ASSESSMENT OF RADON CONCENTRATION AND ITS HEALTH-RELATED HAZARDS IN THE DRINKING WATER SOURCES OF HAYATABAD TOWN AND ADJOINING AREAS, PESHAWAR, PAKISTAN

N. U. Khattak[*1], M. A. Shah[1], N. Ali[2] and M.T. Shah[3]

*[*1]National Centre of Excellence in Geology, University of Peshawar*

[2]Physics Division, PINSTECH, P.O. Nilore, Islamabad, Pakistan

[3]FATA University, Dara Adam Kheil

nimat_khattak@yahoo.com

Abstract

The radioactive gases, radon (^{222}Rn), as well as its decay products present in the environment are considered to be the main causes of radiation dosage to the community from radioactive materials. Presence of radon in drinking water causes radiation related health hazards both through the processes of inhalation and ingestion. A total of one hundred and three (103) drinking water samples were collected from different phases of the Hayatabad Township, Peshawar for the determination of their radon concentration with the RAD7 electronic apparatus. Out of a total of one hundred and three (103) water samples, tube wells, offices/parks, houses, schools, markets, and hospitals represent 25, 7, 34, 12, 8, 12 and 5 samples, respectively. The drinking water samples collected from Hayatabad Township have an average minimum, average maximum and average mean radon values of 7.33 $Bq1^{-1}$, 9.71 $Bq1^{-1}$ and 8.66 ± 0.11 $Bq1^{-1}$, respectively. Highest value of 18.5 ± 0.6 $Bq1^{-1}$ was recorded in the water sample from the southern Hayatabad in a tube well from Phase-I. The Lowest value of 1.34 ± 0.1 $Bq1^{-1}$ was recorded in the water sample of a storage tank of a house in Phase-II, southern Hayatabad. The mean annual effective dose to the stomach and lung due to ingestion and inhalation of radon gas for the residents of both the southern and northern Hayatabad have been computed to be 0.0018 ± 0.0002 mSv a^{-1} and 0.022 ± 0.002 mSv a^{-1}, respectively. The mean annual total effective dose due to ingestion and inhalation for the resident of the Township has been computed to be 0.023 ± 0.002 mSv a^{-1}. The mean annual effective dose of 0.0018 ± 0.0002 mSv a^{-1} due to drinking of water from different phases of the Hayatabad Township is lesser than the mean annual effective dose of 0.0025 mSv a^{-1} of UNSCEAR for ingestion. The average annual effective dose of 0.022 ± 0.0021 mSv a due to Inhalation from the drinking water of the Township is also lower than the maximum recommended dose of 0.025 mSv a^{-1} of UNSCEAR for inhalation. The average concentration of radon in tube well water of the southern Hayatabad is slightly higher than the average concentration of radon in tube well water of the northern Hayatabad. It has also been noted that tube wells which are in close proximity to the streams have elevated radon concentrations. All the dose levels are well below the action level of 0.1 mSv a^{-1} of WHO and the European Union (EU) as an annual effective dose received from the consumption of radon-rich drinking water.