: Excess life-time cancer risk (ELCR) on public health who are Living nearby the hospital.

Conclusion:

This kind of study is required to detect the presence of natural radionuclides and artificial radionuclides (if any) releasing from radiological facility such as hospital

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