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Survey of Indoor Radon/Thoron Concentrations in High Lung Cancer Incidence Area in India

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Abstract : Mizoram state has the highest lung cancer incidence rate in India due to its high-level consumption of tobacco and its products which is supplemented by the food habits. While smoking is mainly responsible for this incidence, the effect of inhalation of indoor radon gas cannot be discarded as the hazardous nature of this radioactive gas and its progenies on human population have been well-established worldwide where the radiation damage to bronchial cells eventually can be the second leading cause of lung cancer next to smoking. It is also known that the effect of radiation, however, small may be the concentration, cannot be neglected as they can bring about the risk of cancer incidence. Hence, estimation of indoor radon concentration is important to give a useful reference against radiation effects as well as establishing its safety measures and to create a baseline for further case-control studies. The indoor radon/thoron concentrations in Mizoram had been measured in 41 dwellings selected on the basis of spot gamma background radiation and construction type of the houses during 2015-2016. The dwellings were monitored for one year, in 4 months cycles to indicate seasonal variations, for the indoor concentration of radon gas and its progenies, outdoor gamma dose, and indoor gamma dose respectively. A time-integrated method using Solid State Nuclear Track Detector (SSNTD) based single entry pin-hole dosimeters were used for measurement of indoor Radon/Thoron concentration. Gamma dose measurements for indoor as well as outdoor were carried out using Geiger Muller survey meters. Seasonal variation of indoor radon/ thoron concentration was monitored. The results show that the annual average radon concentrations varied from 54.07 – 144.72 Bq/m^3 with an average of 90.20 Bq/m^3 and the annual average thoron concentration varied from 17.39 – 54.19 Bq/m^3 with an average of 35.91 Bq/m^3 which are below the permissible limit. The spot survey of gamma background radiation level varies between 9 to 24 µR/h inside and outside the dwellings throughout Mizoram which are all within acceptable limits. From the above results, there is no direct indication that radon/thoron is responsible for the high lung cancer incidence in the area. In order to find epidemiological evidence of natural radiations to high cancer incidence in the area, one may need to conduct a case-control study which is beyond this scope. However, the derived data of measurement will provide baseline data for further studies.

Keywords : background gamma radiation, indoor radon/thoron, lung cancer, seasonal variation
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