

The Impact of Arsenic and Toxic Chemical Problems in the Groundwater on the Environment of Bangladesh

방글라데시의 지하수 환경에서의 비소 및 독극물의 영향

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1. INTRODUCTION

Bangladesh is located in the midst of one of the world's largest river systems. Although this vast amount of water provides a living for almost 1/3 of the country's population, the water quality is poor and the abundance of this water does little to meet the drinking needs of the people. Hence, drinking water in Bangladesh is not largely a river based water purification system but it instead, the most crucial source of drinking water remains ground water. However, the discovery of "Arsenic" in groundwater in several areas of Bangladesh has aroused widespread concern from the last couple of years. The arsenic crisis in Bangladesh has been called the worst environmental catastrophe of the twentieth century. Arsenic, a metalloid element known for its toxicity and carcinogenicity, is soluble in water and occurs naturally in many minerals. Arsenic contamination of groundwater in Bangladesh is widely accepted to be of geological origin, though the exact mechanisms remain poorly understood. Arsenic occurs in different forms, organic and inorganic, with different toxicity. Humans get affected by arsenic mainly through ingestion and probably the nutritional status is important in relation to the development of arsenicosis. The World Health Organization (WHO) has set a provisional guideline value of 0.01 mg/l (10 ppb) for total arsenic in drinking water. The Government of Bangladesh has set a provisional water quality standard of 0.05 mg/l (50 ppb) arsenic for drinking water. The general objective of the study was to identify the causes for different response patterns among people in the two study villages in order to understand the difference in community response patterns.

2. BACKGROUND TO THE ARSENIC PROBLEM

The Bangladesh arsenic contamination is possibly the largest mass poisoning case in the world now. The 'Green Revolution' has been identified theoretically to be the recent cause of the problem which has involved large-scale unplanned withdrawal of ground-water, gradually denuding the arsenic deposited under the fertile delta of Bangladesh millions of years ago by the rivers from the Himalayas or some other source. The arsenic affected areas of West Bengal are lying on a sediment of Younger Deltaic Deposition (YDD) which extends east-ward towards Bangladesh covering the approximate area of the aforesaid 41 districts which lie mostly in the Atrai, Meghna and Genetics flood plains and the tidal regions. Arsenic is a ubiquitous widely

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Table 2: General difference between the study villages Vhagolpur upazila Kamarpara upazila

1. very close to the capital of Bangladesh (20 km).	1. very far away from the capital city (1000 km).
2. Average economic condition of this people of the village is relatively rich	2. Average economic condition of the people of the village is relatively poor.
3. Culture of the people is almost town oriented.	3. Culture of the people is mostly village oriented.
4. Profession of people is mostly business-oriented.	4. Profession of people is mostly agriculture-oriented.
5. Households are mostly individual and family oriented.	5. Households are mostly collective and community oriented.
6. Acceptance of any new technology or idea is very difficult; i.e. people in the community are not very responsive to the motivation from outside the village	6. Acceptance of any new technology or idea is less difficult; i.e. people are more open-minded.
7. Literacy rate is comparatively high in this village.	7. Literacy rate is comparatively low in this village.

Vhagolpur village in Sonargaon upazilla and Kamarpara village in Jhikargacha upazilla were selected for household survey type analysis. In Vhagolpur the number of households was small (51) and therefore in this village a 100% household survey was conducted, whereas in Kamarpara the number of households was 56, one in every three households was selected for the household survey in order to keep the household number in the two upazilas consistent. Two field researchers were trained in each upazilla to conduct the household survey and carry out the focus group discussions. Several focus group discussions were held in each location with different categories of people. Different categories of people were selected for the focus group discussion.

4. RESULTS AND DISCUSSIONS

On average, in Jhikargacha the percentage of Arsenic contaminated (red) wells was 48% while in Sonargaon it was 80% (BRAC, 1999). Such variation in the contamination of the ground water of Sonargaon and Jhikargacha may be explained by considering the geomorphology and geology of the two areas. Jhikargacha is rarely flooded and is geomorphological more stable than Sonargaon which is mainly underlain by the active Meghna floodplain.

Table 3: Arsenic in tube well water is a problem: by age group

Parameters	Age-Group							
	10-20		20-30		30-50		50+	
	Vhagolpur	Kamarpara	Vhagolpur	Kamarpara	Vhagolpur	Kamarpara	Vhagolpur	Kamarpara
problem	13 (100%)	20(100%)	18 (100%)	20 (100%)	9 (82%)	12 (100%)	3 (33%)	1 (25%)
No problem	0	0	0	0	2 (18%)	-	6 (67%)	3 (75%)
Total	13(100%)	20(100%)	18(100%)	20(100%)	11(100%)	12(100%)	9(100%)	4(100%)

From the table it is observed that arsenic is considered to be a problem by the young and middle-aged group in both villages although there are marked differences between the two villages as regards the perception and views of the problem. In both villages, older people do not consider it to be a problem; they have been drinking water from

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the present sources for about 25-30 years without perceiving any difficulties and they think there will be no problem in the near future.

Table 4: Arsenic is problem in tubewell

Arsenic in tube well water a problem	No. of Respondents	
	Vhagolpur	Kamarpara
Yes	46 (90%)	54 (96%)
No	5 (10%)	2 (4%)
Total	51 (100%)	56 (100%)

Table 5: Knowledge about arsenic

Arsenic is a Contagious and hereditary disease	Vhagolpur	Kamarpara
Yes	11 (22%)	2 (4%)
No	40 (78%)	54 (96%)
Total	51(100%)	56 (100%)

Table6: Arsenic testing information

Arsenic Test Results	No. of Respondents	
	Vhagolpur	Kamarpara
Arsenic tested	51 (100%)	56 (100%)
Not tested	-	-
Total	51 (100%)	56 (100%)
Arsenic-contaminated	49 (96%)	51 (91%)
Not contaminated	2 (4%)	5 (9%)
Total	51 (100%)	56 (100%)
Arsenic-contaminated water for drinking & cooking purposes	No. of Respondents	
	Vhagolpur	Kamarpara
Still using	41 (80%)	8(14%)
Not using	10 (20%)	48 (86%)
Total	51 (100%)	56 (100%)

Table7: Arsenic-affected patients in villages.

Monthly income	No of patients	No. of total respondents
1000-1500	4 (27%)	6 (11%)
1501-3000	10 (67)	23 (41%)
3001-5000	1(7%)	24 (43%)
5001+	-	3 (5%)
Total	15 (100%)	56 (100%)

Table8: solve the arsenic problem in villages

Expectation to solve the problem	No. of Respondents	
	Vhagolpur	Kamarpara
Government	6 (12%)	30 (54%)
NGO	27 (53%)	16 (28%)
Govt.+NGO	12 (24%)	10 (18%)
Don't Know	6 (12%)	-
Total	51 (100%)	56 (100%)

5. Conclusion

Bangladesh has been facing multifarious challenges in addressing the problem of arsenic contamination of ground water, which has become a public health problem of catastrophic proportion. This study has shown that the differences in the response patterns of the villagers to the arsenic problem and the solutions proposed are not as it were random, but are themselves related to variables such as the relative economic condition and mobility of the populations. Finally, it can be said that the situation of arsenic poisoning in rural areas of Bangladesh is like the ebbs and flows of a river. When villagers get fresh motivation or are faced with newly-affected people in their vicinity, they make an effort to collect or obtain arsenic-free water for a couple of weeks or months. Soon, however, they go back to being reluctant to collect arsenic-free water. In order thoroughly to convince people, a well-structured motivational programme that in turn draws upon the prior identification of different community factors, is needed to make arsenic-free, safe drinking water a priority in rural areas of Bangladesh.