

Title: Extreme exposure of fluoride and arsenic contamination in shallow coastal aquifers of the Ganges delta, transboundary of the Indo-Bangladesh region

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Abstract: Globally, shallow aquifer groundwater (GW) has been severely affected in recent decades for both geogenic and anthropogenic reasons. The hydro-geochemical characteristics of the GW change inconsistently with the addition of unwanted inorganic trace elements into the GW aquifer of the Indo-Bangladesh delta region (IBDR), such as arsenic (As) along with fluoride (F⁻) contamination. Contaminated GW can have a negative impact on drinking water supplies and agricultural output. GW pollution can have serious adverse effects on the environment and human health. Thus, the GW quality of this region is deteriorating progressively, and human health threatening by various life-threatening disorders. Hence, the current study concentrated on the GW quality evaluation and prediction of possible health issues in the IBDR due to elevated contamination of As along with F⁻ within GW aquifers by considering sixteen causative. Field survey-based statistical methods such as entropy quality index (EWQI) combined with health risk index (HRI) was implemented for evaluating the As and F⁻ sensitivity with the help of correlation testing and principal component analysis. The study's outcome explains that a substantial portion of the IBDR has been vastly experiencing inferior GW quality, environmental issues, and health-related problems in dry and wet seasons, correspondingly for As and F⁻ exposure. Piper diagram verified the suitability of water that almost 55% of GW across the study area's aquifers are unfit for drinking as well as cultivation of crops. Sensitivity analysis and the Monte Carlo simulation method were also applied to assess the contaminant's concentration level and probable health risk appraisal. The present study concludes that the elevated exposure of As and F⁻ pollution has to be monitored regularly and prevent unwanted GW contamination through implementing sustainable approaches and policies to fulfil the sustainable development goal 6 (SDG-6) till 2030, ensuring the most basic human right of clean, safe, and hygienic water.

Keywords: Indo-Bangladesh delta, Entropy quality index, Health risk index, Monte Carlo simulation, SDG-6

DOI: <https://doi.org/10.1016/j.gsf.2023.101725>

<https://www.sciencedirect.com/science/article/pii/S1674987123001925>