



Heritage or Hazard? Health Risk Assessment and Toxicological Evaluation of Common traditional Beverages

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This study assessed the concentrations of selected heavy metals and their associated health risks in commonly consumed traditional beverages—Zobo, Agbo, Kunu, and Tigernut—sourced from three major markets (Akim, Marian, and Watt) in southeastern Nigeria. Concentrations of Chromium (Cr), Cadmium (Cd), Nickel (Ni), Copper (Cu), Zinc (Zn), Iron (Fe), and Manganese (Mn) were determined using Atomic Absorption Spectrophotometer following standard analytical procedures. Human health risk assessment was performed using USEPA models, calculating Estimated Daily Intake (EDI), Target Hazard Quotient (THQ), Hazard Index (HI), and Carcinogenic Risk (CR). Results revealed that Cr, Cd, and Ni exceeded WHO/USEPA permissible limits in multiple samples, particularly in Tigernut and Zobo from Akim and Marian markets. THQ and HI values surpassed the safety threshold of 1 in several samples, indicating potential for non-carcinogenic effects. CR values for Cr and Ni exceeded the USEPA benchmark of 1×10^{-4} in some samples, suggesting a possible lifetime cancer risk. From a biochemical perspective, these metals are known to disrupt redox homeostasis, induce oxidative stress, and impair mitochondrial function. Cr and Ni can interfere with DNA repair and promote genomic instability, while Cd impairs enzyme activity and accumulates in hepatic and renal tissues. The findings highlight the biochemical toxicity risk posed by unregulated traditional beverages. This study underscores the need for continuous monitoring, regulatory enforcement, and public education to mitigate heavy metal exposure and associated biochemical damage in consumers.

Keywords: Heavy metals, health risk assessments, traditional beverages.
