

## Assessment of toxic metals in vegetables with the health implications in Bangladesh

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**Abstract.** This study was conducted to investigate the levels of heavy metals in twelve species of vegetables and assessment of health risk. Samples were analyzed using inductively coupled plasma mass spectrometer (ICP-MS). The ranges of Cr, Ni, Cu, As, Cd and Pb in vegetables species were 0.37-5.4, 0.03-17, 0.35-45, 0.01-2.6, 0.001-2.2, and 0.04-8.8 [mg/kg, fresh weight (fw)], respectively. The concentrations of As, Cd and Pb in most vegetable species exceeded the maximum permissible levels, indicating unsafe for human consumption. Health risks associated with the intake of these metals were evaluated in terms of estimated daily intake (EDI), and carcinogenic and non-carcinogenic risks by target hazard quotient (THQ). Total THQ of the studied metals from most of the vegetables species were higher than 1, indicated that these types of vegetables might pose health risk due to metal exposure. The target carcinogenic risk (TR) for As ranged from 0.03 to 0.48 and 0.0004 to 0.025 for Pb which were higher than the USEPA acceptable risk limit (0.000001) indicating that the inhabitants consuming these vegetables are exposed to As and Pb with a lifetime cancer risk. The findings of this study reveal the health risks associated with the consumption of heavy metals through the intake of selected vegetables in adult population of Bangladesh.

**Keywords:** toxic metals; vegetables species; health risk; Bangladesh

### 1. Introduction

The human body requires at least 20 elements for optimal health (Broadley and White 2010). Many of the elements/minerals are essential in physiological and biochemical processes such as water absorption, enzyme catalysis, hormone functions (Gutzeit *et al.* 2008). Element deficiencies may result in major debilitating effects including reduced defense systems, reduced physical and mental development and acuity. Fortunately, consumption of appropriate foods especially different types of vegetables for optimal health can supply the needed micro-/macronutrients. Contaminations from toxic heavy metals in a number of foods pose serious health problems (Nachman *et al.* 2013) that range from shortness of breath to several types of cancers (Dogan *et al.*

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