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and the Way Forward**

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## **Seasonal variation impacts of airborne radon levels and its progeny in public hospitals: Case study in Kurdistan region**

### Abstract

This study involves the assessment of seasonal exposure dose and health risks of indoor radon in public hospitals of Iraqi Kurdistan using CR-39 nuclear track detectors (NTDs) for all seasons of the year. The results showed that indoor radon depends on the geological formation, type of building material, and ventilation rate. The highest and lowest values of rate indoor radon were recorded in winter ( $105.25 \pm 17.16$  Bq/m<sup>3</sup>) and summer ( $39.84 \pm 8.14$  Bq/m<sup>3</sup>) season, respectively. The high level of indoor radon was due to poor ventilation rate, while the low levels were a result of high ventilation rate. Furthermore, estimated risk factors of radon-induced lung cancer in public hospitals were shown to vary from  $2.7 \pm 0.08$  to  $11.16 \pm 1.94$  per million persons. The results also show that the indoor radon concentration for the ground level was much higher than the first and second levels. The highest and lowest values of internal radiation dose were recorded in the winter and summer seasons, respectively. 62.5% of internal radiation dose in the winter season ranged between 0.6 - 0.7  $\mu$ Sv/h, which is less than that recorded within the summer season (0.1 - 0.14  $\mu$ Sv/h). The highest radon exhalation rate and radium content was recorded in the sand samples and the lowest in ceramic tile, which depends on high porosity and rate of radium content in the sand samples.

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