Title: Natural radioactivity and concomitant health hazards in Kovalam beach sediments, Tamil Nadu with physico-chemical and mineralogical analysis

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Abstract: The activity concentration of natural radionuclides in beach sediment samples collected from the tourist hotspot of Kovalam beach in Tamil Nadu was determined using NaI (Tl)-based gamma-ray spectrometry. The average activity concentrations of the radionuclides ^{238}U, ^{232}Th, and ^{40}K in sediment samples are 9.79 ± 1.6, 206.96 ± 12.1, and 325.01 ± 24.9 Bq kg^{-1}, respectively. The elevated concentrations of ^{232}Th in the studied samples are likely due to the presence of thorium-bearing minerals. To understand the health and environmental implications, several radiological indices such as radium equivalent activity (Ra_{eq}), absorbed dose rate (DR), annual effective dose equivalent (AEDE), external hazard index (H_{ex}), and gamma index (I_γ) were calculated and compared with the UNSCEAR reported reference levels. The activity ratios ($^{232}Th/^{40}K$ and $^{232}Th/^{238}U$) and the relationship between them have been studied to identify the sources of natural radionuclides in the study area. Multivariate statistical analysis provides information about the interrelationship within the radionuclides and radiological parameters.

Keywords: Natural radioactivity,Physico-chemical properties,Minerals,Radiological parameters, Activity ratios, Multivariate statistical approach

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