

Arsenic Mitigation in Bangladesh

KEY STATISTICS

	Number	%
Household drinking water tested for arsenic in 2009^a	13,423	100
Household drinking water exceeding Bangladesh standard ¹ in 2009		12.6
Household drinking water exceeding WHO guideline in 2009 ²		23.1
Estimated number of tube wells in Bangladesh in 2002	8,600,000	100
Tube wells tested for arsenic in 2002 and 2003 ^b	4,750,000	55
Tube wells marked green (safe)	3,300,000	39
Tube wells marked red (unsafe)	1,400,000	16
Estimated total villages in country	87,319	100
Villages screened for arsenic	54,041	62
Villages where < 40% of the wells are contaminated	70,610	81
Villages where 40-80% of the wells are contaminated	8,331	10
Villages where 80-99% of the wells are contaminated	6,062	7
Villages where ALL wells are contaminated	2,316	3
Active public safe water options in arsenic affected areas^c	705,094	100
Shallow tube well with hand pump(safe)	417,960	59.3
Deep tube well with hand pump	154,264	21.9
Shallow well with Tara pump (safe)	82,880	11.8
Deep tube well with Tara pump	10,350	1.5
Dug well	9,163	1.3

^a Source: Multiple Indicator Cluster Survey, Bangladesh Bureau of Statistics/UNICEF2009

^b Source: National Arsenic Mitigation Information Center, 2005

^c Source: Situation Analysis of Arsenic Mitigation 2009, JICA/DPHE

BACKGROUND

Arsenic contaminated tube well water was first detected in Bangladesh in early 1990s. The arsenic comes from naturally arsenic-rich material delivered by the region's river systems, deposited over many years to make up the land of Bangladesh. Arsenic contamination is not caused by tube wells, or by irrigation or application of fertilizers.

Today, although 98 per cent of the population uses an improved drinking water source the safe water coverage of Bangladesh is 86 per cent³ because of arsenic contamination.

¹ The WHO Guidelines value for arsenic in drinking water is 10 microgram per liter. This value has been adopted by many developed countries as the drinking water standard for arsenic. However many developing countries such as Bangladesh have kept their standard at 50 microgram per liter for practical reasons.

² See note above.

³ Multiple Indicator Cluster Survey, Bangladesh Bureau of Statistics/UNICEF, 2009

In 2009, a household drinking water quality survey conducted by UNICEF⁴ found that 12.6% of drinking water samples still do not meet the Government drinking water standard for arsenic. This represents approximately 20 million people at risk of arsenic exposure. This compares with an estimated 35 million people⁵ in Bangladesh who were exposed to arsenic contaminated water in early 2000s.

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In 2002 and 2003, a total of 4.7 million tube wells in Bangladesh have been screened for arsenic. Of those, 1.4 million tube wells were found to contain arsenic above the Government drinking water standard of 50 microgram per liter⁶. Almost one in five tube wells is not providing arsenic-safe drinking water. There are more than 8,000 villages where 80 per cent of tube wells are contaminated.

Over the past decade, the combined efforts of the Government and development partners have led to notable success in arsenic mitigation and a significant decrease in the number of people exposed to arsenic. In 2009, a situation analysis of arsenic mitigation has found that there are a total of 705,094 public safe water options available since 1960s in all the arsenic affected areas in Bangladesh. However in the

most affected areas, where more than 80 per cent tube wells are contaminated, only 4 out of the total 9 million residents have been provided with safe water options by the government. An urgent task is therefore to reach those people who are still without arsenic safe water in the highly contaminated areas

ISSUES

Health danger

Nearly 40,000 people showing the skin lesions symptoms characteristic of arsenicosis have been identified in Bangladesh in early 2000s. This number has likely grown with time because a long latency of more than 20 years is common for arsenic related lesions to develop. There is no known cure for chronic arsenic poisoning. Some of the symptoms due to arsenic poisoning can be reversible if detected early and if people stop drinking arsenic-contaminated water. Lotions containing urea and salicylic acid can ease the pain of skin lesions. People can recover more rapidly from skin lesions when they eat nutritious food or take multi-vitamin supplements.

The visible symptoms from arsenic can include lesions, hardening of the skin, dark spots on hands and feet, swollen limbs and loss of feeling from hands and legs. Lesions are easily infected, pose a threat of gangrene and can be very painful. Lesions can appear quickly if arsenic concentrations are very high. Malnourished people are twice as likely to develop skin lesions as well-nourished people. On the long term arsenic can cause skin cancer.

However visible symptoms might be the tip of the iceberg. The invisible symptoms from long-term exposure to arsenic include internal cancers of the lungs, bladder and kidney, which can be fatal. Long-term exposure to arsenic also increases the mortality rate from heart

⁴ Multiple Indicator Cluster Survey, Bangladesh Bureau of Statistics/UNICEF, 2009

⁵ *Arsenic contamination of groundwater in Bangladesh*, British Geological Survey & Department of Public Health Engineering, 2001:

attacks and other cardio-pulmonary diseases. According to a cohort analysis of 115,903 persons conducted between 1991 and 2000 in a health and demographic surveillance system in Matlab, Bangladesh, it was found that for people exposed to arsenic above 50 microgram per liter in drinking water, the death rate due to cancers, cardiovascular disease and infectious disease increased by a factor of 1.44, 1.16 and 1.30, respectively. Studies from other parts of the world all show that arsenic exposure leads to very high excess deaths.

Studies of health dangers of arsenic have also shown that exposure to arsenic contaminated water can impair cognitive development in children. In general children are particularly vulnerable to arsenic poisoning and are much more likely to face health impacts than adults.

Social stigma

People with lesions from arsenic poisoning still suffer social stigma in Bangladesh, although the situation has improved. Ten years ago, many people believed arsenic poisoning was contagious or a curse. Parents were reluctant to let their children play with children suffering arsenic poisoning. Arsenicosis patients were shunned within their villages. For women, the situation was worse and remains an issue. In Bangladesh, a woman's attractiveness is often associated with the pale complexion. This makes it harder, in some cases impossible, for single women suffering from arsenic poisoning to marry. Once married, women face the risk of divorce if they develop arsenicosis skin lesions. This can be a dire situation in Bangladesh's male-dominated society, where unmarried women are more vulnerable to poverty and social exclusion.

Changing behavior

Arsenic has no taste, odor or color, and poses long-term health risks, unlike the immediate risks of diarrhea. Rural Bangladesh has only recently switched from surface water to tube well water in order to reduce diarrheal disease. By early 1990s, the campaign for tube wells has led to 97 per cent of rural population to use wells for drinking, corresponding to dramatic decline of deaths from diarrhea. Most tube wells have been built by private individuals. However, discovery of wide spread arsenic contamination in tube well presented a double challenge: to ensure that the health gains on diarrhea would not be lost while also reducing the health impact of arsenic. The challenges are both technical and social-economical. In certain arsenic-affected areas there are few if any affordable safe water options for rural households with average income. Many alternatives are safer, but less convenient or more costly, than arsenic-contaminated shallow tube wells. Solutions such as rainwater harvesting have shown low social acceptability. It is not rare to still see people drinking arsenic contaminated water from red painted tube wells. It is hard to compete with the low-cost, easily maintained and convenient shallow tube wells when it comes to water supply to rural household.

Institutional and policy framework

One of the features of the institutional landscape is the very large number of agencies (governmental and non-governmental) engaged in arsenic-related interventions. Coordination is challenging not least because of the multi-sectoral nature of the problem.

In 2004, the Government of Bangladesh has formulated the National Policy for Arsenic Mitigation which was translated into the Implementation Plan for Arsenic Mitigation. An Arsenic Policy Support Unit (APSU) and a National Committee for the Implementation Plan for Arsenic Mitigation (IPAM) was established. However, today the APSU no longer exists and the committee is inactive. Policies for the three different sectors affected by arsenic

contamination in the ground water, namely the National Agriculture Policy, National Water Policy and National Health Policy, do not include provision for arsenic mitigation.

In 2009, the Policy Support Unit of the Local Government Division of the Ministry of Local Government, Rural Development and Co-operatives called for a review of the IPAM. This represented an important step in revigorating arsenic mitigation efforts.

Cost

Recent estimate indicates that an investment of US dollar 200 million is necessary to provide basic access to arsenic safe water to the 20 million people still exposed to high level of arsenic contamination, assuming that 20 households share one safe water point.

Action

Bangladesh is home to UNICEF's largest arsenic mitigation programme that has been contributing from policy to practice since the discovery of arsenic problem. UNICEF Bangladesh works with many partners including the Government, Non-Governmental Organizations and other UN agencies in some of the worst arsenic-affected areas in the country for sustainable arsenic mitigation. Without addressing the arsenic issues urgently, the Millennium



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Development Goal of halving the proportion of people without access to safe water will be missed; not to mention the Government's goal of reaching *Safe water for all* by 2011.

When arsenic was discovered, UNICEF supported the Department of Public Health and Engineering (DPHE) in the first nation-wide survey of tube wells which indicated the national extent of the problem. This set the stage for a massive National Tube Well Screening Program, in which all tube wells - public and private - in arsenic-prone areas were tested. Of the 4.7 million wells screened for arsenic using field test kits, approximately 1.5 million was supported by UNICEF.

Another critical early intervention by UNICEF was the development of the National Arsenic Communication Strategy and Campaign. Mass media and inter-personal communication tools for a wide range of field-level workers, including school teachers, religious leaders, health care workers, and DPHE engineers were developed.

Between 2000 and 2010, UNICEF supported the Government for the installation of safe water devices in arsenic-affected areas: pond sand filters, deep tube wells, rain water harvesting systems, etc. This support is on-going.

UNICEF supported DPHE in reviewing the potential of large scale use of arsenic removal technologies - or filters- in rural villages from twenty six unions where arsenic contamination is especially severe and where alternative safe water options are limited. Supported by the Canadian International Development Agency from 2005 to 2009, four of the six arsenic removal technologies provisionally approved by the Bangladesh Council of Scientific and Industrial Research were deployed on a trial basis. Through a community participatory process, nearly 18,000 household filters, and 50 community filters, were deployed and checked for arsenic removal effectiveness. Approximately 90,000 people previously exposed to arsenic have benefited from these filters. The technologies are shown to have the potential to serve as a supplement to the range of safe water options when it is deployed properly and when user service needs are supported, such as monitoring of filter performance. However the evaluation also raised some concerns regarding the performance, affordability and sustainability of these technologies and the local institutional capabilities for large scale implementation.

Arsenic mitigation is also an integral component of UNICEF supported project Sanitation, Hygiene Education and Water Supply in Bangladesh (SHEWAB) which started in 2007 and will continue to 2011. Supported by the United Kingdom's Department for International Development, 10,000 Community Hygiene Promoters use a range of communication methods and materials to raise awareness about sanitation, hygiene, and safe water in 68 sub-districts in 19 districts. Disseminating messages on arsenic risk is part of their social mobilization efforts. They also began testing for arsenic for a nominal fee in several unions. The project also aims to install 20,000 new arsenic-safe water points and gives priority to communities facing arsenic contamination. Safe water options include deep tube wells, dug wells, pond or river water filters, rain water tanks and arsenic removal systems. To determine which safe water option is best suited, technology maps have been developed for all unions that ranks the feasibility of the safe water options. Communities then choose which option is best suited to their needs, considering costs and the possibilities of health hazards, such as contamination by other chemicals or germs. Communities are responsible for selecting sites, contributing to set-up costs and maintaining and operating the alternative sources.

UNICEF also supports the Government in developing a water quality data management system, with the objective of building the capacity of national and local institutions for water quality testing and strengthening the regulatory role of the Government. UNICEF is also involved in innovative designs of water facilities and treatment technologies as well as rural and urban piped water systems.

UNICEF is a key contributor to the ongoing arsenic screening programme that is part of the World Bank's Horizontal Learning Programme. Sustainable arsenic mitigation requires the collaboration of local government institutions, non-governmental organizations, and the private sector. Since the vast majority of tube wells in Bangladesh are built by private persons, the idea is to propose water testing for arsenic for a minimal fee so that villagers who install shallow tube wells can test the quality of the water at an affordable price. Community Hygiene Promoters working under SHEWA-B project can become private testers after the completion of the project and maintain this critical service. Government laboratories are being engaged to provide oversight and quality check to private arsenic tester.

UNICEF encourages knowledge sharing between affected countries. In April 2009, UNICEF facilitated a regional conference on arsenic mitigation. A total of 12 Asian countries met in Bangladesh to discuss ways of mitigating the impact of arsenic and share their experiences. UNICEF participates actively in knowledge sharing networks and information dissemination on arsenic.

In 2010, UNICEF joined force with the Food Agricultural Organization, the World Health Organization and the Water and Sanitation Programme of the World Bank to launch a document titled '*Towards an Arsenic Safe Environment in Bangladesh*'. This publication presents the status of arsenic mitigation in Bangladesh as well as emerging threats and calls for urgent action to address the current health risks posed by arsenic contamination. It provides a clear set of measures that could be taken immediately in agriculture, water and health sectors.



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UNICEF also supports the Government in developing a concrete plan for the water sector with quantifiable targets and sufficient budget allocations to ensure arsenic safe water to all.

IMPACT

UNICEF has led the way in raising awareness about arsenic poisoning. Now 80% of people know that arsenic can be a problem in tube well water, up from single digits in the late 1990s before the arsenic awareness campaign began. About 70% of households who have heard of arsenic report they are taking some action to avoid arsenic – most commonly by collecting water from a tube well known to be safe. Arsenicosis patients are also reporting fewer social problems as awareness increases. Although stigma for prospective marriage partners has remained, a 2004 arsenic attitudes survey revealed more than one in four parents would allow their child to marry an arsenicosis patient.

UNICEF has also identified that one of the most effective agents of communication is the tube well tester: testing a well takes at least 30 minutes, during which time the tester can share basic information about arsenic with the tube well users, dispelling common myths. At the end of the test, tube well users could visually see evidence of the result, and wells were painted red if contaminated, and green if the water met the government limit of 50 microgram per liter. Testing has allowed villagers to share safe wells and to identify depths where arsenic is less prevalent. Therefore, UNICEF continues to foster public-private partnership for arsenic testing in rural Bangladesh as a means to raise awareness, to reduce exposure and to identify alternative source of safe water.

Between 2000 and 2009, more than 160,000 safe water devices have been installed in arsenic-affected areas. Of these, 15,000 were through UNICEF-supported projects. About 4,000 water points have been recently installed as part of the SHEWA-B project, benefiting 400,000 people in the arsenic affected areas.

Working closely with the Government, UNICEF has strengthened the Government's capacity in monitoring water quality for public and privately installed water points in Bangladesh and to enforce water quality regulation.

Updated 11 March, 2010