ENVIRONMENTAL DISTRIBUTION OF TRACE METALS IN THE BIU VOLCANIC PROVINCE NIGERIA: EXPOSURE AND ASSOCIATED HEALTH PROBLEMS

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The Biu volcanic province constitutes one of the largest volcanic provinces in Nigeria. It marks the structural culmination between the Benue and the Chad sedimentary basins. The province covers a superficial area of 5000Km2 with a thickness of 250m. Geochemical analysis of the volcanic soil revealed the complete leaching of the major elements (Fe_2O_3, CaO, K_2O, MgO, MnO, TiO_2) from the surface soil probably into water sources. This may explain the extremely high CaO and K_2O levels especially in the stream water where they display values of 348mg/l and 36 mg/l as against 200 mg/l to 12 mg/l respectively of WHO admissible limits for drinking water. The accumulation of transition metals in the soil (Co 84-111ppm; Cr: 230-443 ppm); Ni: 169-237 ppm) is geogenic derived from the weathering of the host basaltic rock. Cr, Ni, and Cu do not easily form soluble ions in solution explaining why they display lower levels below their respective WHO admissible limits for drinking water. The absence in the soil profile and the extremely higher values of Potentially Harmful Elements (PHEs) (As, Se, Sb, and Cd) in the spring and stream water as opposed to the lower values in the wells and borehole water suggest their extreme solubility, the leaching and transportation of these elements from deep sources. The higher values of Zn and Pb (10-40 ppm and 246-496 ppm respectively) 4x their average abundance in basalts, could be explained like for Co, Cr, Ni, by their absorption and retention in clay minerals structure. The over-exposure to Potentially Harmful Elements through the ingestion of water and food could have adverse health hazards. Few of the inhabitants show manifestations of nail deformity and hyperpigmentation of the skin and hand palms. Others present various forms of skin diseases which all could be attributed to exposure to As and Se toxicity.

Keywords: volcanic province, potential harmful elements, health hazards