Abstract No: STMM 24 Science, Technology, Mathematics and Medicine

Exploring the toxic metal contamination and unveiling the risks in staple grains grown in a CKDu hotspot in Sri Lanka

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Toxic metals in dietary grains could pose health risks from direct ingestion. This investigation aims to analyze the concentrations of toxic metals in selected dietary grains and conduct a comparative risk assessment in a region endemic to Chronic Kidney Disease of Unknown etiology(CKDu) in a non-endemic region. Six household fields in the CKDu endemic region in *Nikawewa* Grama Niladhari Division(GND) and three in the reference region; *Wewagedara* GND were selected for sampling. Inductively Coupled Plasma-Mass Spectrometry(ICP-MS) was used to determine Arsenic (As), Cadmium (Cd), Lead (Pb), Chromium (Cr), Copper (Cu), and Zinc (Zn) in composite samples collected from both GND areas (pulses; [(*Vigna radiata;* n=20*)*, (*Vigna unguiculata;* n=20*)*, (*Vigna unguiculata* subsp.; n=20)] cereal; [(*Oryza sativa;* n=30)]. Descriptive statistics revealed average As concentrations in samples as follows; *Oryza sativa* (38.60±13.84 μg/kg,) *Vigna unguiculata* (3.25±1.96 μg/kg), As was undetectable in samples of *Vigna radiate,* and *Vigna unguiculata* subsp. in CKDu endemic area. The average As concentrations of *Oryza sativa* in the reference area was 5.56±1.87μg/kg and As was not detected in other grain species. All values complied with FAO/WHO & Codex permissible limits (As-100-200 μg/kg). The estimated Daily Intake (EDI) value of As (0.257 μg/kg/day) in *Oryza sativa* in the endemic area did not exceed the Tolerable Daily Intake (TDI) (As-0.3 μg/kg/day). The average concentrations of Cd and Pb were reported in the CKDu endemic area; *Oryza sativa* (Cd-1276.92±234.42 μg/kg, Pb-419.31±98.78 μg/kg), *Vigna radiata*(Cd-571.31±60.71 μg/kg, Pb-344.15±93.75 μg/kg), *Vigna unguiculata* (Cd-1354.33±265.34 μg/kg, Pb-408.56±22.20 μg/kg), and *Vigna unguiculata* subsp.(Cd-1546.23±355.23 μg/kg, Pb-408.63±115.14 μg/kg) and exceeded FAO/WHO permissible limit(Cd-400 μg/kg, Pb-300 μg/kg). But those values were within the limits in the reference areas. However, Cu, Cr, and Zn remained within FAO/WHO safe limits in both regions. A health risk can be generated owing to long-term consumption of staple grains grown in *Nikawewa* GND; CKDu endemic area.

Keywords: CKDu, Contamination, Estimated Daily Intake (EDI), Grains, Heavy metals

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