

Arsenic Groundwater Contamination in Middle Ganga Plain, Bihar, India: A Future Danger?

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Abstract

The pandemic of arsenic poisoning due to contaminated groundwater in West Bengal, India and all of Bangladesh has been thought limited to the Ganges Delta (the Lower Ganga Plain) despite early survey reports of arsenic contamination in groundwater in the Union Territory of Chandigarh in the northwestern Upper Ganga Plain and recent findings in the Terai area of Nepal. Anecdotal reports of arsenical skin lesions in villagers led us to evaluate arsenic exposure and sequelae in the Semria Ojha Patti village in the Middle Ganga Plain, Bihar, where tube wells replaced dug wells about 20 years ago. Analyses of the arsenic content of 206 tube wells (95% of the total) showed 56.8% to exceed arsenic concentrations of 50 µg/L with 19.9% >300 µg/L, the concentration predicting overt arsenical skin lesions. On medical examination of a self-selected sample of 550 (390 adults; 160 children), 13% of the adults and 6.3% of the children had typical skin lesions, an unusually high involvement for children, except in extreme exposures combined with malnutrition. The urine, hair, and nail concentrations of arsenic correlated significantly ($r=0.72-0.77$) with the drinking water arsenic concentrations up to 1654 µg/L. On neurological examination, arsenic-typical neuropathy was diagnosed in 63% of the adults, a prevalence previously seen only in severe, subacute exposures. We also observed an apparent increase in fetal loss and premature delivery in the women with the highest drinking water arsenic. The similarity to the index villages in West Bengal and Bangladesh is noted, evoking concern for the potential risk for the entire Ganga Plain, with a total population of 449 million.