UMYU Scientifica, Vol. 2 NO. 3, September 2023, Pp 020 – 026
https://doi.org/10.56919/usci.2323.004
ISSN: 2955 – 1145 (print); 2955 – 1153 (online)
A periodical of the Faculty of Natural and Applied Sciences, UMYU, Katsina

REVIEW ARTICLE

A Review of Radon Concentration in Water Sources in Nigeria and its Impact.

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ABSTRACT

Given the characteristics of radon, people may unwittingly be exposed to radon through water ingestion. Research on radon concentration has increased over the years due to its negative impact on the body being the major causes of lung cancer. This study reviewed twenty (20) journal publications on radon concentration in water sources (such as well, boreholes, stream and taps) in Nigeria from year the 2016 to 2023. The type of sample, sample location, devices used, the range and mean values of radon concentration (RnC) and annual effective dose (AED) were considered. From the reviewed journals, the average values of RnC ranged from 1.9 Bq/L to 88.0 Bq L^{-1}. When compared with WHO and US EPA recommended limits of 100 Bq L^{-1} and 11.1 Bq L^{-1} respectively, all reviewed journals recorded average values of RnC below 100 Bq L^{-1} and 75 % of the reviewed journals recorded average values of RnC above US EPA recommended limit of 11.1 Bq L^{-1}. The mean AED reported is within the range of 0.02 mSv yr^{-1} and 92 mSv yr^{-1} with 30 % above the recommended limit of 0.1mSv yr^{-1}. This result shows that the majority of the radon concentration in water sources in Nigeria reported may not pose any immediate health risk. However, there is a need for continuous monitoring and protective measures to be taken.

ARTICLE HISTORY

Received June 16, 2023.
Accepted September 04, 2023.
Published September 30, 2023.

KEYWORDS

Radon concentration, Annual Effective Dose (AED), Water, Nigeria.

INTRODUCTION

Radon (Rn) is a naturally occurring radioactive noble gas with three major isotopes, namely; radon (^{222}Rn), thoron (^{220}Rn) and actinium (^{219}Rn) with half-lives of 3.8 days, 55.8 seconds and 3.98 seconds each (Belete & Anteneh, 2021). These isotopes occur due to the spontaneous decay of ^{232}Th or ^{234}U and ^{238}U which exists in soil, rocks, and air. While ^{220}Rn is a byproduct of the alpha decay of ^{224}Rn in the ^{232}Th decay series, ^{222}Rn is part of the ^{238}U decay series (Schwela & Kotzias, 2005; Tarago, 2012). The significance of ^{222}Rn is because of how highly abundant its weight is compared to the overall combination of other isotopes of radon; hence, the name 'radon' refers solely to this substance (Vogiannis & Nikolopoulus, 2015). ^{222}Rn exists in soil, water, and air, due to its instability, it disintegrates into four (4) radioactive decay products called progeny, namely, polonium (^{218}Po), bismuth (^{214}Bi), lead (^{214}Pb) and polonium (^{214}Po) (Belete & Anteneh, 2021). Among all the radon progeny, ^{218}Po and ^{214}Pb, which emit alpha particles, are responsible for most radon damage (over 85%) from radon exposure (Gilmore *et al.,* 2005).

The ground is the principal source of radon. It emanates from rock, soil, and building materials, such as concrete, cement and paint, and diffuses into buildings through the floor, holes and cracks in the walls (WHO, 2023). It may also diffuse from rocks in the crust of the Earth into water, and exists in water sources, such as groundwater and surface water, in varying proportions due to its solubility in water (USEPA, 2003). Due to changes in the concentration of radium-226 (^{226}Ra) and thorium (^{232}Th) existing in the soil, the level of radon and its daughters change considerably with time (Vogiannis and Nikolopoulus, 2015). The amount of Rn present in water is affected by the temperature of the groundwater, depth, location, season, and rock type (Nagaraja *et al.,* 2019).

Radon exposure happens when people come into touch with radon atoms (Olusegun *et al.,* 2015). ^{222}Rn can enter the body through the ingestion of contaminated water or inhalation of contaminated air. Upon ingestion or inhalation, this radioactive gas decays into its progeny and release alpha particles that trigger lung cancer (Ajibola *et al.,* 2021). The radioactive decay of the ionizing radiation produced by the inhalation and ingestion of radon continuously damages the cells in fragile organs, such as the stomach and lung, which damages the nucleic acid and result in cancer (ICRP, 2013). Radon is the second major cause of lung cancer in people, right after tobacco usage.

The danger of radon at higher concentrations and its potential role in developing many lung cancers cannot be overstated (Darby *et al.,* 2005). Because of the public's growing interest in cancer over the past few years, research

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How to cite: Bashir, M., Kanu, F. C., & Suleiman, I. K. (2023). A Review of Radon Concentration in Water Sources in Nigeria and its Impact. *UMYU Scientifica*, 2(3), xx – xx. https://doi.org/10.56919/usci.2323.004

on radon has become vital. The United States and other wealthy nations have recognized the negative effect it brings on human health and is attempting to limit human exposure. The World Health Organization (WHO) issued a rule in 2003 that established 100 Bq L^{-1} as the maximum value for ^{222}Rn concentration in drinking water (Catao *et al.,* 2022), while the United States Environmental Protection Agency (USEPA) established a maximum limit of 11.1 Bq L^{-1} (US EPA, 1999). In Nigeria, few people are aware of radon and few data on radon concentration and its potential risks are available (Olusegun *et al.,* 2015). Therefore, it is vital to have more databases on radon concentration in water sources, such as borehole, well, and tap, and how vulnerable those who consume drinking water that may have high radon concentrations are.

This review provides detailed information on previous research on radon concentration in water sources and its possible health effects, which will further increase awareness of radon concentration in Nigeria.

MATERIALS AND METHOD

Twenty (20) journal publications on radon concentration in Nigeria's water sources from year 2016 to 2023 were reviewed. The type of sample, sample location, devices used for measurements, the range and mean values of radon concentration (RnC) and annual effective dose (AED) were considered. The reviewed articles were categorized based on the RnC average values being below or above the World Health Organization (WHO) and European Union (EU) recommended limits of 100 Bq L^{-1} or United State Environmental Protection Agency (US EPA) recommended limits of 11.1 Bq L^{-1} for drinking water. Also, the number of reviewed journal publication with AED average values below or above the safe limit of 0.1 mSv yr^{-1} suggested by WHO, US EPA, and EU.

RESULTS AND DISCUSSION

Due radon affecting health, research on radon concentration (RnC) in water sources has been conducted in Nigeria using devices such as RAD7 radon detectors and Liquid Scintillation Counters (LSC). This study comprises the review of twenty (20) journal publications on radon concentration in water sources in Nigeria from 2016 to 2023.

Kolo *et al.* (2023) measured the radon concentration in hand-dug Wells and boreholes in the Bosso Community. Twenty (20) samples of the two groundwater sources were assayed using a RAD7 radon detector coupled with RAD-H_2O accessories. RnC in the samples varied between 1.5±0.6Bq L^{-1} and 42.5±3.1Bq L^{-1} with average values of 9.8±1.9Bq L^{-1} and 24.8±2.5Bq L^{-1} respectively. The average AED was 0.026mSv yr^{-1} and 0.067mSv yr^{-1} respectively, below the safe limit suggested by the EU. The RnC in drinkable water was widely below the reference level established by the European Union Commission.

Farai *et al.* (2023) examined the radon concentration in fifty-eight (58) drinking water samples in different locations in Abeokuta. Twenty-five (25) samples from hand-dug wells and thirty-three (33) from boreholes were analyzed using the RAD7 radon monitor system. The results showed that radon concentration in drinking water samples taken from boreholes varied from 10.65Bq L^{-1} to 29.5Bq L^{-1} with a mean value of 18.8Bq L^{-1}, while the measured samples from hand-dug wells varied between 1.4Bq L^{-1} and 20.0Bq L^{-1} with a mean value of 9.7Bq L^{-1}. Hundred percent of borehole and forty eight percent of hand-dug well water samples had RnC above the US EPA recommended limit. The mean values of the AED due to ingestion and inhalation of radon from hand-dug wells and boreholes were 0.027mSv yr^{-1} and 0.051mSv yr^{-1}, respectively, below the limit US EPA recommended.

Ajiboye *et al.* (2022) assessed radon levels in 145 groundwater samples from Southwestern Nigeria using RAD7 electronic detector with RadH_2O accessories. RnC in the samples varied from 1.6Bq L^{-1} to 271Bq L^{-1} with a mean value of 35.9±38.4Bq L^{-1}. In the given order, the AED was 29mSv yr^{-1}, 41mSv yr^{-1} and 92mSv yr^{-1} for infants, children and adults in the given order. The total mean value of RnC in the samples is above the safe limit recommended by US EPA.

Dosunmu *et al.,* (2022) assessed the radon concentration in twenty (20) well water samples along Iwaraja-Ifewara Faults, Southwestern, Nigeria, using a RAD7 radon detector. With a total average value of 45.8±85.9Bq L^{-1}, RnC in the samples varied between 5.0Bq L^{-1} and 400.1Bq L^{-1}. About 70 % of the samples exceeded US EPA recommended limit. The average value of the AED was 59.4Sv yr^{-1}, which is lower than US EPA recommended limit.

Mostafa *et al.* (2022) measured radon concentration in sixteen (16) water samples (from wells, boreholes, and sachet water precisely) from six (6) locations in Ojo, Lagos State using RAD7. The RnC in the samples varied between 10.8±5.2Bq L^{-1} and 30.4±2.0Bq L^{-1} with an overall average value of 18.8±7.4Bq L^{-1}, above limit US EPA recommended. The overall AED is above the safe limit recommended by the EU.

Shu'aibu *et al.* (2021) assayed ten (10) groundwater samples of Gadau, Bauchi State, Nigeria for radon measurement using RAD7 alpha spectrometry. RnC in the samples varied between 4.9Bq L^{-1} and 82.9Bq L^{-1} with an average value of 38.3Bq L^{-1}, above US EPA recommended limit. The average values of the AED due to ingestion and inhalation were 8.05μSy yr^{-1} and 0.10μSv yr^{-1} respectively, below recommended limit set by WHO.

Dankawu *et al.* (2021) use a liquid Scintillation Counter to measure the radon concentration in twenty-two (22) boreholes and well water samples of Dutse, Jigawa State. The RnC varied between 31.2Bq L^{-1} and 273.2Bq L^{-1} with average values of 82.8Bq L^{-1} and 94.1Bq L^{-1} for borehole and well water samples respectively. The average values of AED due to ingestion of radon for infants, children and adults, were 1.06mSv yr^{-1} and 1.20mSv yr^{-1}, 0.91mSv yr^{-1} and 1.03mSv yr^{-1}, 0.60mSv yr^{-1} and 0.69mSv yr^{-1} for borehole and well water respectively. The mean values of RnC and AED are above the limit recommended by US EPA.

Jidele *et al.* (2021) employed a RAD7 radon detector to assay a total of twenty (20) groundwater samples around Ota, Ogun State, Nigeria for radon measurement. RnC values ranged from 34.5Bq L^{-1} to 2.3Bq L^{-1} with a mean value of 7.7Bq L^{-1}. Fifteen percent of the samples were found to have RnC higher than US EPA recommended limit, whereas the mean value is below the recommended limit. The AED varied between 0.017mSv yr^{-1} and 0.252mSv yr^{-1} with a mean of 0.056mSv yr^{-1}, which is below the US EPA recommended limit.

Ajibola *et al.* (2020) uses RAD7 to measure the radon concentration in drinking water from the Gold and Bismuth mining area of Edu, Kwara State. A total of seventeen (17) water samples (including surface water and groundwater) were collected, and it was recorded that the RnC in surface water varied between 16.2±3.5Bq L^{-1} and 24.7±4.5Bq L^{-1} with an average value of 19.1±3.9Bq L^{-1}. The RnC for groundwater varied between 21.6±3.3Bq L^{-1} and 27.9±5.7Bq L^{-1} with a mean of 24.2±4.2Bq L^{-1}. The total mean values of AED due to radon ingestion and inhalation for surface water were 187.9μSv yr^{-1}, 257.84μSv yr^{-1} and 292.77μSv yr^{-1} for adults, children and infants respectively, whereas that of groundwater were 237.25μSv yr^{-1}, 325.44μSv yr^{-1}, and 379.53μSv yr^{-1} for adults, children, and infants in the given order. Both RnC and AED for all the samples were above the permissible limits set by USEPA.

Kalip (2020) measured the radon concentration in two (2) water sources (borehole and well water precisely) in Jos, Plateau State, a using RAD7 radon detector. The values of RnC obtained from nineteen (19) samples of these water sources ranged from 2.8Bq L^{-1} to 59.4Bq L^{-1}, and the mean value was 17.0Bq L^{-1}. Thirteen (13) samples had RnC above the US EPA recommended limits.

Abdullahi *et al.* (2020) assessed radon concentration in eleven (11) groundwater samples of the Riruwai Mine Site and surrounding-, Kano State using RAD7. The RnC are within the range of 0.5 Bq L^{-1} and 5.1 Bq L^{-1} with a mean value of 2.4 Bq L^{-1}. The results showed that all the samples had RnC below US EPA and EU recommended limits respectively. The AED due to radon ingestion in the groundwater varied between 0.00386mSv yr^{-1} and 0.03744mSv yr^{-1} with an average value of 0.01706mSv yr^{-1}, within the safe limit.

Oni *et al.* (2019) analyzed the concentration of radon gas in Ogbomoso, Oyo State using RAD7. Thirty (30) water samples were evaluated and the RnC is within the range of 0.6±0.4Bq L^{-1} and 2.6±0.8Bq L^{-1} with a mean value of 1.9±0.7Bq L^{-1}, while the AED due to radon ingestion ranged between 6.25×10^{-3}mSv yr^{-1} and 1.93×10^{-2}mSv yr^{-1}, with an average value of 0.02mSv yr^{-1}. The RnC for the sampled water sources are below USEPA, and EU recommended limit.

Faweya *et al.* (2018) evaluated the radon concentration in twenty spring water samples located in Ekiti West local government of Ekiti state using a RAD7 radon analyzer. The RnC values in bottled, cold and warm spring water samples varied between 0.07Bq L^{-1} and 0.36Bq L^{-1}, 3Bq L^{-1} and 210Bq L^{-1}, and 11.7Bq L^{-1} and 140.0Bq L^{-1} with average values of 0.20Bq L^{-1}, 75.9Bq L^{-1} and 79.4Bq L^{-1} respectively. The average RnC and AED results are within US EPA, and WHO recommended reference levels respectively.

Akinnagbe *et al.* (2018) assayed forty (40) borehole, well, and stream water samples of ground water in Ijero Ekiti using the RADH$_2$0 alpha spectroscopy method. RnC in the samples are within the range of 0.2Bq L^{-1} and 78.5Bq L^{-1}. Forty-five percent of the samples had RnC above the US EPA recommended limit.

Joseph *et al.* (2018) analyzed the radon concentration in some selected water sources in Dutsi-Ma, Katsina state, using a liquid Scintillation Counter. RnC varied from 11.7Bq L^{-1} to 152.8Bq L^{-1}, 0.6Bq L^{-1} to 172.3Bq L^{-1}, and 21.9Bq L^{-1} to 47.2Bq L^{-1} with mean values of 64.66Bq L^{-1}, 41.15Bq L^{-1} and 34.57Bq L^{-1} for borehole, open well and surface water samples, respectively. 86.67 % exceed US EPA recommended limit. The average values of the AED in the study area exceeded the recommended limit.

Gyuk *et al.* (2017) use Liquid Scintillation Counter to determine the radon concentration in groundwater and surface water sources from Idah and its environs. RnC in the borehole, well, and surface water samples ranged from 4.7Bq L^{-1} to 24.0Bq L^{-1} with an average value of 10.2Bq L^{-1}, 5.7Bq L^{-1} to 13.6Bq L^{-1} with an average value of 12.3Bq L^{-1}, and 1.9Bq L^{-1} to 4.5Bq L^{-1} with an average value of 3.1Bq L^{-1}, respectively. The average values of borehole and surface water samples are below the limit recommended by US EPA recommended, while that of well water exceeded the recommended limit. The mean value of the overall AED by ingestion was 0.0412mSv yr^{-1} below the limit recommended.

A liquid scintillation counter was used to examine radon concentration in drinking water in some selected areas of Sokoto by Adetoro *et al.* (2017). Twenty (20) groundwater samples (6 well wate,r and 14 borehole water) were assayed in the research. RnC in the well and borehole water samples varied between 4.1Bq L^{-1} and 22.9Bq L^{-1} with mean values of 12.0Bq L^{-1} and 10.0Bq L^{-1} respectively. The mean value of the AED due to ingestion for well water and borehole water were 0.087mSv yr^{-1} and 0.074mSv yr^{-1}, respectively.

Isinkaye and Abejoye (2017) used RAD7 electronic radon detector to test the concentration of radon in fifty-two (52) samples of drinking water from Ekiti State. Three (3) different well types (namely; deep wells, hand-dug well with removable covers, and hand-dug well with manual pumps) were considered. RnC in all the samples are within the range of 2.1Bq L^{-1} and 206.1Bq L^{-1} with a total average value of 34.3 ± 43.0Bq L^{-1}. Hand-dug wells with manual pumps had the highest RnC, while hand-dug wells with

Table 1: Summary of the Results

Author	Sample Location	Sample Type	Number of Sample	Device Used	Results (Bq L^{-1})	Conclusion
Kolo *et al.,* (2023)	Bosso community, Niger state	Wells and boreholes	20	RAD7 radon detector	Range: 1.5-42.5 Mean: 17.3	Above US EPA recommended limit of 11.1Bq L^{-1}
Farai *et al.,* (2023)	Abeokuta	Groundwater	58	RAD7 radon detector	Range: 1.4-29.5 Mean: 14.3	Above US EPA recommended limit of 11.1Bq L^{-1}
Ajiboye *et al.,* (2022)	Akoko, Ondo State	Groundwater	145	RAD7 radon detector	Range: 1.6-27.0 Mean: 35.9	Above US EPA recommended limit of 11.1Bq L^{-1}
Dosunmu *et al.,* (2022)	Ilesha, Southwestern Nigeria	Groundwater	20	RAD7 radon detector	Range: 5.0-400.1 Mean:45.8	Above US EPA recommended limit of 11.1Bq L^{-1}
Mostafa *et al.,* (2022)	Ojo, Lagos State	Groundwater and surface water	16	RAD7 radon detector	Range: 10.8-30.4 Mean: 18.8	Above US EPA recommended limit of 11.1Bq L^{-1}
Shu'abu *et al.,* (2021)	Gadau, Bauchi State	Groundwater	10	RAD7 radon detector	Range: 4.9-82.9 Mean: 38.3	Above US EPA recommended limit of 11.1Bq L^{-1}
Dankawu *et al.,* (2021)	Dutse, Jigawa State	Groundwater	22	Liquid Scintillation Counter	Range: 31.2-273.2 Mean:88.0	Above US EPA recommended limit of 11.1Bq L^{-1}
Jidele *et al.,* (2021)	Ota, Ogun State	Groundwater	20	RAD7 radon detector	Range: 2.3-34.5 Mean: 7.7	Below US EPA recommended limit of 11.1Bq L^{-1}
Ajibola *et al.,* (2020)	Edu, Kwara State	Groundwater and surface water	17	RAD7 radon detector	Range: 16.2-27.9 Mean: 21.7	Above US EPA recommended limit of 11.1Bq L^{-1}
Kalip (2020)	Jos, Plateau Stae	Groundwater	19	RAD7 radon detector	Range: 2.8-27.9 Mean:17.0	Above US EPA recommended limit of 11.1Bq L^{-1}
Abdullahi *et al.,* (2020)	Doguwa, Kano State	Groundwater	11	RAD7 radon detector	Range: 0.5-5.1 Mean: 2.4	Below US EPA recommended limit of 11.1Bq L^{-1}
Oni *et al.,* (2019)	Ogbomoso, Oyo State	Groundwater	30	RAD7 radon detector	Range: 0.6-2.6 Mean: 1.9	Below US EPA recommended limit of 11.1Bq L^{-1}
Faweya *et al.,* (2018)	Ekiti West	Spring water	20	RAD7 radon detector	Range: 0.1-210.0 Mean: 77.8	Above US EPA recommended limit of 11.1Bq L^{-1}
Akinnagbe *et al.,* (2018)	Ijero, Ekiti State	Groundwater and surface water	40	RAD7 radon detector	Range: 0.2-78.5 Mean	Below US EPA recommended limit of 11.1Bq L^{-1}
Joseph *et al.,* (2018)	Dutsin-Ma, Katsina State	Groundwater and surface water	15	Liquid Scintillation Counter	Range: 0.6-172.3 Mean: 46.8	Above US EPA recommended limit of 11.1Bq L^{-1}
Gyuk *et al.,* (2017)	Idaho, Kogi State	Ground and surface water	76	Liquid Scintillation Counter	Range: 1.9-24.0 Mean: 8.5	Below US EPA recommended limit of 11.1Bq L^{-1}
Adetoro *et a.,l* (2017)	Sokoto, Sokoto State	Groundwater	20	Liquid Scintillation Counter	Range: 4.1-23.0 Mean: 11.0	Within US EPA recommended limit of 11.1Bq L^{-1}
Isikaye & Abejoye (2017)	Ekiti State	Groundwater	52	RAD7 radon detector	Range: 2.1-206.1 Mean: 34.3	Above US EPA recommended limit of 11.1Bq L^{-1}
Aruwa *et al.,* (2017)	Idaho, Kogi State	Groundwater	20	Liquid Scintillation Counter	Range: 7.9-21.2 Mean:13.8	Above US EPA recommended limit of 11.1Bq L^{-1}
Oladipupo (2016)	Lapai, Niger State	Groundwater	7	Liquid Scintillation Counter	Range: 9.6-18.8 Mean: 14.4	Above US EPA recommended limit of 11.1Bq L^{-1}

removable covers had the least. The average value of RnC for all the samples exceeded the safe limit recommended by US EPA. The total AED due to ingestion and inhalation of radon ranged between 0.10mSv yr^{-1} and 0.41mSv yr^{-1} with a mean value of 0.17±0.22mSv yr^{-1}, which is within the limit recommended by WHO.

Aruwa *et al.* (2017) measured radon concentration in twenty (20) groundwater (that is, wells and boreholes) samples from eleven (11) locations in Idah, Kogi State, using Liquid Scintillation Counter (LSC). RnC in the water samples varied between 7.9±1.1Bq L^{-1} and 21.2±1.1Bq L^{-1}. The mean value for boreholes and well waters were 14.1±1.1Bq L^{-1} and 13.5±1.0Bq L^{-1} respectively with a total mean of 13.8±1.1Bq L^{-1}, above US EPA recommended limit. In given order, the mean values of the AED by ingestion for the two water supplies were 0.051 mSv yr^{-1} and 0.049 mSv yr^{-1}. These values are below ICRP recommended limit.

Oladipupo (2016), in research: radon concentration analysis of borehole and well water sources in Lapai, using Liquid Scintillation Counter, probed seven (7) samples of groundwater (3 well water samples and 4 borehole water samples) for radon. RnC in the samples varied between 9.6 ± 1.1Bq L^{-1} and 18.8 ± 1.2Bq L^{-1} with mean values of 14.5Bq L^{-1} and 14.3Bq L^{-1} for borehole and well water, respectively. The mean value of the AED was 2.8mSv yr^{-1}. The mean values of RnC and AED are above the limit recommended by US EPA.

This study reviewed twenty (20) journals on concentration of radon in water sources (groundwater and surface water precisely). The maximum average value of radon concentration was 88.0Bq L^{-1} which was found in water samples from the Dutse Local Government Area of Jigawa State, as recorded by Dankawu *et al.* (2021), while the minimum value of radon concentration was 1.9Bq L^{-1} which was found in the water samples from Ogbomoso, Oyo State, as recorded by Oni *et al.* (2019). All the twenty (20) journals reviewed recorded average values of radon concentration below the safe limit of 100Bq L^{-1} recommended limit by WHO, whereas five (5) journals recorded average values of radon below and fifteen (15) journals recorded average values of radon concentration above 11.1Bq L^{-1} limit recommended by US EPA. The mean AED reported is within the range of 0.02mSv yr^{-1} and 92mSv yr^{-1}, 30 % above the recommended limit of 0.1mSv yr^{-1}.

Research shows that the presence of radon in varying concentrations in water sources in Nigeria may be attributed to variations in geological structure, location, depth, season, rock type, aeration and the diffusion of radon into the air.

CONCLUSION

This research indicates that the radon concentration in water sources in most locations in Nigeria is below the WHO recommended limit of 100Bq L^{-1}. However, 75 % of locations covered in the reviewed journal publications had radon concentrations above the US EPA limit of 11.1Bq L^{-1}. The mean AED reported is within the range of 0.02mSv yr^{-1} and 92mSv yr^{-1} 30 % above the recommended limit of 0.1mSv yr^{-1}. This implies that the majority of the water sources in Nigeria reported in the reviewed journal publications may not pose any immediate health risk. Nevertheless, radon in drinking water from Nigeria should be measured using one of the following; RAD7, Liquid scintillation counter, gamma-ray spectrometer and protective measures should be taken to mitigate the radon concentration in drinking water. The protective measures that can be taken include: Keeping water supplies safe from contamination, since high radon concentrations are linked to serious health issues, and examining water supply systems to determine their radon levels and also subject them to aeration treatment, which is the most efficient method of eliminating radon from drinking water supplies.

In addition, more reviews of radon concentration that covers all regions in Nigeria should be carried out to have more databanks of reported radon concentration in Nigeria; this will help heighten the awareness of Nigerians on areas with high radon concentration and also enlighten them on the measures that can be taken to be protected from this gas.

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