

A comparison of food contamination by heavy metals/metalloids in CKDu prevalent areas and a reference area; A study in Sri Lanka

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During the past two decades, so many studies have been involved in exploring the relationship between the prevalence of chronic kidney disease of unknown etiology (CKDu) and exposure to toxic metals. These studies revealed signs of chronic low levels of toxic metal exposure in Sri Lanka. To assess the risk of negative health effects and propose appropriate public health interventions, novel research studies will be very beneficial. This assessment was performed to study the toxic metal contamination status in domestic rice, leafy vegetables, legumes, and citrus fruits in the CKDu prevalence area in north central province in Sri Lanka and to compare those levels with a reference area in the Eastern province in Sri Lanka where CKDu is not prevalent. CKDu hot spots areas Maradankulama- Mahakanadarawa in the Anuradhapura district, Sri Lanka was selected for sampling and Buddhanga Grama Niladhari area in Ampara district was selected as a reference site. Food samples, including (*Oryza sativa*; n=25, *Centella asiatica*; n=25, *Citrus crenatiflora*; n=18, *Vigna radiata*; n=10) were collected from the villager's own paddy fields and home gardens of the CKDu suspected patients according to the random stratified sampling method in both areas and the collected food samples were digested by microwave digestion according to the standard procedures and the concentrations of metal ions in food samples, including Cadmium, Nickel, Chromium, Copper, Iron, Manganese, Lead, Zinc, Arsenic, and Calcium, were measured using Inductive Coupled Plasma technique (ICP). As a result of the study, mean As and Pb concentrations of *Oryza sativa* (As-0.15 mg/kg, Pb-3.10 mg/kg) and *Citrus crenatiflora* (As-0.15 mg/kg, Pb-0.47 mg/kg), Pb (0.65 mg/kg) and Cd (0.05 mg/kg) content in *Centella asiatica*, and mean concentrations of As (0.14 mg/kg), Pb (9.25 mg/kg) and Cu (57.8 mg/kg) in *Vigna radiata* have exceeded the permissible limits given by the FAO and WHO, 2011: As-0.1 mg/kg, Pb-0.1 mg/kg, Cd-0.05 mg/kg, Cr-2.3 mg/kg, Cu-40 mg/kg. However, none of the food samples collected from the reference areas has exceeded the permissible limits of analyzed heavy metals/metalloids. THQ (Target Hazard Quotient) values of Cr have exceeded the threshold values for all food species. Furthermore, Pb is also regarded as a toxic element and THQ values of Pb in *Oryza sativa* and *Vigna radiata* are noticeably high. Meanwhile, THQ values of the food samples in the reference areas have not exceeded the threshold values. According to the outcome of the study, there is a noticeable difference reported in toxic metals contamination status between the CKDu-prone areas and the reference area. Therefore, the consumption of analyzed rice, leafy vegetables, and legumes was estimated to be risky, and their regular consumption may boost the likelihood of CKDu prevalence in those areas. Further studies are required to monitor and assess heavy metals and metalloids in soil, and fertilizers to find the pathways of contamination of food by toxic metals.

Keywords: CKDu, Heavy metals, Food safety, Chronic kidney disease, Nephropathy, Arsenic, Lead, Cadmium

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