

◆ Research Paper ◆

Groundwater arsenic contamination in shallow alluvial aquifers of Bhulri Shah Karim taluka, Tando Muhammad Khan district, Sindh, Pakistan

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Abstract: The aim of present study is to determine the groundwater arsenic contamination and identification of its possible sources through hydro-geochemistry in Bhulri Shah Karim Taluka which is part of Tando Muhammad Khan district, Sindh. For this purpose, 66 groundwater samples taken from shallow wells (depth < 30 meters) were analyzed to determine physicochemical and microbiological parameters including arsenic. Hydro-geochemical data reveal that groundwater is marginally saline (Mean TDS: 1166 mg/L) and slightly alkaline (Mean pH: 7.25). More than half of the groundwater wells (n = 25) are sewage impacted as indicated by the occurrence of pathogenic bacteria. Strong positive correlation of HCO₃ with SO₄ (r = 0.61), Cl⁻ (r = 0.54), F⁻ (r = 0.52) and NO₃ (r = 0.5) was observed which suggest that complex geochemical processes are operating in the study area. Hardness of groundwater showed the strong relationship with NO₃ (r = 0.57) and HCO₃ (r = 0.47) indicating the mineral and fertilizer contribution. On the other hand, weak but positive correlation of Fe with NO₃ (r = 0.22) suggests that denitrification process is active but slow in study area. In about 40% groundwater samples arsenic occurs in alarmingly high concentrations (up to 250 µg/L) against WHO permissible limit of 10 µg/L for drinking water. About one third of total sewage impacted wells show arsenic concentrations in the range of 10-200 µg/L suggesting that arsenic release is somehow linked with sanitation. Correlation of As with Fe (r = 0.21) is weak but positive and strong with PO₄ (r = 0.48) which suggest that as released from organic matter is followed by reductive dissolution of FeOOH through bacterial respiration in the groundwater of Bhulri Shah Karim.

Keywords: Groundwater, hydro-geochemistry, arsenic, pollution, Indus delta, Sindh



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