

Evaluation of the Level of Groundwater Contamination Using Numerical Indices: A Case Study of CKDu Prevalence Area, Sri Lanka

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Chronic Kidney Disease of unetiology (CKDu) has been emerging as a pressing health crisis in Sri Lanka. The most vulnerable age group for this disease has been identified as 40-60 years of age. It is not associated with identified factors such as hypertension, diabetes, and illegal drug abuse. Therefore, this study was carried out to assess the toxic element contaminants associated with drinking water resources in a newly emerged CKDu prevalence area, Rideemaliyadda-South Grama Niladhari Division in Badulla district in Sri Lanka. Thirty groundwater samples were collected from the study area, and Dissolved Oxygen (DO), pH, Electrical Conductivity (EC), and Fluoride level (F⁻) were analyzed using multipara-meter and Fluoride meter. Ca, Mg, Al, Mn, Fe, Ni, Zn, Cr, As, Cd, and Pb were analyzed using Inductively Coupled Plasma Mass Spectrometry (ICP-MS-Agilent-7800). Water hardness values were calculated based on Ca and Mg concentrations. The Pollution Index of Groundwater (PIG), Synthetic Pollution Index (SPI), and Overall Pollution Index (OPI) were computed to classify the groundwater in the sampling area. Results were statistically analyzed using MINITAB 17 software. According to the results, the mean values of selected nephrotoxic and trace element concentrations (in µg/L) Al (41.8±16.33), Mn (63.4±19.75), Fe (239.9±62.47), Zn (152.9±41.51), Cr (0.1587±0.046), As (0.242±0.058), Cd (0.113±0.024), Pb (0.449±1.174) and Ni (0.314±0.115) are complied with WHO standard limits -2004, except Fe. Mean water hardness (75.10±5.60 mg/L) indicated ‘moderately hard water’ (60 to 120 mg/L). The PIG (0.2031±0.0060) showed insignificant pollution (PIG<1.0), the SPI (0.0402±0.0080), indicated suitable drinking water (SPI<0.5), and the OPI (0.2831±0.0021) meant excellent water quality (OPI = 0-1). Based on the results, it can be concluded that the water hardness and long-term exposure to nephrotoxic metals may lead to the occurrence of CKDu in the study area. Proper treatment of water before consumption and responsiveness on handling agrochemicals can be recommended as a preventive measure of CKDu in the study area.

Keywords: CKDu, Water hardness, Nephrotoxic heavy metals, Pollution indices

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