

Title : Heavy Metal(loid)s Chemometric Analysis Human Health Risk Assessment Coastal Bangladesh Bay of Bengal Spatiotemporal Distribution

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Abstract: Despite sporadic and irregular studies on heavy metal(loid)s health risks in water, fish, and soil in the coastal areas of the Bay of Bengal, no chemometric approaches have been applied to assess the human health risks comprehensively. This review aims to employ chemometric analysis to evaluate the long-term spatiotemporal health risks of metal(loid)s e.g., Fe, Mn, Zn, Cd, As, Cr, Pb, Cu, and Ni in coastal water, fish, and soils from 2003 to 2023. Across coastal parts, studies on metal(loid)s were distributed with 40% in the southeast, 28% in the south-central, and 32% in the southwest regions. The southeastern area exhibited the highest contamination levels, primarily due to elevated Zn content (156.8 to 147.2 mg/L for Mn in water, 15.3 to 13.2 mg/kg for Cu in fish, and 50.6 to 46.4 mg/kg for Ni in soil), except for a few sites in the south-central region. Health risks associated with the ingestion of Fe, As, and Cd (water), Ni, Cr, and Pb (fish), and Cd, Cr, and Pb (soil) were identified, with non-carcinogenic risks existing exclusively through this route. Moreover, As, Cr, and Ni pose cancer risks for adults and children via ingestion in the southeastern region. Overall non-carcinogenic risks emphasized a significantly higher risk for children compared to adults, with six, two-, and six-times higher health risks through ingestion of water, fish, and soils along the southeastern coast. The study offers innovative sustainable management strategies and remediation policies aimed at reducing metal(loid)s contamination in various environmental media along coastal Bangladesh.

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