3.0. OBJECTIVES

3.1. Identification of the HBRA’s from south west – east coast of Tamil Nadu by ground radiometric survey

Identification of HBRA’s was carried using ground radiometric survey from south west to east coast of Tamil Nadu. The survey was carried out for 4 different seasons such as Winter, Pre-monsoon, Monsoon and Post-monsoon in the selected HBRA region. Based on the ground radiometric data, spatial analysis was carried out in order to determine the unknown values and seasonal variations in the study region. Also hot spot analysis was carried out to determine the high & low background radiation. Based on the ground radiometric survey the villages were categorized in to 5 blocks and, the annual outdoor effective dose to the public residing in each block was calculated.

3.2.a. Survey and identification of villages for recruiting subjects for duplicate diet samples (DDS)

The villages from the radiometric surveyed blocks were identified for volunteer recruitment from different families to participate in DDS samples collection. The preliminary survey was carried in each village and the volunteers were grouped into 4 such as children (1-11 y), adolescent (12-17 y), adults (18-45 y) and elderly (46+ y). From the volunteers, the 24 h intake of the duplicate diet samples were
collected for the analysis of natural radionuclides and recorded the intake of each age group helped us in the computation of ingestion dose and cancer risk assessment for the natural radionuclides.

3.2 b. Identification and collection of market basket samples (MBS) from agricultural fields, fish markets and farmhouse.

Based on the collected DDS and ground radiometric survey, the available food samples from the selected sites were identified and the locally grown vegetables in the agricultural fields or local vegetable markets, fish catching site in the fish markets, milk & meat products in the local farm house were collected. The collected food samples were grouped in to 12 food categories such as leafy vegetables, other vegetables, roots & tubers, spices & condiments, nuts, fruits, fish, dry fish, meat products, milk, cereals and pulses. The collected uncooked MBS were processed for the analysis of natural radionuclides

3.3. Calculation of annual food intake from DDS & MBS

The annual food intake of different age groups such as children (1-11 y), adolescent (12-17 y), adults (18-45 y) and elderly (46+ y) were computed for both DDS & MBS dietary samples. From the annual food intake, the ingestion dose levels were computed to assess the cancer risk assessment. For DDS, 24 h food intake data from all the volunteers participated during dietary sample collection will be used and for MBS the food intake data were taken from National Nutrition Monitoring Board (NNMB) for all the age groups.

3.4. Analysis of natural radionuclide’s ($^{238}$U, $^{234}$U, $^{232}$Th, $^{226}$Ra, $^{228}$Ra, $^{210}$Po & $^{40}$K) in DDS & MBS.

The DDS & MBS samples were analysed quantitatively for natural radionuclides. $^{238}$U, $^{234}$U, $^{232}$Th, & $^{210}$Po were radio-chemically separated and analysed in for $^{238}$U & $^{234}$U by alpha spectrometry, $^{210}$Po by alpha counter, $^{232}$Th by ICP-MS. Similarly $^{226}$Ra, $^{228}$Ra, & $^{40}$K were analysed by non-destructive method after secular equilibrium in gamma spectrometry. The analysed radionuclides were computed for annual intake of radionuclide and ingestion dose for different age groups.
3.5. Computation of ingestion dose for natural radionuclides by DDS & MBS

Prior to computation of ingestion dose, the annual intake of natural radionuclides were calculated from DDS & MBS for different age groups and expressed in Bq/y. The Natural radionuclide annual intake was computed along with ICRP dose coefficient for the ingestion dose and expressed as Sv/y.

3.6. Epidemiological Health Impact Study

a. Computation of Cancer risk assessment from DDS & MBS

The lifetime cancer (morbidity) risk assessment was computed based on the activity concentration and analysed for natural radionuclide in DDS & MBS for different age groups. The lifetime cancer risk assessment involves, with the various factors like morbidity slope factor via ingestion, exposure duration, exposure period and intake of food per day. The attributed cancer risk help us in comparing with the prevalence of cancer to determine the risk effect from the natural radionuclides via ingestion studies.

b. Prevalence of Cancer by Hospital Based Cancer Registry (HBCR)

The hospital based cancer registry (HBCR) method was followed in order to analysing the prevalence of cancer in the study region during the period of 2001 to 2011 and computed for cancer risk. This HBCR was compared with the attributed lifetime cancer risk via DDS and MBS to ascertain the variations between the computed risk and prevalence of cancer in HBRA.