Multimedia arsenic exposure and human health risk assessment in Araihazar, Bangladesh

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Arsenic (As) contamination, often called the worst mass poisoning in the human civilization, has been a critical public health hazard worldwide for decades. In Bangladesh, one of the most severely affected countries from As contamination, about 30-35 million people are exposed to very high As concentration (> 50 ppb) in groundwater. Arsenic contaminated groundwater is frequently used for drinking, irrigation, household and non-household purposes in Bangladesh. Therefore, arsenic exposure spans from drinking and irrigation of the groundwater, soil As loading from groundwater irrigation and transfer of As from the soil to crops. In Araihazar, one of the densely populated and highly As contaminated areas in Bangladesh, 376550 people are exposed to 0.1 to 864 ppm As within an aerial extent of 183km^2. Numerous studies have been conducted in Araihazar, Bangladesh in the past decade. We collected and compiled As concentration data in water wells, sediment, and soil as well as As exposure data for major exposure pathways (i.e., ingestion, inhalation, dermal contact) from various public sources and government agencies. In this study, we analyzed and assessed As exposure and human health risk from multiple sources, considering As uptake from direct and indirect water intake (drinking, bathing), contaminated food (rice, vegetables and fruits, animal origin foods, spices and pulses), beverages (tea), soil ingestion through occupational (paddy field workers) and accidental activities, inhalation through the combustion of fuel (cow dung, coal), tobacco smoking, and betel quid chewing. The results from this research will be particularly useful to planners and managers in local government and regulatory authorities to assess, prioritize, plan, and manage As hazard as well as implement or enhance new and existing policies for pollution control. Also, the knowledge from this study will be suitable for other regions in Bangladesh or South and Southeast Asian countries, where groundwater As contamination is a major threat to public health.