

Fluoride Accumulation in Food Chain and Daily Dietary intake from a Fluoride-Affected Area in Jharkhand District, India

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Abstract: Total exposure of fluoride from food composites and drinking water, used by the family members in the fluoride-affected areas of Berhait block in Sahibganj district has been investigated. Mean fluoride concentration in groundwater samples, used for drinking purposes by the villagers was 2.5 mg/l (range = 0.95-6.9 mg/l, n = 30). Mean fluoride concentrations in vegetables and crops were 8.87 mg/kg (range: 0.44-21.7 mg/kg, n = 111) and 8.64 mg/kg (mean = 2.11-18 mg/kg, n = 49), respectively. High accumulation of fluoride in rice grain was significant (mean = 14.6 mg/kg, n = 20). A considerable amount of fluoride in the water soluble part of edible herbs was observed (mean = 6.35 mg/kg, n = 20). Higher concentration of fluoride was absorbed by the skin of vegetables, compared to the fleshy material. Mean fluoride concentration in shallow tubewell waters, used for agricultural irrigation in the study area was 1.9 mg/l (range = 1.05–5.45 mg/l; n = 9). The upper layer agricultural land soils contained a high concentration of fluoride (mean = 55 mg/kg, range = 43–101 mg/kg, n = 16). Average dietary intakes of fluoride by adult and children (approximately 10 years of age) were 408 and 484 µg/kg body wt./day, respectively, which were much higher compared to the WHO recommended Provisional Tolerable Daily Intake (PTDI) value of inorganic fluoride. Rice contributed 78% and 75%, of fluoride, with respect to the total intakes of fluoride from all food composites by adult and children, respectively. Clinical features of fluorosis have been observed in the studied population.

Keywords: *Berhait block in Jharkhand; Groundwater fluoride contamination; Fluoride accumulation in vegetables; Daily dietary intake; Fluoride toxicity*

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