

Health risk assessment of exposure to heavy metals in fish species consumed in Aba, Abia State, Nigeria

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Abstract. The concentrations of heavy metals (Pb, As, Cr, Cu, Cd and Fe) were determined in the gills, liver and muscles of thirty-five fishes, water and sediment samples from Aba River using atomic absorption spectrophotometer. Heavy metal concentrations varied markedly among fish species and organs. Results revealed that Pb, Cr, Fe had maximum concentration levels of 0.63 ± 0.01 , 0.81 ± 0.01 and 16.91 ± 0.20 mg/kg in *Chrysichthys nigrodigitatus* respectively. As and Cd recorded the highest concentration of 0.18 ± 0.03 and 0.87 ± 0.02 mg/kg in *Malapterurus electricus* respectively, while *Trachurus trachurus* had 1.05 ± 0.03 mg/kg of Cu. *Oreochromis niloticus*, *Tilapia zilli* and *Malapterurus electricus* had higher concentrations of As and Cr in the liver compared to gills and muscles. The gills had higher concentrations of these heavy metals than liver and muscles in the rest of fish species studied. The concentrations of Cd, Pb and As in freshwater samples were higher than the standard maximum permissible limit. The sediments had higher concentrations of these metals than in fish and water samples. Heavy metal concentrations in fish species exceeded the standard guideline limit in food substances for human consumption. *Malapterurus electricus*, *Parachanna obscura* and *Chrysichthys nigrodigitatus* had bioaccumulation factors for Cd which ranged from 1.069 -1.663, indicating potential Cd poisoning or contamination of the three fish species. The estimated daily intake in both adult and children ranged from 8.611×10^{-7} to 9.72×10^{-3} mg/kgbw/day and were within the standard limit of daily intake for the human population. The hazard quotient for adult and children populations ranged from 0.0041 -1.3972 and 0.000287 - 0.2080 respectively. The hazard quotient was less than one in most of the metals except for iron, but hazard index was greater than one, indicating potential chronic health hazards. Incremental life cancer risk for the adult population was within safe limits.

Keywords: fish species; heavy metal; hazard quotient; hazard index; cancer risk.

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