

AN UNFORESEEN TRAGEDY

THE BATTLE WIDENS AGAINST THE WATER CRISIS IN BANGLADESH

BY BABAR KABIR

Pinjira Begum died in 1999, at the age of 35; the last two years of her life spent mostly in bed, rising to go from one hospital to another. She featured in an article in *The New York Times*, but that was little solace for one suffering the ignominy of seeing her husband marry a second time and living with his second wife in the same thatched hut.

Pinjira worried about her three children; specially her two daughters – Juthi, then aged 2, and Shapla, then aged 7. In a society not favorable to girl children, Pinjira realized that without her, both her daughters would be neglected. Juthi passed away eight months after Pinjira's death, neglected, suffering from arsenic poisoning and malnutrition. Both mother and daughter were victims of arsenic contamination of groundwater, the source of their drinking water.

For over two years, Pinjira was ostracized by her neighbors, who thought that her illness was a form of leprosy, a disease that still is prevalent in parts of Bangladesh. Fearing that she was suffering from leprosy, she tried to conceal her symptoms. It was not until a health worker from Dhaka Community Hospital came to her village that she learned that she was suffering from arsenicosis. The source of her ailment, she was told, was the arsenic-contaminated drinking water



from her tube well. But it was too late. Her condition had become irreversible, leading to cancer, and eventually death.

Luckily, for others, there is now hope.

In the early 1970s, most of Bangladesh's rural population got its drinking water from surface ponds and nearly a quarter of a million children died each year from water-borne diseases. The provision of tube well water for 97% of the rural population has been credited with bringing down the high incidence of diarrheal diseases and contributing to a halving of the infant mortality rate. Paradoxically, the same wells that saved so many lives now pose a threat due to the unforeseen hazard of arsenic.

With more than an estimated 24 million of its 130

million people assumed to be drinking contaminated water and another 70 million potentially at risk, Bangladesh is facing what has been described as perhaps the largest mass poisoning in history. High concentrations of naturally occurring arsenic have already been found in water from thousands of tube wells, the main source of potable water, in 59 out of Bangladesh's 64 districts. With the majority of the country's wells yet to be tested, the extent of the problem is still largely unknown. Nonetheless, a significant portion of the country's groundwater has proven to be contaminated with arsenic.

The social consequences of the arsenic crisis are far-reaching and tragic. Because of illiteracy and lack of information, many confuse the skin lesions caused by arsenicosis with leprosy. The most hard-hit villages where health problems have gripped a large population are treated much like isolated leper colonies. Within the community, arsenic-affected people are barred from social activities and often face rejection, even by immediate family members. Women are unable to get married, and

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wives have been abandoned by their husbands. Children with symptoms are not sent to school in an effort to hide the problem.

Among various efforts to tackle the problem, a major communications campaign has been launched to educate the rural and urban population about arsenicosis. This is gradually leading to more acceptance of arsenic victims.

Although scientists in Bangladesh and around the world are investigating the problem, the exact cause of the contamination is still being debated. In some countries with arsenic contamination, it was found that oxygen introduced into groundwater by the regular lowering of the groundwater table, for example through intensive agricultural irrigation with groundwater, triggered an oxidative process that dissolved arsenic from the soil.

This does not appear to be the case in Bangladesh. According to a hydrogeological study commissioned by the World Bank and funded by the British Department for International Development, the arsenic in Bangladesh's groundwater is already dissolved and present under natural circumstances, thus

Photos: Pinjira Begum and her daughter, Juthi, both died of arsenicosis. Some 70 million people in Bangladesh are at risk of drinking unsafe water. A broad-based partnership is supporting national efforts to combat problems. Wells are tested in field campaigns, with contaminated tubewells painted red to indicate they are unsafe.

(Credits: Maatrik/BAVRAT)



making human-related causes unlikely. However, other studies indicate that the process may be more complex, with a number of contributing factors to the release of arsenic to groundwater.

Arsenic contamination in Bangladesh is highly irregular, so tube wells in neighboring locations or even at different depths can be safe. Arsenic is a natural element. It is also a poison. Only about 125 grams is enough to kill a person in a single dose. Arsenic is also extremely hazardous if ingested in drinking water or used in cooking in excess of the maximum permissible limit of 0.01 mg/liter (the standard set by the World Health Organization, or WHO) over an extended period of time. It takes anywhere between 2 to 14 years for arsenicosis to develop.

The problem of high levels of arsenic in numerous shallow and deep wells was first detected in Bangladesh in 1993, and was subsequently confirmed after 1995.

Arsenic poisoning is difficult to detect because there is a lack of capacity and tools to diagnose it. Furthermore, only a minority of those suffering from arsenicosis can be easily identified from their skin condition. Thus, the majority of arsenicosis cases have gone undetected. To date, several thousands of patients with arsenic-related skin disease have been found in the first surveys. Available data on arsenic-related mortality is scarce, but dozens of deaths due to arsenic-induced skin cancer have been reported in the past few years. Because the majority of the country's tube

wells were installed in the past two decades, it is likely that many more people will start developing symptoms in the next few years.

Health effects of arsenic exposure can be extremely serious. The single most characteristic effect of long-term oral exposure to inorganic arsenic is a pattern of skin changes including hyperpigmentation interspersed with small areas of hypopigmentation on the face, neck and back; and the appearance of small hyperkeratoses ("corns" or "warts") on the palms, soles, and torso. Some of the keratoses may develop into skin cancer. Areas of altered pigmentation are not considered precancerous. Serious health outcomes include carcinomas of the skin (usually squamous cell, sometimes basal cell), liver, bladder, kidneys, and lungs; cardiovascular effects such as cardiac arrhythmias and vascular damage leading to necrosis and gangrene (i.e. "Blackfoot disease"), neurological effects (i.e. weakness, reflex loss, wrist-drop), anemia, and possible metabolic effects (i.e. diabetes).

Although the exact form of the dose-response relationship is not known, exposure to arsenic concentrations of 50 ppb – and possibly even 10 ppb – is believed sufficient to cause these health outcomes.

Arsenic Mitigation Programme. The World Bank made a credit for US \$32.4 million available to Bangladesh in February 1999 to fund the Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP), which is also financed by the Government of Bangladesh and the Swiss Agency for Development and

Cooperation. The Project is slated to run over four years and was envisioned as the first phase of a longer term program that would be funded by at least one additional four-year credit. The Project has two key components: emergency screening of tube wells and arsenicosis patients along with provision of emergency water supply and medical interventions; and identification of longer-term, sustainable solutions to the arsenic crisis. A number of other local, bilateral and international donors, non-governmental organizations (NGOs), and research institutions have also initiated programmes, most of which also emphasize water testing and identifying sustainable water treatment options.

The National Screening Programme is being implemented through the BAMWSP. An uncommon partnership between government and grassroots NGOs has been created to implement the programme. In addition to conducting the screening, local NGOs will help form village organizations that will decide on sustainable alternative water supply options, oversee operation and maintenance of new water supply and sanitation systems, and help fund the capital costs. Because of the lack of information about the extent, causes, and proven remedies, the project is helping to strengthen data collection and has set up a National Arsenic Mitigation Information Center to collect and disseminate information. A Technology Advisory Group has also been established to review technology options, and funds

FINDING SAFER WATERS

The search for alternative and safe sources of drinking water intensified in the wake of the arsenic crisis. Through IAEA-supported projects in the field of isotope hydrology, scientific criteria have been developed to assess the safety of deep groundwater sources. Through an IAEA technical cooperation project in Bangladesh, work continues to provide strategic information to the World Bank and the government's arsenic mitigation programme, through isotopic analyses of groundwater in selected areas of the country.



are being provided to local researchers to undertake studies on all aspects of the arsenic problem. The project will also finance training to health care professionals.

A 1997 pilot financed by the United Nations Development Program (UNDP), with technical assistance from the World Bank Water and Sanitation Program, laid the foundation of the larger national programme now underway.

Other UN agencies and donors also have responded with complementary programmes, funded research studies, and supported development of alternative technology options. They include the IAEA, United Nations Children's Fund (UNICEF), WHO, United Nations Educational, Scientific and Cultural Organization

(UNESCO) and United Nations Environment Programme (UNEP); and bilateral donors and international development agencies, including the United Kingdom's DFID, Canada's CIDA, the Netherlands' Ministry of Development Corporation, Sweden's SIDA, Denmark's DANIDA, and the Japanese government through the Japan International Cooperation Agency.

The project is active in rural villages and urban and suburban areas and is helping to set up community-based organizations while installing water supply alternatives. These include sharing safe tube wells and rainwater; harvesting pond water in conjunction with decontamination or filters; digging deep groundwater wells; and, when available, applying simple arsenic removal techniques.

Many of these options will require sanitation to prevent recurrence of water-related diseases, and sustained commitment to operation and

maintenance. Local NGOs and elected local government bodies will act as the partners for communities when forming their community-based organization.

To ensure that these new alternative sources of water and sanitation are maintained, community-based organizations oversee operation and maintenance and contribute 20% to 40% of the capital costs. In urban areas, the project monitors water quality in towns that are at risk of contamination and helps local authorities develop remedial strategies.

Over time and through trial and error, the Bangladesh Arsenic Mitigation Water Supply Project and other related initiatives will help to identify the most cost-effective and sustainable technologies and interventions to provide safe drinking water over the long term to deal with the country's arsenic crisis.

But, ultimately, it is up to communities themselves to ensure success. Millions of lives depend on it. □

Photos: In villages and communities across Bangladesh, communications programmes are raising awareness of the arsenic crisis. (Credit: Maatrik/BAVRAT)