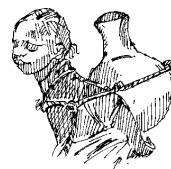




## Arsenic mitigation programme in Bangladesh

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OVER THE PAST 30 years, the incidence of deaths from diarrhoeal diseases has reduced markedly. This has coincided with the introduction of tubewells (now numbering upwards of 11 million nation-wide) and almost 100 per cent practice of oral rehydration for diarrhoea outbreaks. Little study has been conducted into the individual impact of these two momentous introductions but certainly, even though it is found that some tubewells do not provide safe water (i.e. show high levels of e.coli contamination), their ease of use has been welcomed throughout the country. The discovery of arsenic in tubewells is a massive problem. Estimates of the population at risk have been given by different organisations between 24 and 75 million but even the lowest estimate shows the enormity of the problem. The prevalence of symptomatic patients is about 3 in 1000 for a population of 120 million. Dhaka Community Hospital (DCH) (which is a private, non-profit making trust) has been employed by the Government to conduct a Rapid Action Programme to investigate the problem. The results of the first stage of the programme showed various anomalies between ingestion of arsenic through drinking water and symptoms. The results also differ when compared with other international studies e.g. higher incidences of paediatric poisoning and lesions appearing at very young ages.

DCH operates an integrated, sustainable health care system in a number of areas throughout Bangladesh and it was decided to incorporate an additional arsenic mitigation component into the programme. In anticipation of producing a viable model for national replication, a pilot phase for the arsenic component has been started in three villages where DCH is not operating, while also introducing the component into existing programmes where arsenic has been found. The pilot phase is still in its early stages.

### Method

The integrated health scheme works by operating a health insurance system, which provides primary and secondary health care backed up by monthly visits from a DCH consultant, who sees referrals and who also refers patients to DCH for secondary and tertiary care when necessary. The primary care component consists of the nine points of primary health care established by the Government of Bangladesh. It includes water and sanitation.

At the request of a community or organisation working with the community, DCH holds a series of meetings to discuss how a health care system can be run in a particular area. Normally a cluster of communities numbering 2-3000 households is required for sustainability. The com-

munity decides how much each household should pay each month (usually in the region of £0.07). This entitles any member of a card-holding household to visit the doctor and receive regular visits from community health workers and a home visit from the doctor when required. The communities themselves decide whom from within the community, should be employed as community health workers. The field doctor is contracted by DCH but the local community provides the salary. All the field workers are trained initially at DCH. They receive regular retraining and updating. From the beginning the communities own the programme, deciding the extent to which it is developed, often this goes beyond a health system.

The arsenic mitigation component broadly comprises:

- Alternative safe water supply. The immediate need for safe water is paramount. Technologies are being tested by many organisations but it should also be remembered that Bangladesh is a delta area where surface water is readily available most of the year and indigenous solutions combined with knowledge of 'safe' water may provide this immediate need. This does not preclude the introduction of relevant modern technologies as they become available but it does allow the community to manage and control its own water system.
- Health and social education. The community health workers (along with the usual health care components) are trained to identify and advise patients and the community about the origins of arsenicosis and how to avoid further ingestion, or at least reduce total body burden. They also promote social education for the disfiguring nature of melanosis and keratosis has led to social rejection, partly through fear of contagion. Community awareness is essential to cope with the situation.
- Patient management. This includes treatment and monitoring / surveillance and where possible rehabilitation, so that the community sense of well-being is promoted.
- Community capacity building. Increased capacity will result from the empowerment of the community to determine its own health care and water management, rather than waiting for the intervention of external agents.
- Sustainability. The integrated health care scheme has been proved to be sustainable. Community ownership of water management from the beginning should encourage sustainability.

**Table 1a. Sources and Uses of Water by Household - Charal**

	Shallow Twell	Deep Tell	Pond	Dug Well	Beal*	River	Canal
Drinking	123	-	-	-	-	-	-
Cooking	86	-	-	-	-	-	37
Bathing/ Washing	84	-	-	-	-	-	39
Household	83	-	-	-	-	-	40
Agriculture	2	-	2	-	-	-	72

Total number of households = 123

\* Large pond

**Table 1b. Sources and Uses of Water by Household - Nilkanda**

	Shallow Twell	Deep Tell	Pond	Dug Well	Beal	River	Canal
Drinking	86	-	2	-	-	-	--
Cooking	44	-	19	-	-	-	25
Bathing/ Washing	46	-	21	-	-	-	21
Household	77	-	3	-	-	-	8
Agriculture	4	-	23	-	-	-	20

Total number of households = 88

**Table 1c. Sources and Uses of Water by Household - Ruppur**

	Shallow Twell	Deep Tell	Pond	Dug Well	Beal*	River	Canal
Drinking*	1356	-	-	4	-	-	-
Cooking	1355	-	-	6	-	-	-
Bathing/ Washing	1340	-	2	14	-	5	-
Household	1341	-	2	16	-	2	-
Agriculture	94	-	-	-	-	1	-

Total number of households = 1361

\*One source unknown

**Table 2. Contaminated Tubewells and Patients**

	Charal	Nilkanda	Ruppur
Patients (% of village pop.)	4.50%	9.81%	0.91%
Contaminated Tubewells (As > 0.1mg/l)	91.50%	95.50%	25.26%
Households using tubewells for drinking	100.00%	97.73%	99.63%

## Results

The tables show the results of the initial household and village surveys. Tables 1a-1c show the near total reliance on tubewells in the pilot villages and the other available water sources. Table 2 shows the percentage of symptomatic patients and the extent of usage of contaminated wells.

## Discussion

These results have been presented in community meetings and discussions held about safe water alternatives. The vast

majority of households use tubewells for drinking and cooking. Many have invested in tubewells and they are seen as a symbol of social standing. However, a sense of 'community' still exists and tubewells are shared if the 'sharing' household is perceived as a 'good' neighbour. Therefore, those with non-contaminated wells will share. However, the problem is dynamic. 'Safe' tubewells will need regular monitoring and it may be seen in Table 2 that the test limit used was 0.1mg/l. This is above both the WHO limit (0.01mg/l) and the Government limit of 0.05mg/l and

reflects the problem finding a safe, user-friendly, field testing kit. Regular testing of water for pathogens is also required. The expenditure for all testing will at present have to be born by the community, so community ownership is essential.

In many of the discussions held so far, the community is favouring the use of dug wells as an alternative source. Those above 40yrs remember using them and how to build and maintain them. The use of alum for water cleaning is still practised although its safety and reliability are questionable when not accurately measured.

Table 2 also highlights some of the medical problems being faced. Why are not all the people drinking from the same contaminated wells showing the same severity of symptoms? Many patients have passed beyond what is thought to be a reversible condition (although long term outcome of the 'reversible' stages is uncertain). The focus has been on ingestion of contaminated water but much more investigation is required into other possible sources and confounding factors.

DCH experience is that it usually takes around 12-36 months to establish a sustainable programme. Sometimes there is insufficient interest and the doctor is withdrawn if subscriptions for the health cards are not paid and no salary available. Sometimes the closure is only temporary and the community requests a restart. However, sustainability of the arsenic component is necessary whether communities decide to run the integrated health care scheme or not and motivation is essential. Early results are showing that if patients are involved in managing the programme, there are greater chances of success.

We have also found a problem in some areas (especially those close to Dhaka) arising from rumours that external agents will arrive with financial assistance e.g. why should we use, or finance, one of the alternatives, which do not provide 'clean' water without further treatment, when 'x, y and z' are handing out money and installing various

options? This is a valid response but there is no evidence that all the affected villages of Bangladesh are to receive funding and many are being used as experimental areas for inappropriate technology.

As in other low-income countries, there is a lack of low-cost, validated laboratory testing facilities and quality control is a further problem.

### **Conclusion**

It is our experience that the success and sustainability of a programme is determined by the initial involvement of the community in selection and implementation of methods. The arsenic problem is immense but we have to make some form of immediate intervention. Knowledge about diarrhoeal disease is nationally much greater than it was 30 years ago and if we are able to use indigenous solutions carefully with regular monitoring and surveillance, we hope that the not only will the problem be contained while more investigation takes place but also no knee-jerk reaction is used which will lead to further problems. We are encouraged that the Government's latest health policy has a clause in its essential service package to deal specifically with the arsenic problem.

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