

# **COMBATING A DEADLY MENACE**

## **Early Experiences with A Community-based Arsenic Mitigation Project in Bangladesh**

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***Dedicated to  
Kaiser Ali (of Goalbakpur village of  
Jhikargachha upazila) and others who died  
due to arsenic poisoning.***

***Let our efforts gear up to prevent such  
untimely deaths***

## EXECUTIVE SUMMARY

Bangladesh is facing the problem of arsenic poisoning in drinking water. Around 27% of the tubewells, which supply drinking water to most of the population, have arsenic concentrations above the government of Bangladesh limit of 50 µg per litre. This means that a quarter of the country's population is exposed to arsenic poisoning which is alarming and unprecedented in history.

BRAC, a non-governmental organisation, in conjunction with the Department of Public Health Engineering (DPHE) of the government of Bangladesh and UNICEF, has implemented a project titled, '**Action Research into Community-Based Arsenic Mitigation**' in two upazilas of Bangladesh - from June 1999 to June 2000. The aim of the project was to assess the technical viability as well as the effectiveness of different alternative safe water options and to figure out the community acceptance of such options. The activities included the determination of the extent of arsenic contamination in water of all the tubewells of the project area; involvement of community members in choosing, implementing and maintaining alternative sources for safe drinking water, determination of the viability and effectiveness of different mitigation options and assess their relative acceptance by villagers; identification of arsenic-affected patients and providing treatment; and make the community people aware of arsenic poisoning. This report presents the experiences of the initial course of project implementation. A summary of the experiences is given below.

### Results of tubewell testing

Testing of tubewells for arsenic was carried out on a 'census' basis by BRAC-trained Village Health Workers (VHW) using the field test kit produced by Merck of Germany. Test results were verified twice by field supervisors and in the laboratory. In Sonargaon upazila 62% of the wells contain arsenic above 100 ppb<sup>1</sup> and in Jhikargachha it was 48%. All these wells were painted 'red'. The percentage of 'safe' well (arsenic concentration in water of 0 ppb) in Sonargaon and Jhikargachha is 35% and 41% respectively, and all their spouts were painted 'green'. Wells that lie in the range of above 0 but below 100 ppb have been painted with a 'red cross' to indicate uncertainty. The proportion of these wells is 3%

<sup>1</sup> Both ppb (parts per billion) and micrograms per litre have been used interchangeably as the unit of measurement for arsenic. In some cases, ppm (parts per million) and milligram per litre (mg/L) have also been used.

in Sonargaon and 11% in Jhikargachha. A total of 51,685 tubewells were tested in the two upazilas.

#### **Validation of tubewell testing**

To check the accuracy of testing by VHWs, 2,266 tubewells (5% of total 'red' and 'green' marked tubewells in both the upazilas) were re-tested by BRAC field supervisors using the same kit. The results showed that VHWs did very well in testing the tubewells. The percentage of correctly tested tubewells (green-green and red-red) was 90% of the tubewells tested in Sonargaon and 85% of the tubewells tested in Jhikargachha. The percentage of false negatives (red tubewells painted green - a dangerous identification) was 12.5% of the green tubewells tested in Sonargaon and 5% of the green tubewells tested in Jhikargachha. The percentage of false positives (a tubewell painted red when it should have been green- a wasted well) was 4% of the red tubewells tested in Sonargaon and 7% of the red tubewells tested in Jhikargachha.

#### **Monitoring of tubewell testing over time**

Tubewells tested 'green' in September 1999 using Merck kit were again re-tested in June 2000 with the kit and Atomic Absorption Spectrophotometry (AAS). In Sonargaon upazila, 95.8% of the tubewells continued to mark green implying that they remained unchanged for over 9 months; only 3.3% and 0.9% green marked tubewells changed to 'red' and 'cross' respectively during this period. In Jhikargachha only 2.8% of the tubewells changed into 'red'.

Twenty-five tubewells had tested 'green' and 'cross' using the Merck kit in September 1999 in Jhikargachha. In June 2000 when these were re-tested using AAS, only one was found to have become 'red' (0.06 mg/L). In Sonargaon, 64 'green' and 'cross' marked tubewells were re-tested using AAS in June 2000, and only one of the 'cross' marked tubewells changed to 'red'. Based on these results, it can be said that no change in concentration of arsenic in tubewell waters occurred in these two upazilas over a nine-month period.

#### **Arsenicosis patients, their treatment and support**

VHWs initially identified 348 arsenicosis patients who were later confirmed by physicians. The number of patients increased over time, and by June 2000 this rose to 403. All these patients were provided with safe drinking water. Of them, 269 received *Carocet* tablets with vitamin A, C, and E, and salicylic acid as ointment. They are being monitored on a regular basis.

### **Installation and assessment of safe water options**

Installation and assessment of safe water options was a major activity. The main options promoted were: treatment of surface water with Pond Sand Filter (PSF) and home-based filters; collection of rainwater in Rain Water Harvesters (RWH); treatment of arsenic contaminated groundwater with home-based three-pitcher filters, Safi filters, and arsenic removal plants; and use of shallow groundwater through dugwells. It may be noted that there was little previous experience to draw lessons from.

These options have been assessed on several criteria: initial and running costs; ease of implementation, running and maintenance; continuity and flow of supply; arsenic removal capacity; susceptibility to bacteriological contamination; and acceptability to the community.

All options have their own strengths and limitations and none are as easy as fetching tubewell water directly. At present the home-based filters are proving most popular due to their low cost, ease of use, and cultural acceptability. Three-pitcher filters have proved to be the most popular and feasible in the short-run due to their low cost, ease of operation, availability, and low running cost. Among the community-based options the pond-sand filters initially created good interests among people. But it was found later that people were more interested in using the PSF treated water for cooking than drinking. People in general were found less enthusiastic in using rain water although people in Sonargaon used this option more than in Jhikargachha. Dugwells have good potentials in the arsenic-affected areas if the shallow aquifer is free of arsenic contamination; people's interest to use this option was found to be marked. The newly introduced community-based activated alumina filter also seems promising but it requires further monitoring. The tubewell-sand-filter also has good potentials. The bacteriological quality of all these need continuous monitoring.

BRAC has been able to provide 'safe' water to nearly a quarter of the households exposed to arsenic contamination in all severely affected villages of the two upazilas.

### **Community involvement in project implementation**

The people of the project areas were involved in implementing the project. In a village multiple meetings were held at different stages of the project to inform and involve the community. At these meetings the potential safe water options were discussed. Taking into account the opinion of the villagers, BRAC proceeded with the demonstration of different alternative safe water options with no cost to the community. The villagers decided

where the community-based systems would be best located and then committed to maintaining the system.

### **Awareness development**

A combination of approaches such as meetings, workshops, distribution of posters and leaflets, and the print and electronic media were used in raising awareness about arsenic contamination and the consequences of drinking arsenic contaminated water.

Village meetings, school meetings, and meetings with the local elected bodies were conducted to inform people about the arsenic issues. To design a communication campaign workshops were conducted in the two upazilas where representatives of different stakeholders participated. Research carried out found that BRAC was the primary source of knowledge about arsenic and its mitigation options in the project villages although health workers of other organisations and the media played a role. As a result of the project activities, the awareness level of the community increased significantly.

### **Collaboration with other organisations**

The BRAC arsenic mitigation project maintained a close relationship with the local DPHE and elected bodies like the Union Parishad (UP). Monthly field co-ordination meetings were conducted with the Sub-Assistant Engineer (SAE) of DPHE, Jhikargachha and UNICEF Regional Co-ordinator to inform them of the progress of the project activities. The DPHE officials of Jhikargachha upazila were involved in selecting sites for construction and distribution of options.

The UP chairmen and ward members of both the upazilas were involved in implementing the project activities. They contributed in site selection for construction of options and distribution of filters.

### **Summary conclusions**

1. The existence of arsenic contamination in drinking water has been confirmed in the two upazilas. A blanket testing reveals that 62% of the tubewells in Sonargaon and 48% in Jhikargachha are contaminated with arsenic above the government of Bangladesh limit. There are many villages where no arsenic-free tubewells are available.
2. With some training it is possible for semi- or illiterate female village volunteers to test the tubewell water for arsenic. The technology for testing at the field level, however, needs further improvement.

3. Community mobilisation and involvement are essential for the process of arsenic mitigation.
4. Among the home-based options the three-pitcher filters were most popular due to their low cost and ease of construction. Tubewell-sand-filter, dugwells, and activated alumina filters so far monitored, seemed promising to fulfil the demand of the community. Eleven different options were tested under this project.
5. There should be a system of continuous monitoring of water quality for arsenic treated by any device. Most of these devices have potentials in removing arsenic for a certain period of time. The water also needs to be monitored regularly for bacteriological contamination.
6. There was a lack of consistency in the results of laboratory tests, particularly for coliform bacteria, much of which remained unexplained. In future, more attention needs to be given on proper testing of the water.
7. The usage of the different 'safe' water options by the community also needs to be monitored to understand the use dynamics.
8. It is likely that multiple options will need to be promoted in Bangladesh to tackle the arsenic crisis based on local situations.
9. NGOs with their base at the grassroots level and wide network throughout the country are capable of scaling up the arsenic mitigation activities rapidly; however, co-ordination of various agencies involved in the process is very important. In the two upazilas BRAC has so far been able to provide 'safe' water to a quarter of households exposed to arsenic contamination in the severely affected villages.
10. Finally, this action research project has provided some important learning about the potential sources of arsenic-free water. Community mobilisation and motivation will be essential in providing a sustainable solution to the problem. In the longer term, the country must consider piped water supply to its rural and urban populations. In the short term, however, the options tested in this and other similar projects will need to be considered as emergency measures for the arsenic affected villages.