Geochemical characterization of water and sediments in the high-altitude lacustrine ecosystem

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The primary resources of water in the country are high altitude lacustrine ecosystem that store and control the flow for downstream ecological, industrial, household, and agricultural uses. Consequently, the heavy metals (HMs) are deposited in ecosystems, and stagnant lakes put water supplies at risk. The current study investigated the quantities of HMs such as Zn, Pb, Mn, Fe, Co, Cr, Cd, Ni in five high-altitude lakes (HAL) water and sediments in District Mansehra, Pakistan. The concentrations of HM in sediments were used to determine pollution variables such as ecological risk assessment (ERA), sediment pollution index (SPI), risk index (RI), contamination factor (Cf) and pollution load index (PLI) and for the water quality different physicochemical parameters were used to find heavy metals evaluation index (HEI) and chronic risks. Fe had the highest concentration of 1411 mg/kg in lake sediment, while Cd had the lowest at 1.06 mg/kg. The findings showed that, with the exception of Cd, the majority of HM concentrations in HAL sediments fell under the sediment quality standards (SQGs) level. Siri Lake's sediments had greater levels of HM pollution as well as greater RI, ERA, PLI and Cf values as compared to the other lakes. With the exception of moderate levels of Pb and significant levels of Cd in the exposed aquatic habitat, most HMs in HAL sediments exhibited minimal contamination. The water analyses found that children who drank Siri Lake (SL) water had higher cadmium (Cd) hazard quotient (HQ) values of 0.36 ± 0.05 and the values obtained from heavy metal ingestion for Hazard Index (HI) were found to be below the 1.0 threshold. The analysis revealed that 96% of the sediment samples posed minimal to moderate risks to the lake environment and the water parameters studied were within the WHO drinking guidelines. The geogenic sources of pollution were found to be significantly contributing to the sediments for HM contamination, according to statistical and geographic assessments

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