Awareness and Choice of Options of Arsenic-free Drinking Water

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Summary

The discovery of arsenic contamination in tubewell water has created concern for its potential health effects. BRAC initiated an arsenic mitigation project in two upazilas in 1999. The project included promotion of community awareness about arsenic contamination in drinking water and the demonstration of alternate safe water options among others. This report assesses the contribution of BRAC initiative in raising awareness about arsenic problem and identifies the choice of options for safe drinking water.

A combination of several methods such as sample survey, in-depth interviews and focus group discussions (FGDs) were used. The study was conducted in selected villages in Jhikargachha (project area) and Bheramara upazilas (comparison area). A total of 1,240 randomly selected adult persons were interviewed. Arsenic problem and its mitigation options were discussed with key stakeholders relevant to the project. In addition, the perception of the users about options was understood through eight FGD sessions.

The term *arsenic* became well known in the remote communities where the tubewells were tested to identify arsenic. The knowledge of safe water options was much higher in the project than comparison villages. However, a very small proportion was aware of more than two options. The mitigation project was not only able to significantly raise the awareness but also the knowledge of the signs and transmission of arsenicosis, it prevention and sources of treatment.

The report assesses public perception about several safe water options that BRAC tested. No community had *all* options together. The beneficiaries were given limited choices on the basis of which they could finally select a mitigation option. It has become clear that each option had strengths as well as problems. Rainwater harvesting, for example, was well known in the community but not preferred by most because of its seasonality problem and odd smell of its water. The pond-sand filter (PSF) was a viable option although its distance from home discourages many to use it. The main problem of Shafi filter was its maintenance and water containing capacity. The dugwell water was reportedly visibly dirty and had health hazard. The maintenance of SIDKO filter was proved difficult. The flow of water and the containing capacity of the lately introduced three-pitcher was inadequate. However, considering price and privacy of its use, this option became very popular and acceptable to a large community.

The study concludes that the community awareness of arsenic has significantly increased although the use of safe water options was much less than expected. The main thrust of the project should, therefore, be shifted from raising awareness to increase practice. Less preferred options should be discontinued in the subsequent phase of the project. BRAC should think of providing more options in limited communities rather than limited choices in more communities. The community played a very limited role in the mitigation process. The project can sustain only when the users not only participate but own its success and failure. The role of key stakeholders of the project should be clearly defined and their performance should be monitored. While the project has provided valuable insights about arsenic mitigation in a poor community, a number of issues have remained unresolved. The project, therefore, should continue for some time.

Introduction

The discovery of arsenic in groundwater has created concern for its potential health effects. Although the presence of arsenic in tubewell water was first detected in 1993 in Chapai Nawabganj district[1], the problem has drawn attention only in recently. The arsenic poisoning is generally caused by contamination of the tubewell water. It is estimated that over half of the Bangladeshi population is at risk of arsenic poisoning[2]. As nearly 97% of the population uses tubewell as the sources of drinking water, nearly all people living in the arsenic affected areas are at risk. According to a report, about 25% water of the hand tubewells tested by the government have shown the presence of arsenic[2].

BRAC, along with the government and other development organisations, have been promoting the use of tubewells as the safe source of drinking water. The recent discovery of arsenic contamination in tubewell water in Bangladesh has created concern and forced the government and others to develop alternative sources of drinking water in the arsenic affected areas. BRAC has initiated an arsenic mitigation project in Jhikargachha and Sonargaon upazilas in collaboration with UNICEF and Department of Public Health Engineering (DPHE). The mitigation project included promotion of community awareness about arsenic contamination in drinking water and its health effects, demonstration of alternate safe water options, and involve community in selecting and implementing an arsenic-free drinking water source. BRAC has used its grassroots workers to communicate villagers through both formal and informal meetings and disseminate the potential safe water options. The phase I of the project officially ended in June 2000. The purpose of the study was to assess the contribution of the mitigation project in raising awareness of the community about arsenic contamination and identify the choice of options for safe drinking water.

Methods

A combination of several approaches such as sample survey, stakeholder interviews and focus group discussions (FGDs) was used. The assumption was that multiple approaches would help triangulate the information generated from various sources.

Data for this study came from the selected villages of Jhikargachha *upazila* where BRAC has both arsenic mitigation project (project area) and a development surveillance system known as *Watch*. A number of comparison villages was selected from Bheramara *upazila* of the same region where BRAC has no arsenic mitigation project (comparison area) but operates similar surveillance system. Information about arsenic awareness and the choice of options of alternative sources of water was collected by a sample survey. All adult population aged between 15 and 74 years were considered to be included in sample. Two sampling frames for both men and women were constructed. Systematic

random sampling technique was followed to select samples from both study areas. The total sample size was 1,240 where 636 from the project and 604 from the comparison villages were selected and interviewed. A total of 6 in-depth interviews were conducted with key stakeholders of the project. They were as BRAC and DPHE officials, and local government representatives to understand the problems of implementing such a project. Finally, 8 focus group discussions (FGDs) were held with the users of various safe water options and community leaders. The data collection instruments were field tested in Sonargaon project area. Information was collected during 13-21 May 2000.

Findings

The socio-demographic characteristics of the population in both the project and comparison villages were generally similar in terms of age and sex distribution, and exposure to media (not shown). Overall socio-economic condition was better in the project than comparison villages.

Table 1. Arsenic awareness, source and options of arsenic-free water by study area

	Study area		
	Project	Comparison	*P-value*
Awareness of arsenic (Unprompted)	81.8	58.3	*<.01*
Heard about arsenic (Prompted)	95.4	70.4	*<.01*
Arsenic free water			
At least one	77.8	44.9	*<.01*
At least two	35.8	15.6	*<.01*
Source of arsenic free water			
Pond or river	42.6	27.8	*<.01*
Rain water	36.8	7.8	*<.01*
Green tubewell	23.3	17.7	*<.01*
Deep tubewell	13.2	0.7	*<.01*
Dug well	8.6	10.9	*ns*
Safe water options			
At least one	81.6	50.2	*<.01*
At least two	41.7	9.7	*<.01*
At least three	14.7	0.8	*<.01*

Arsenic awareness

As part of the arsenic mitigation strategy, the government and several development organisations have been implementing arsenic awareness campaign throughout the country. A combination of approaches

such as meetings with the community leaders, workshops for the health and other service providers, use of school teachers and religious leaders as advocates, meetings with neighbours at the time of testing hand tubewells for arsenic, distribution of posters and leaflets at key public places and the use of print and electronic media were used in raising knowledge about arsenic contamination and the consequences of drinking arsenic water on human health. As a result, the term *arsenic* became well known even in the remote communities where the tubewells were tested to identify arsenic (Table 1). As expected, the awareness level was significantly increased in the project than comparison villages as the project villages received additional inputs through the community health workers of BRAC. When prompted, the awareness level raised to 95% in the project and 70% in the comparison villages.

The project village people seemed to be better informed about arsenic free surface water sources such as pond or river and green-coloured or deep tubewell as reliable arsenic-free water sources than the comparison villages. Only few sources such as rainwater, dugwell, ponds, green-marked tubewell and deep tubewell were available in the study villages. Awareness of at least one source of arsenic-free water was nearly 78% in the project and 45% in comparison village. The knowledge level dropped to 36% in the project compared to only 16% in the comparison villages when asked to mention at least two arsenic-free sources of water.

Several options for arsenic-free water were developed by various agencies. The government, development organisations, business community and the media have been field testing these options in various arsenic-affected communities. Compared to the awareness of arsenic poisoning and its potential health hazard, the knowledge of these options was very poor. While discussing about six selected options (such as Rainwater harvesting, Pond-sand filter, Shafi filter, Dug well, SIDKO filter and Three-pitcher), it was found that nearly 82% respondents in the project compared to 50% in the comparison villages had knowledge of at least one safe water option. Only 42% in the project villages and nearly 10% in the comparison villages could mention at least two options. The limitation of their knowledge was reflected when it became clear that a very small proportion of the population were, in fact, aware of more than two options. The awareness of options, however, was significantly higher in the program than comparison villages.

Table 2. Knowledge about sign, transmission and treatment of arsenic

Prevention and treatment	Study area		
	Project	Comparison	*P-value*
Signs of arsenicosis			
Black spots on body	31.1	9.9	*<.01*
Rustles on palms	34.7	16.6	*<.01*
Wounds on palms and body	79.7	43.5	*<.01*
Transmission of arsenicosis			
Never spread	44.3	14.4	*<.01*
Physical touch	30.8	39.6	*<.01*
Living together	1.7	16.6	*<.01*
Treatment			
Doctor or health worker	86.5	62.4	*<.01*
Drink arsenic-free water	10.7	4.0	*<.01*
Fresh vegetable and vitamin	2.5	1.2	*ns*

Identification and treatment of arsenic patients were important components of the mitigation project. The awareness campaign included the identification visible signs of arsenicosis on the body of the affected persons and the mode of transmission of arsenic diseases. Attempts were made to reduce the misconception that *arsenicosis is a contagious diseases*, etc. Table 2 shows that the knowledge about the signs of arsenicosis such as black spots on body, rustles on palms or wounds on palms and body was significantly higher in the project than comparison villages. The misconception regarding the transmission of arsenic disease such as arsenic could spread by physical touch remained high in the project villages (31%) and even higher in the comparison villages (39%) indicating that epidemiology of arsenicosis was not properly understood by the community. Such misconception could create other problems. One arsenic patient, whose husband died from arsenic poisoning three years ago, complained that her neighbours tended to avoid her. She wanted us to assured others that arsenicosis is not a contagious disease.

In-depth interviews with the arsenic-affected community suggest that a significant proportion of the community people believed that arsenic disease had no cure. BRAC tried to develop a preventive approach by promoting the increased consumption of fresh vegetables, the use of arsenic free water and the existing health facilities in the area. As a result, the awareness to seek help from the health providers, drinking arsenic-free water and consuming fresh vegetables as curative measures increased in the project villages.

Table 3. Sources of knowledge about arsenic by study area

Sources of knowledge	Study area		
	Project	Comparison	*P-value*
BRAC health worker	84.0	0.8	*<.01*
Other health worker	27.8	68.7	*<.01*
Radio/TV	11.3	13.7	*ns*
Newspaper	3.6	1.3	*<.01*
Neighbour/friend	14.2	4.2	*<.01*

As expected BRAC was the primary source of knowledge about arsenic and its mitigation options in the project villages although health workers of other organisations and media also played a role (Table 3). On the other hand, grassroots level health workers along with the mass media were crucial in disseminating arsenic problems in the comparison villages.

Table 4. Awareness and use of options in the project villages (N=636)

Awareness and use	Option					
	RWH[1]	PSF[2]	Shafi[3]	DG[4]	SDK[5]	Pitcher[6]
Aware of	87.9	37.4	33.0	100	26.6	69.8
Have seen	67.7	21.8	20.2	56.4	16.5	25.2
Ever used	32.4	16.8	6.0	43.6	11.0	15.9
Still using	2.8	7.4	1.3	0.4	---	11.0

[1]RWH=Rain water harvesting
[2]PSF=Pond-sand filter
[3]Shafi=Shafi filter
[4]DG=Dug well
[5]SDK=SIDKO filter
[6]Pitcher=Three-pitcher

Choice of options

BRAC tried six options to provide arsenic-free drinking water in the project villages. These included treatment of surface water such as rainwater harvesting, revival of dugwells and building pond-sand filters, and various arsenic removing filters namely Shafi filter, SIDKO filter and three-pitcher filter. It

should be noted that not *all* options were offered to any community in the project villages. While all users of tubewell water in the project villages were informed about all mitigation options offered by BRAC, it was not possible to provide many options in a single village. Thus, the beneficiaries of BRAC project had practical experience of the advantages and disadvantages of only limited number of choices on the basis of which they could finally select a mitigation option. As seen in Table 4, the community people were much better aware about the dugwell and rainwater harvesting, only moderately aware about the three-pitchers and significantly less aware about the pond-sand filters and other options. Dugwell was an indigenous source of water for long time in the community and, thus, was known to all. Three-pitchers were introduced later and other less known options were available in only few communities. The differences between *heard* and *ever seen* of various options were quite high, as only 25% of the respondents have ever seen three-pitcher system although nearly 70% have heard about it. Similarly, access to or the actual use of options was very low as none of the options was practised by more than a third of the community except dugwell. When the proportions of ever user and continuing user of various options were compared, it became quite clear that three-pitcher was the best choice among all followed by the pond-sand filters (PSF). SIDKO filter, the most popular option in the community where it was installed, was found out-of-order. While SIDKO filter was the most preferred option, the maintenance costs and the unwillingness of the community to take the responsibility of the filter clearly indicated that SIDKO was not a viable option in the poor communities in Bangladesh. Dugwell, although less costly and was widely used till the introduction of hand tubewells, was not preferred largely because of the availability of other choices.

Table 5. Problems of various options as perceived by the community

Options	Problems
Rain water harvest	Seasonal only Dirty & smell
Pond-sand filter	Distance Bad smell
Shafi filter	Costly Low capacity
Dugwell	Dirty Costly
SIDKO filter	Distance Maintenance
Three-pitcher	Low capacity Water flow

The problems of each option, as perceived by the community, were understood through interaction with the community in group meetings and in-depth interviews in addition to the survey. The two major problems of each option were shown in Table 5. Rainwater harvesting was well known and nearly a third of the community had ever used this option. This option was not preferred by most not because the option was available in the rainy season only but the smell and taste of water were not liked by them. As one woman commented, "The rainwater is arsenic free I know but I don't like to drink it. It has bitter taste. We use rainwater in cooking only". The pond-sand filter (PSF) was considered a viable option although the long distance of PSF from home would discourage many user particularly adult women to continue. The smell of the water of PSF had to be improved to sustain the use of PSF. The PSF has other problems as well. In one project village, it was found that PSF was not operational because the pond had not adequate water. In another case, the water pipe was found broken. The community was not willing to repair by themselves. They believed that the government should repair it.

It is surprising that water quality issue of both rainwater and pond-sand filter was not a serious concern to most of the people in the project villages. The mitigation project should focus in disseminating the quality of water in its subsequent phase. Shafi filter was a user-friendly option in the sense that it was used at the family level and could be easily moved. The main problem, as perceived by its users, was that the filter was expensive and the capacity of the container was inadequate for most

household needs. The project officials disclosed other problems of this filter and have been considering discontinuing the promotion of this option in future.

As have discussed earlier, the dugwell was the least used source of the available options. The major complains were that the water was visibly dirty and had potential health hazard. In addition, the construction of dugwell with outer wall and cover was costly. The main problem of SIDKO filter was its distance as only one piece was installed in a single village. Moreover, the repair and maintenance of this filter by the local mechanics were not possible. Lately introduced three-pitcher had also problems of low capacity and slow flow of water after using couple of days. However, considering price and privacy of the use, this option became very popular and acceptable to a large community. Many of them opted for deep tubewell because they believe that deep tubewell water cannot have arsenic. Although not known to many, the Tubewell-Sand-Iron Filter (TSIF) seemed to be a reliable and low cost option. Its performance was quite satisfactory.

Conclusions and Implication

BRAC has a pilot arsenic mitigation project where promotion of raising awareness about arsenic poisoning in tubewells and the health effects of drinking of arsenic water were two components. While the implementation of promotional activities such as holding series of workshops with key stakeholders had just begun at the time of study, it seems that the group meetings with the community during and after testing tubewells by BRAC workers were very effective in creating an interest about arsenic problems. *This study clearly demonstrates that the community awareness of arsenic has increased.*

In any new initiative, the general public expresses their curiosity but does not accept new approach or technique in the beginning. They prefer to wait, observe carefully and take time to decide. This scenario was clearly reflected in this project as the practice of safe water options was relatively low while the awareness level was very high. One woman commented, "I know that drinking arsenic water is bad for my health. But what can I do? I have to go far to fetch water everyday. ... I have no other choice." During the second phase of the project, *it is expected that the main thrust of the project should shift from raising awareness to increase practice.*

In assessing the preferences or choices of safe water source, it has become clear that some options were better than others. The reasons of non-acceptance of few options were clearly known. *It is recommended that the less preferred options should be withdrawn in designing the next phase of the project.*

The project was not designed to offer many choices to a particular community. As a result, it was difficult to assess the preferences of options as the community had a limited number of choices. *The project that offers wider variant in limited communities clearly had better edge than distributing the options in many communities.*

One major weakness of the project has been the absence of community leaders in the mitigation process. As a result, the effort has become a BRAC-DPHE-UNICEF project. The local chairman had little interest in arsenic mitigation project activities in his village although he managed to procure one three-pitcher for his own family from BRAC office. The community participated in various activities as exogenous elements, not as a part of it. In many cases, the local leadership remained at dark about the project. *The project can sustain only when the users of arsenic-free water participate in the mitigation process.*

The project was designed to be implemented jointly by BRAC, DPHE and the local government agencies with the financial assistance of UNICEF. The study has identified co-ordination problems and confusions between the Department of Public Health Engineering and BRAC. DPHE had its own project to built safe water options. Has there been better co-ordination between BRAC and DPHE, duplication in installing arsenic-free option in the same community could be avoided. It is strongly recommended, therefore, that *the role of key stakeholders in the extended project should be clearly defined and their activities should be independently (e.g., by UNICEF) monitored.*

While the project has provided us valuable insights about the problems of arsenic mitigation, a number of issues were remained unresolved. *The study suggests, therefore, that the project should be continued for some time.*

References

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