

Annual Effective Dose Associated with Radon in Groundwater Samples from Mining Communities Within the Ife-Ilesha Schist Belt, Southwestern Nigeria.

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Abstract : In this study, the activity concentration of ^{222}Rn in groundwater samples collected from gold and kaolin mining communities within the Ife-Ilesha schist belt, southwestern Nigeria, with their corresponding annual effective doses have been determined using the DurrIDGE RAD-7, radon-in-water detector. The mean concentration of ^{222}Rn in all the groundwater samples was 13.83 Bq l^{-1} . In borehole water, ^{222}Rn had a mean value of 20.68 Bq l^{-1} , while it had a mean value of 11.67 Bq l^{-1} in well water samples. The mean activity concentration of radon obtained from the gold mining communities ranged from 1.6 Bq l^{-1} from Igum town to 4.8 Bq l^{-1} from Ilesha town. A higher mean value of 41.8 Bq l^{-1} was, however, obtained from Ijero, which is the kaolin mining community. The mean annual effective dose due to ingestion and inhalation of radon from groundwater samples was obtained to be $35.35 \mu\text{Sv yr}^{-1}$ and $34.86 \text{ nSv yr}^{-1}$, respectively. The mean annual ingestion dose estimated for well water samples was $29.90 \mu\text{Sv yr}^{-1}$, while $52.85 \mu\text{Sv yr}^{-1}$ was obtained for borehole water samples. On the other hand, the mean annual inhalation dose for well water was $29.49 \text{ nSv yr}^{-1}$, while for borehole water, $52.13 \text{ nSv yr}^{-1}$ was obtained. The mean annual effective dose due to ingestion of radon in groundwater from the gold mining communities ranged from $4.10 \mu\text{Sv yr}^{-1}$ from Igum to $13.1 \mu\text{Sv yr}^{-1}$ from Ilesha, while a mean value of $106.7 \mu\text{Sv yr}^{-1}$ was obtained from Ijero kaolin mining community. For inhalation, the mean value varied from 4.0 nSv yr^{-1} from Igum to 12.9 nSv yr^{-1} from Ilesha, while $105.2 \text{ nSv yr}^{-1}$ was obtained from the kaolin mining community. The mean annual effective dose due to ingestion and inhalation is lower than the reference level of $100 \mu\text{Sv yr}^{-1}$ recommended by World Health Organization except for values obtained from Ijero kaolin mining community, which exceeded the reference levels. It has been concluded that as far as radon-related health risks are concerned, groundwater from gold mining communities is generally safe, while groundwater from kaolin mining communities needs mitigation and monitoring. It has been discovered that Kaolin mining impacts groundwater with ^{222}Rn than gold mining. Also, the radon level in borehole water exceeds its level in well water.

Keywords : ^{222}Rn , Groundwater, Radioactivity, Annual Effective Dose, Mining.

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