**Comparative analysis of spatial and depth wise distribution of uranium in groundwater of South-west & North-east region of Punjab state, India**

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**Abstract**

High prevalence of uranium (U) in groundwater beyond WHO recommendation limit (30 µg/l) may pose severe health issues associated with kidney, liver and bones as they are prominent sites of uranium deposition. Therefore, regular monitoring of uranium content has gained immense attention at global level because of its potential chemical and radiological toxicity. The relation between uranium contamination in water and chronic kidney diseases (CKD) lead to nephrotoxic effects confirmed by epidemiological and toxicological studies. In this study, a heterogeneous distribution of uranium concentration (3.4 – 624.82 μg/L) has been observed in the groundwater of south-west region as compare to north-east region of Punjab (0.1 – 38.71 μg/L). The average uranium concentration was found to be 83.2 μg/L and 4.1 μg/L for south-west and north-east regions, respectively. The high prevalence of uranium concentration in groundwater is only observed in shallow depth (< 200 ft.), which further decreases with increasing depth. The 86% and only 1% samples from south-west and north-east regions of Punjab, respectively, were observed to be above the WHO,2011 recommended safe limit of 30 µg/L for shallow depth (< 200 ft.). In parallel, 20% samples from south-west region of Punjab were exceeding WHO limit for depth more than 400 ft. Gibb’s diagram suggested that both rock weathering and evaporation influences the chemistry of the groundwater of south-west region. In addition, Pearson’s correlation and PCA studies confirmed the positive correlation of U with its path finder elements (Mo, Cr, Se) revealed the similar enrichment origin and geogenic source (granite rocks) of these elements i.e., primary source of uranium is geogenic but anthropogenic activities are also responsible for the uranium distribution in groundwater of south-west region of Punjab. Considering the chemical and radiological toxicity of uranium, it becomes consequentially important to provide datasets for uranium in groundwater of the study regions to local communities, State and Central government along with organizations such as PGWB, CGWB, BRNS and DAE for the sake of society and ecosystem.