Assessing Nephrotoxic Heavy Metal Contamination in Reservoir Sediments: Implications for Human Health and Aquatic Ecosystems

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Assessing Nephrotoxic Heavy Metal Contamination in Reservoir Sediments: Implications for Human Health and Aquatic Ecosystems

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ABSTRACT

Background: Wetlands, often referred to as the "kidneys of the earth," play a crucial role in ecosystem services. This study focuses on reservoirs in dry zone, in Sri Lanka, recognizing their significance in fulfilling diverse ecological needs.

Originality/Value: The research addresses the scarcity of studies linking Chronic Kidney Disease of unknown etiology (CKDu) hotspots with heavy metal contamination in reservoir sediments.

Objective: The study aims to assess nephrotoxic heavy metal contaminations in reservoir sediments, specifically focusing on the potential health risks for humans through the ecological implications for aquatic ecosystems.

Methodology: Ten (10) triplicated composite sediment samples were randomly collected from Ulhitiya, Diwulankadawala, Wahalkada, (within the CKDu hotspots), and Namaloya (the Reference) reservoirs. Inductively Coupled Plasma Mass Spectrometry was employed to determine metal concentrations followed by microwave digestion. Inverse Distance Weighted (IDW) tool in ArcMap. 10.8 Software was used for the spatial interpolations.

Findings: Ulhitiya, Diwulankadawala, and Wahalkada reservoirs exhibited elevated contents of Cd, Pb, As, Cr, Cu, and Zn in sediments than the reference. Sediment-bound As, Cu, Zn, and Cd were higher than NOOA-ERL and ERM levels and instead of Pb, all the other selected heavy metals exceeded the LELs, implicating harmful biological impacts on living organisms inhabiting the selected reservoirs in the CKDu hotspots. A clustering pattern in higher concentrations of Cd and Pb was observed near the water inputs of the reservoirs in CKDu endemic areas.

Conclusions: Heavy metal contamination in reservoir sediments, particularly Cd and Pb, poses risks to aquatic ecosystems and human health through the food chain, especially in CKDu hotspots.

Keywords: *Heavy metal contamination, reservoir sediments, nephrotoxic metals, CKDu hotspots, sediment quality standards*