

A detailed study of the arsenic contamination of groundwater and its impact on residents in Rajapur village of the Domkal block, district Murshidabad, West Bengal, India

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Objectives An in-depth study was carried out in Rajapur, an arsenic affected village in the state of West Bengal in India, to determine (a) the magnitude of arsenic contamination in hand tubewells (b) the number of residents who may have consumed arsenic contaminated water at various concentration levels of arsenic (c) the level of arsenical dermatosis in the exposed population and the percentage of the population that may suffer from arsenicosis and cancer (d) the arsenic levels in the biological samples of the residents (e) the effectiveness of installed arsenic removal plants (ARPs) in the village (f) social and socio-economic problems to affected villages and (g) safe water options and a viable solution to the arsenic problem.

Methods The total arsenic, arsenite and arsenate in the water samples, the arsenic metabolites in the urine samples and the total arsenic in the acid digested hair and nail samples were analyzed by the flow injection hydride generation atomic absorption spectrometry (FI-HG-AAS) method. The arsenical dermatological features were recorded by dermatologists.

Findings Out of a total of 336 hand tubewells that existed in Rajapur, 91% contained arsenic at above 10 µg/l and 63% contained arsenic at above 50 µg/l. Another 6.8% tubewells contained arsenic at above 300 µg/l, the concentration which is associated with visible arsenical skin lesions. The speciation of arsenic in the groundwater, the variation in the arsenic concentration with depth of tubewell and the iron concentration in the hand tubewells of Rajapur village were also measured. We have examined 825 out of 3500 people in the village for arsenical skin lesions and of these, 149 showed arsenical skin lesions. Of the 420 biological samples of hair, nail and urine collected and analyzed for arsenic from Rajapur, 92.6% contained arsenic at above normal levels. Thus many villagers might be sub-clinically affected. Although 5 arsenic removal plants had been previously installed in the Rajapur village, it appears from the examination of urine and other biological samples that the villagers are still exposed to elevated levels of arsenic from drinking water.

Conclusions Detailed village level studies of arsenic affected areas of West Bengal are required to understand the magnitude of arsenic contamination and human suffering. Villagers seem to be ill informed about the danger of drinking arsenic contaminated water. By increasing awareness and installing proper watershed management that involves the locals, the arsenic situation could be brought under control.

Keywords Rajapur village; arsenic groundwater contamination; speciation of arsenic in groundwater; population at risk; arsenic in biological samples; arsenical skin lesions and cancer; arsenic removal plant; arsenic safe water source.