GEOCHEMICAL MAPPING AS A TOOL TO DISTINGUISH GEOCHEMISTRY BETWEEN AREAS WITH HIGH AND LOW PREVALENCES OF CHRONIC KIDNEY DISEASE OF UNKNOWN ETIOLOGY – A STUDY FROM YAN-OYA BASIN

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The increase in the number of patients suffering by Chronic Kidney Disease of unknown etiology (CKDu) from the north central region of Sri Lanka has become a leading health issue of national concern. Though the exact contributing etiology has not been identified, the quality of drinking water is at the base of all foremost theories linked with CKDu in Sri Lanka. The river basin of Yan Oya is located in the dry zone of Sri Lanka and overlies a CKDu prone area in the middle part of the basin. A total of 80 water samples were analysed from tube wells in CKDu prone area (CKDTW -17), tube wells in non-CKDu prone area (NonTW-22), dug wells in CKDu prone area (CKDDW-30) and dug wells in non-CKDu prone area (NonDW-11). To illustrate the spatial distribution of groundwater chemistry, several geochemical maps were created for each parameter, using ArcMap 10.5 software. The "Spline with barrier" function was used for the interpolation of geochemical variations within the study area. The extreme values of each population which were determined through box and whisker plots were ignored in preparing of geochemical maps as they can cause bias on interpolations, and only presented as point values on maps. However, outliers were kept quarantined permitting to visualize variations within each geochemical population. The river Yan Oya and its tributary system including man-made tanks which occur along the river system were used as the barrier for interpolation, assuming that groundwater is not flowing across these elements of the river system. Presences of some geochemical components such as fluoride, dissolved silica, alkalinity in elevated levels were observed throughout the basin, regardless of the CKDu prevalence. Mean fluoride concentrations of all groundwater categories are above the 1.0 mg/L of Sri Lankan standard. More than 70 percent of groundwater samples exceed TDS value of 500 ppm, which is the Sri Lankan standard for potable water. All groundwater categories show higher mean values for Alkalinity than 200 ppm of drinking water guideline for alkalinity in Sri Lanka. However, a comparably depletion of some element such as Potassium, Zinc, Aluminum, Lithium and Copper in groundwater was observed within CKDu prone area. Potassium shows 1.45 ppm and 1.95 ppm for CKDTW and CKDDW

groundwater categories while 4.09 ppm and 5.29 ppm for NonTW and NonDW respectively. Zinc has 38.43 ppb, 17.93 ppb, 49.66 ppb and 40.76 ppb for CKDTW, CKDDW, NonTW and NonDW respectively while Aluminum shows 0.28 ppb, 0.41 ppb, 0.95 ppb and 1.62 ppb for groundwater in same order. Groundwater form tube wells and dug wells in CKDu prone area has 5.1ppb and 2.81ppb of mean values for Lithium while tube wells and dug wells in non-CKDu prone areas host groundwater with 7.4ppb and 4.55ppb of mean Lithium values. Copper in groundwater collected from tube wells has elevated mean values (CKDTW – 15.29 ppb, NonTW – 39.09 ppb) than that of groundwater in dug wells (CKDDW – 0.85 ppb, NonDW – 0.91 ppb) with same regional wise differences in source of water. Except for these components, no other geochemical parameters could be compared with the CKDu distribution pattern within the study area. A more comprehensive geochemical mapping programme with dense sampling interval, focusing on both inorganic and organic suspects is recommended.

Keywords: *CKDu, Yan Oya, water sample, geochemical*