ABSTRACT

Human beings are constantly exposed to natural radioactivity. This radiation is mainly from natural gamma rays and radon and its decay products. The gamma rays are as a result of the decay of primordial nuclides and their daughter radioactive nuclides present in the earth's crust. Radon is produced from the decay of ^{226}Ra and it diffuses to the indoor environment through cracks on the floor or from building materials containing radium and hence radon problem is mainly indoors. In Kenya, some parts have been identified as having high gamma radiation causing exposure to the public. These areas include Mrima Hill (Kwale), Homa Bay, Bufayo, Weast Pokot, Kitui, Nanyuki, Kerio Valley and Tura. It is therefore necessary to carry out studies on the levels of radiation and determine whether they are within safe limits. Kerio valley, which is the area of study in this work, has been identified as one of the areas with uranium traces associated with fluorite mineralisation. In this study an assessment of the natural radiation levels in this area was carried out and in addition the radon concentrations indoor as well in water that the public is exposed were determined. To measure the radiation levels, soil samples were collected from the area of study, Kerio valley, and analysed for gamma levels using gamma spectroscopy technique. Indoor ^{222}Rn and radon in water concentrations were measured using the E-perm system. The activity concentrations of the radionuche activity concentrations of the radionuclides present, the doses as well as the annual effective dose equivalents were calculated for the soils using conversion factors adopted from the UNSCEAR (1988 and 1993) reports. Similarly, the dose equivalents and the annual effective doses for ^{222}Rn concentrations were evaluated. For natural gamma radiation 74 samples were analysed. The soil samples yielded activity concentrations ranging from 194.54??2.89 to 995.77??5.48 Bq Kg-1 for ^{40}K, 17.04??0.43 to 122.4??0.94 Bq Kg-1 for ^{232}Th which was evaluated from the ^{212}Pb gamma line and 12.22??0.54 to 223.22??1.3 Bq Kg-1 for ^{238}U evaluated from the ^{214}Pb gamma line. The averages of concentration for each radionuclide is 606.59??3.59 Bq Kg-1 for ^{40}K, 46.11??2.29 Bq Kg-1 for ^{232}Th and 66.70??1.42 Bq Kg-1 for ^{238}U. The calculated annual effective dose average from the soils was found to be 0.091 mSv y-1. This is 5.5 times lower than the worlds average and safe limit for gamma rays of 0.46 mSv y-1 as reported by UNSCEAR (1993). The area average of indoor ^{222}Rn concentrations was observed to be 145??15.8 Bq m-3 with a range from 13.67??0.83 to 573.70??20.4 Bq m-3. All were within the safe limit set by IAEA and ICRP of 200-600 Bq m-3. Results of ^{222}Rn concentrations in water ranged from 0.53??0.16 to 25.19??2.77 Bq L-1 with an average of 5.73 Bq L-1. Only three water samples exceeded the US EPA limit of 11 Bq L-1