Abstract No: MO-26

Assessment of groundwater contamination with environmental toxicants in CKDu endemic area, Polonnaruwa, Sri Lanka.

W. P. R. T. Perera*, M. D. N. R. Dayananda, W. S. M. Botheju and J. A. Liyanage

Department of Chemistry, University of Kelaniya, Sri Lanka
*ruwantharangaperera@gmail.com

Chronic Kidney Disease unknown etiology (CKDu) is one of the major health impacts predominantly confined to people in North Central Province in Sri Lanka. The root courses for the disease prevalence have not found yet. Therefore, this investigation was carried out to determine the groundwater contamination with environmental toxicants: Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Zinc (Zn), Arsenic (As), Iron (Fe), Calcium (Ca), Magnesium (Mg) Fluoride (F), Sodium (Na) and Aluminium (Al) in Dimbulagala Grama Niladhari Division (GND) in Polonnaruwa District, Sri Lanka. The study investigated the groundwater quality of Dimbulagala GND in dry zone of Sri Lanka to assess its suitability for drinking purposes. Only Ten working tube wells were found in the studied area and groundwater samples were collected from the tube wells. Basic physicochemical parameters (pH, temperature, conductivity and dissolved oxygen), (Hatch HQ14d) and fluoride content were determined (Orion Star- 2014) onsite. Environmental toxicant concentrations were determined using Inductive Coupled Plasma Mass Spectrometry (ICP–MS, Agilent 7800). Results were analyzed using SPSS statistical software. descriptive statistics were performed on the data set and the Pearson correlation was applied. According to the results obtained from the onsite investigations the mean values of pH, conductivity and fluoride content were 7.78 ($\pm$1.28), 520 us/cm ($\pm$148) and 1.20 mg/l ($\pm$0.32) respectively. The mean value of the fluoride content has exceeded the permissible limit (1.0 mg/L), (SLS 614-2013). It was highlighted that significant toxic heavy metals such as Lead (Pb), Cadmium (Cd), Chromium (Cr) and Arsenic (As) levels as well as other metals like Fe, Cu, Zn, Na, Al have not been exceeded than permissible limits (SLS 614-2013). Statistically evaluation process proved none of the positive correlation is reported between heavy metal concentrations and Fluoride content of the groundwater in the studied area. But a negative correlation was reported between Fluoride and Cr (p= -0.05) in the groundwater in the studied area. Ca and Mg concentrations ranged between 3.43 mg/l to 130.56 mg/L And 6.54 mg/L to 75.32 mg/L respectively. Although mean Ca (10.12 mg/L) and Mg (15.45mg/L) did not exceed the permissible levels (100 mg/L and 30 mg/L for Ca and Mg), 40% and 50% of individual samples for Ca and Mg levels exceeded the permissible levels respectively.

There is an urgent need for establishing proper long term drinking water treatment method for the studied area because of long term exposure to heavy metals such as Cd, Pb, Cr, As, and high levels of Fluoride as well as other environmental toxicants can be harmful to people. These findings can be used as a benchmark of raw water quality in the design processes of treatment plants.

Keywords: Groundwater, Contamination, Heavy Metals, CKDu

Acknowledgement
This work was supported by CKDu Research and Information Centre, the University of Kelaniya under the research grant PS/DSP/CKDU/3.5/6.0.