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Risk Assessment of Bioaccumulation of Toxic Metals in Rice Grains (*Oryza sativa*) in a CKDu Endemic Area; A Study in Mihintale Division, Sri Lanka

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Background: Chronic kidney disease of unknown etiology (CKDu) is a heterogeneous disorder affecting kidney structure and its functions. CKDu has rapidly spread throughout Sri Lanka in the past two decades and has become predominant in the North Central Region. Food or water borne diseases are one of the key issues in food safety assurance in Sri Lanka. Pesticides and heavy metals play an important role in modern agriculture and food safety.

Objectives: To evaluate the toxic metal contamination status in the polished rice samples (BG 300) grown in the Maradankulama area.

Methods: Maradankulama GN division was selected based on the available information on medical/hospital records, which has the highest number of CKDu patients in the Mihintale division as the sampling area. A survey protocol was developed. Thirty polished rice samples (BG 300) were collected from the households subject to three paddy areas in the Maradankulama GN area according to the random stratified sampling method. Heavy metal concentrations (Chromium, Lead, Arsenic and Cadmium) of rice samples were analyzed by inductively coupled plasma mass spectrometry.

Results: The male CKDu patients were higher than females (Male - 57.15%; Female - 42.85%). All CKDu patients subjected to the survey in the area belong to the farming community within the age group of 60-70 years. In Maradankulama Cr (7.268±0.046), Pb (1.923±0.209), As (0.064±0.009) and Cd (0.026±0.003) were detected in mg/kg levels. Among the analyzed metals in the rice samples, mean Cr and Pb contents have exceeded the maximum permissible level (MPL) according to the Codex Alimentarius commission guidelines.

Conclusion: Arsenic and Cadmium contents in the rice samples were well below the Codex standard. However, rice grain samples have been contaminated with some nephrotoxic metals such as Chromium and Lead and long-term exposure to the toxic metals may generate a risk for kidney damage in people.

Keywords: *CKDu, Codex, Contamination, Oryza sativa, Toxic metals*

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