Answers from the research

1.a. The concentration of heavy metals, minerals and trace elements measured for 80 key foods from 16 food groups and water from 3 markets of Dhaka city - Gulshan and Kawran Bazaar (non-poor) and Hazaribagh (poor) - varies widely. The presence of at least one or more heavy metals (cadmium, arsenic, lead, mercury, antimony, nickel, aluminium and lithium) was detected in 5 out of 16 food groups (cereals, fish, meat, vegetables, spices); mineral (calcium, magnesium, sodium and potassium) and trace element concentration (iron, manganese, copper, zinc, molybdenum, cobalt and selenium) concentration varies widely across the foods and market considered

1.b. As contamination does not show a clear pattern by market, purchasing food in wealthier markets does not guarantee access to safer food. This in turn, signals that traders are not able to deliver safer food in the market that could remunerate their higher safety, most likely due to the difficulty of recognizing which foods are safer

1.c. The concentration of heavy metals in rice appears to be high, influenced by the cooking technique: lower for draining and higher for absorption methods. Puffed rice has higher concentrations of sodium, potassium, iron, manganese and aluminium than ordinary rice. Arsenic content appears higher in fine rice than coarse rice and in Gulshan compared to Kawran Bazaar and Hazaribagh. Comparatively, puffed rice from all 3 markets had similar higher levels of arsenic while that of beaten rice was within a narrow range. There is variation in cadmium concentration in puffed rice from Kawran Bazaar which is higher than that from the other 2 markets

1.d. Cadmium was not detected in wheat flour sold in Kawran bazaar market but was present in wheat flour from Gulshan and Hazaribagh markets. Cadmium was present in hilsa, prawn, katla, pangas and dry fish sold in all the 3 markets. Cadmium concentrations were highest in ‘rohu’ and ‘hilsha’ sold in Hazaribagh market, with ‘hilsha’ having almost twice the concentration compared to Kawran Bazaar and Gulshan markets

2. The dietary risk exposure for male and female to each of the elements was calculated on a per capita consumption basis using the food consumption data from HIES (2010). All households are at high risk of violating the FAO/WHO (2010) ‘Zero’ Provisional Tolerable Weekly Intake for arsenic and lead. Cereals and fish contribute to 98% of total intake of arsenic by both poor and non-poor households. Non poor households have a higher risk exposure to arsenic contaminated rice. Antimony, mercury and lithium levels in diets of both poor and non-poor households are below PMTI and can be regarded as safe. Diets of female have heavy metal concentration below the limits. Among males, arsenic, lead and mercury levels are higher for non-poor than poor; cadmium is above the Provisional Maximum Tolerable Intake (PMTI) for 94% of poor and 78% of non-poor males as dietary cadmium levels are 2.5 times higher than non-poor males; 8% poor and 17% non-poor males are exposed to aluminium contamination. Poor households are at risk of minerals and trace element deficiency, but levels of manganese and molybdenum are above the recommended daily intakes

Implications for Policy

1. Build a comprehensive baseline identifying the markets where food is at higher risk of contamination, tracing the potential entry, hazard analysis and critical control points of contamination across the food chain

2. Develop rice varieties that accumulate less arsenic and cadmium to minimize the transfer of arsenic from irrigation water to the grains and from grains to the body

3. Promote awareness campaigns for (i) decreasing the consumption of rice and increasing the consumption of vegetables to reduce exposure to the contaminant while also contributing to a more balanced diet; and (ii) encouraging processing and cooking methods that minimizes uptake and allows leaching of the contaminant

4. Defining and enforcing regulations and controls of industrial effluents’ treatment and disposal able to minimize heavy metal contamination in food

Consumption of Unsafe Foods: Heavy Metal, Mineral and Trace Element Contamination

Bangladesh Agricultural University

1. What are the concentrations of heavy metals, minerals and trace elements in major foods and beverages consumed by poor and non-poor households in Dhaka city?

2. What is the dietary risk exposure to different heavy metals from different food items by poor and non-poor households?
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