

Policy Brief

Trace Element Deficiency and Heavy metal contamination - A threat to nutrition security in Bangladesh

The low level of trace elements (iron-Fe and zinc-Zn) in diets leads to the reduced amount of dietary intake of Fe and Zn by the households in Bangladesh. On the other hand, the presence of heavy metals in plant-based diets exposes them to serious health hazards. The contamination status of arsenic (As), lead (Pb), and cadmium (Cd) is alarming. Nutritional disorders due to Fe and Zn deficiency can be reduced by iron and zinc biofortification of crops and diversification of trace elements rich food. The dietary risks due to ingestion of heavy metals may be reduced through varietal development of crops having low heavy metal accumulator and regular assessments as well as improved monitoring and inspection mechanisms.

Growing concern: 100%, 93%, 97%, and 85% of adults in Mymensingh, Rajshahi, Khulna, and Chattogram division respectively had dietary intake of Zn less than the recommended daily allowance (RDA) for Zn. Almost all the households of Bangladesh had a dietary intake of Fe less than RDA. Many households in the country are exposed to foods containing heavy metals like As, Pb and Cd. The heavy metals enter into the food chain through different pathways such as irrigation water, polluted soils, automobile exhaust deposit, and agricultural chemicals. High levels of As and Pb have been detected in rice and vegetables. Table 1 shows the dietary intake of arsenic, lead, and cadmium in Bangladesh. The mean daily intake of arsenic of the sampled population is very high and mostly derived from rice, fish, and vegetables. Rice, wheat, and pulses are the major food items contributing to the lead intake by the households. Rice is the major source of cadmium intake followed by vegetables. FAO-WHO now recommends an as-low-as-possible intake for both arsenic and lead.

Table 1: Heavy metals intake from different foods by adult male in Bangladesh

Food item	Arsenic		Lead		Cadmium	
	Daily intake (µg/day)	PTWI*	Daily intake (µg/day)	PTWI*	Daily intake (µg/day)	PTWI* µg/kg BW
Rice	60.87		67.49		24.25	
Wheat	1.40		23.98		1.96	
Pulses	1.93		23.96		2.33	
Fish	8.06	None	9.40	None	0.79	0.0058
Meat	0.99		5.31		0.21	
Vegetables	2.31		12.01		3.56	

PTWI=Provisional Tolerable Weekly intake

Heavy metals can enter the food chain through many routes. One of the main sources of arsenic contamination is irrigation water from shallow depth by low lift pumps for Boro rice. About 20% of areas of Bangladesh are contaminated with water arsenic.

The use of pesticides and chemicals containing heavy metals is another source of contamination. Pollution of surface water by industrial effluents is common in Bangladesh. Sewage sludge, combustion of fuels, and heavy metal-containing agrochemicals also increase the heavy metal content in food. Food also gets contaminated during processing and preparation for consumption.

The level of exposure depends on where and how foods are grown and processed. Therefore, food safety can be strengthened only by regular monitoring and inspection along the entire food chain and incorporating preventive practices from production to consumption. Improving the country's food safety and nutritional standards and ensuring their effective implementation through a regulatory framework will be instrumental to safeguard public health and national productivity.

What can Policymakers do?

- The content of trace elements in plants can be increased through the development of staple food crop varieties that are rich in Fe and Zn. Biofortification strategy with micronutrients (Zn, Fe) for major food crops (rice, lentil) by either varietal development or use of micronutrient fertilizers could be adopted to enhance micronutrient level in crop produce.
- Environmental interventions are needed to decrease industrial pollution, promote proper treatment and safe disposal of effluents.
- The use of deep tube well water for irrigating Boro rice and practicing alternate wetting and drying (AWD) should be encouraged.
- Dry-land crops like wheat, maize, potato, onion, garlic, sesame, pulses etc. crops may be grown in arsenic-contaminated areas of Bangladesh to reduce the intake by the crops and ultimately reduced arsenic in the food chain.
- There is a need to develop rice varieties for lower uptake of As, Cd, and Pb by grains to decrease the risks of As, Cd, and Pb intake by the Bangladesh people.
- The contribution of cereals, especially rice to the intake of heavy metals (As, Pb and Cd) by the household is the highest compared to other food items. Decreased consumption of rice and increased consumption of wheat, potato and vegetables may help reduce the estimated dietary risk exposure from heavy metals.
- Awareness campaigns and nutrition education programs are needed to sensitize people at various stages of the food chain to the risks of heavy metal contamination, their toxicity and effects on human health (e.g., three times washing of raw rice with water, followed by cooking with as free water and discarding the gruel after cooking can greatly reduce As content in cooked rice). Efforts are needed to promote the consumption balanced diet that will help people to develop resistance to the deleterious effects of heavy metals.
- At the institutional level, the Bangladesh Standards and Testing Institute is instrumental in ensuring food safety and nutritional standards of foods. Concerned Ministries and agencies also have to frame and follow appropriate regulations and controls to treat industrial effluents and disposal to minimize heavy metal contamination.

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