Arsenic poisoning: We are at risk

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PINJIRA has lost her battle with arsenic. Sofura is missing. Zahangir is knocked down. Kamal Hossain's dream has been shattered. The sordid tales of thousands of innocent victims of mass poisoning of arsenic contamination have been hitting the headlines of national and international media for last couple of years. The problem of arsenic pollution in Bangladesh's ground water has turned into a crisis of unprecedented proportion. Millions of people in rural Bangladesh have been exposed to the risk. At the end of the year 2001, the claws of arsenic have also threatened thousands of people of 28 municipalities. The new government of Prime Minister Begum Khaleda Zia has already declared arsenic problem as one of its 100-day agenda for action.

In early 1996, arsenic contamination of groundwater was reported first in Bagerhat, Satkhira and Kushtia, three south-western Bangladesh districts bordering the Indian state of West Bengal. Some 61 out of 64 districts across the country (FEJB, 2000) face the menace of arsenic poisoning. LGRD Minister Abdul Mannan Bhuiyan and Health Minister Dr. Khondker Mosharraf Hossain informed that the number of arsenic patients crossed the 10,000-mark.

Against this backdrop, an international arsenic week begins in Dhaka from this Friday. Three back-to-back international conferences and workshops will be held in the city this week. The World Water Forum of Journalists (WWFJ) is organising a two-day international conference on Arsenic contamination on groundwater: Media strategy from January 11. Dhaka Community Hospital is holding an international workshop from January 12. The LGRD Ministry is organising an international workshop from January 14. All to address the grave arsenic problem.

At the end of 2001, Bangladeshi officials admitted that some 80 million people -- more than 65 per cent of the country's population -- live in the arsenic-contaminated areas. Due to the sheer magnitude of the catastrophe, a resource-poor nation like Bangladesh is now struggling, not quite successfully, to cope with the problem caused by arsenic-contaminated tube-wells in the rural areas. Of late, there have been some efforts to mitigate the woes of the arsenic-hit villagers through distribution of water filtration devices. The authorities have also been reportedly seeking an easy solution to tackle this latest environmental hazard.

The authorities are ill equipped both financially and technically to deal with the massive problem. They have been at a loss how to deal with its fallout. The government launched a campaign to create awareness among the public about the hazards of drinking arsenic-contaminated water and issued warnings through radio and television. A National Arsenic Committee was formed to address the problem. But efforts to tackle the situation have to be far more widespread and intense. Most of rural Bangladesh has been caught up in an arsenic panic. Members of the Forum of Environmental Journalists of Bangladesh (FEJB) were the first to break the bad news. Now FEJB is trying to sensitise the officials and policy makers about the magnitude of the disaster. They have also been trying their level best to make the people, particularly the rural community, aware of the hazard and also of the ways to mitigate public suffering caused by the arsenic-contaminated groundwater.

Arsenic is a white, semi-metallic powder found in nature. Some of its compounds -- arsenite and arsenate -- are highly toxic and can cause skin cancer, kidney and liver failure, respiratory problems, and in extreme cases, death. Other symptoms include dark brown spots on the body, thickening of the skin of the palms and feet, and warts on hands and legs. Colourless, tasteless and naturally occurring in the sub-soils, arsenic has been seeping into the region's groundwater for years. Some experts say that arsenic beneath Bangladesh's fertile delta was probably deposited long ago after being washed down from the ores in the Himalayas. For long, the arsenic compounds called arsenic sulphides were submerged in groundwater and remained inert. But with the advent of intensive irrigation in the 1960s, the aquifers started to drop, exposing the poisons to oxygen for the first time. Once oxidised, arsenic sulphides become water-soluble. They percolate from the sub-soils into the water tables during every monsoon flood.

Late Amjad Hussain Khan, a Bangladeshi water expert, reportedly observed in 1997 that the arsenic contamination had originated in the Indian state of West Bengal bordering Bangladesh -- particularly on the eastern side of the Ganges-Bhagirathi rivers. The deadly poison then slowly seeped into Bangladesh's groundwater. He said that the western border districts, specially the south-western region of Bangladesh, were particularly vulnerable to arsenic contamination . The reason is that the sediments on both sides of the border have the same depositional history and geological environment -- the region being commonly known as the Ganges delta. Khan said that the aquifer of the contaminated zones in West Bengal and that of the areas within Bangladesh were hydrologically connected. He further observed that the groundwater of the region along the south-western border belt of Bangladesh is highly vulnerable to arsenic contamination.

The first reports of arsenic contamination of water appeared in 1978 in West Bengal. The initial theories blamed arsenic pollution on the use of insecticides and pesticides, metal strainers of industrial effluents, etc. But, subsequent studies proved such theories to be wrong. The School of Environmental Studies [SOES], Jadavpur University, near Kolkata, the capital of West Bengal, started investigation in 1988 when reports of sporadic cases of arsenic poisoning began to appear in West Bengal. The study said that for centuries a 450-kilometre stretch of arsenic has been deposited in rich silt clay some 70 to 200 feet below the surface in an area covering about 35,000 square kilometres. The problem did not surface until the 1970s when the farmers in West Bengal began tapping huge amounts of groundwater to irrigate their summer crops, thus triggering chemical changes in the soil composition.

Scientists now advise that if a catastrophe is to be averted, pumping of groundwater must be reduced and farmers should increasingly try to tap surface water for irrigation. As the water table falls, pyrites -- a mineral which holds arsenic -- begins to oxidise and exude the poison, contaminating thousands of shallow tube-wells.

In June 2000, the Dhaka-based National Institute of Preventive and Social Medicine (NIPSOM) tested some 1000 samples of tube-well water in 17 rural districts. And it found arsenic in at least 180 such samples. Arsenic toxicity in the water of the affected districts is 25 to 35 times higher the safety level set by the World Health Organisation (WHO). The permissible level of arsenic in water is 0.05 ppm, according to experts. The Bangladesh Atomic Energy Commission found the level of arsenic between 1.5 and 2 ppm in tube-well water in the districts bordering West Bengal. The situation was so bad that an even more dangerous level of arsenic toxicity was found in the water of a tube-well in the village home of the then incumbent Health Minister, the late Salauddin Yusuf, in Khulna, which is not far from the border with India. During 2001, the number of arsenic poisoned tube-wells was on the rise, creating a panic across the country.

Tests of water samples collected from the arsenic-infected areas of the country contained more than the normal percentage of arsenic. Twenty-eight per cent of the affected people had more than 100 to 1500 per cent more arsenic than the normal level in their urine, 47 per cent had 8 to 20 per cent more than the normal level in their nails and 98 per cent had 100 to 15,000 per cent more than the normal level in their skin! Twenty per cent of the water samples contained amounts of arsenic, 100 to 900 per cent more than the allowable quantity. The DCH tested 920 patients suffering from skin diseases, of whom 150 were suspected to have been suffering from arsenic poisoning. Samples of urine, nails, hair and skin were collected from 95 of some 105 patients.

Thousands of people of 28 municipalities of the country are drinking arsenic contaminated water from pipeline water supply system, a recent study has revealed. Earlier, it was believed that the wells including the deep tube-wells in the municipalities posed no threat to public health since they were safe. The tests were carried out by the Dhaka Community Hospital (DCH) in cooperation with The Daily Star between January and September 2001. The municipalities include the hill district of Rangamati where, until now, experts ruled out possibilities of finding arsenic even at low concentration. Laboratory tests of water samples collected from the municipalities revealed that all of them including those from privately owned wells contained at least 0.03 milligram per litre arsenic or three times the acceptable level (0.01 mg/L) for human consumption. For Bangladesh, the highest level of arsenic in drinking water is 0.05mg/L.

According to the World Health Organisation (WHO), long-term consumption of arsenic can cause various skin diseases. Experts studying some arsenic patients have concluded that long-term exposure to arsenic through drinking can lead to cancer in the bladder, intestine and even lungs. So far, official surveys in only 500 villages have found over 10,000 arsenic patients suffering from various forms of ailments including cancer related to arsenic poisoning.

The DCH study found the highest concentration of 0.199 mg/L arsenic in a deep tube-well in Gopalganj town that supplies water to more than 12,000 inhabitants. The second highest concentration was found in another Gopalganj town deep tube-well supplying water to more than 10,000 people. This one has an arsenic concentration of 0.177 mg/L. In Chuadanga town, a 170-feet deep tube-well, which is shared by some 20 families, has a concentration of 0.42 mg/L of arsenic. The users have been drinking from the well for the last six years.

By drilling hundreds of thousands of tube-wells -- both for irrigation and safe drinking water in the villages -- the authorities and planners unwittingly exposed millions of the rural Bangladeshis to the naturally occurring poisons in the groundwater. Now there is no time to waste for the planners and decision-makers. They must act and act decisively to save millions of people from slow mass poisoning by deadly arsenic.

In Kishoreganj and Laxmipur district towns, similar concentrations of arsenic were detected. In Kishoreganj, a privately owned well had presence of arsenic at 0.183 mg/L while in Laxmipur 0.267 and 0.140 mg/L arsenic was found.

Similarly, high concentration of arsenic was detected in Magura, Manikganj, Narail and Kushtia district towns. A total of eight teams collected water samples and other data. People at risk from drinking arsenic at high concentration were informed in writing. The Department of Public Health and Engineering (DPHE) was also informed about the status of arsenic concentration.

However, according to sources, none of the deep tube-wells with high concentration of arsenic have so far been shut down. The urban areas from where water samples were collected are Barisal, Brahmanbaria, Chapainawabganj, Chittagong, Chuadanga, Cox's Bazar, Dhaka, Dinajpur, Habiganj, Jessore, Jhenidah, Khulna, Kishoreganj, Kushtia, Laxmipur, Magura, Manikganj, Moulvibazar, Munshiganj, Narail, Natore, Pabna, Rajshahi, Rangamati, Rangpur and Sylhet. When contacted, Chief Engineer of the DPHE Abu Muslim said, "We have tested water in almost all the 100 municipalities and found eight of them to have contaminated water."

"Alternative measures like iron-arsenic removal plats (IARP) have been installed to remove arsenic and in some places we have also shut down pumps. As soon as we learnt about contamination, we ordered for alternative measures," Muslim added.

The eight districts where the DPHE has taken alternative measures to remove arsenic are Rajshahi, Chapainawabganj, Chuadanga, Satkhira, Meherpur, Faridpur, Noakhali and Gopalganj. Meantime, Gopalganj Pourashava (municipality) Chairman Mohmmad Ali Khan expressed surprise when told about the concentration levels of arsenic in his town. "I am really surprised. We must take immediate measures to inform the people about the risks," Khan reacted.

Until recently, government and non-government agencies have tested water in rural areas. So far, 61 of 64 districts are found affected by arsenic. According to the latest data, 85 million people in the affected areas are at risk of drinking arsenic contaminated water. LGRD Minister Abdul Mannan Bhuiyan said a preliminary survey to identify arsenic-affected patients was conducted in different rural districts of Bangladesh. He said instructions had been given to the Department of Public Health and Engineering to supply arsenic-free water to the affected areas. Besides, he said, instructions had been given to test the tube-well water locally in every district. He suggested that grassroots level people should be involved in arsenic mitigation programmes.

Stressing the need for undertaking preventive measures against arsenic toxicity, Dr. A.Z.M. Iftikhar Hossain, deputy programme manager of the Arsenic Mitigation Project, said his department had already developed a filter to purify arsenic-contaminated water. There is no definite cure for arsenic poisoning, but uncontaminated water and nutritious food over a period of time nurture sufferers back to health. Unfortunately, there are few alternative water supplies in the affected districts and most of the people in the rural areas cannot afford nutritious food.

As the mysterious sores first appeared on the work-toughened palms of Anil Chandra Das, a rice farmer in the southwestern Nowapara area, he kept grizzling in pain but just ignored it. But the lesions did not go away. Instead, the small purplish scabs on his palms began cracking and bleeding. Then the headaches started, accompanied by chest congestion and stomach cramps. And finally, in March, 1997 the man whose neighbours remember him for his breezy story-telling died.

With 61 out of 64 districts affected and 264 upazilas being the most affected, it is believed that at least 26 million people are at risk of contacting arsenicosis. Because, the people themselves with the help of private sector installed most of the tube-wells and so there are no records of how many wells exit. The estimate is between 6-10 million. If the current national pace of testing output cannot be improved, it will take 6-8 years just to test all of the existing tube-wells, observed an expert.

There is no pattern to arsenic contamination of groundwater. One well in a village may be safe while another well 100 yards away may be contaminated over the current nationally prescribed safe level of 50ppb. And the one after that may again be safe! Therefore, the only way to know if a tube-well is providing safe water or not is to test every tube-well. The contamination of tube-wells may change over time and so, people will at some point need to have access to local testing facilities so that they can regularly check the level of contamination in their wells. This facility presently does not exist.

There is still no clear medical understanding as to why some members of a family contact arsenicosis while others do not, even though they drink the same water. At what time and in what circumstances will people contact arsenicosis? What is the risk factor related to the onset of gangrene and cancer? There are no clear answers to these issues till date.

There is a growing possibility that arsenic may be entering the food chain through contaminated irrigation water. This may have an effect not only on the food being eaten (which may eventually have adverse impact on the economy of the farming community), but also on the ability of the soil to produce crops.

While arsenicosis is not a contagious disease, it often appears to be to the affected rural communities. There are instances where affected children, having the raindrop pattern, kurtosis and melanomas symptoms on their skin, are being asked to leave school. Parents are deserting their families. Marriage prospects for the affected youth may be severely hampered. In the advanced stages, people may suffer amputation as a result of gangrene or cancer, severely affecting the chances of earning or sustaining a livelihood. If at some point, soil is found to be contaminated and food production becomes unmarketable, it would have far reaching implications in the socio-economic sector and national development.

There is really no time to lose. This problem calls for a two-pronged approach; an emergency testing and awareness creation in the first place, followed by a second stage of a community based and sustainable set of activities.

The Department of Public Health Engineering (DPHE),and NGOs are working to develop and implement a four-part community-based and integrated arsenic mitigation programme. It is widely believed that action should be carried out on an emergency basis to undertake countrywide testing. The urgent need to test all tube-wells has to be addressed as quickly as possible.

The issue of sustainability must be addressed. Testing facilities must eventually be made available to the people on a continual and cost-effective basis through public and private sector partnerships. The government has an overarching responsibility to put in place regular and systematic groundwater quality monitoring for a wide range of parameters to ensure that knowledge base is increased and that the population is kept fully informed.

Field test kits are improving. Arsenicosis patients can be looked for either by house-to- house search or through health camps. The next and perhaps greatest challenge yet is to help people to obtain safe water supply in a sustainable way in the long term, because arsenic contamination is not going to go away in the foreseeable future.

While there may be more new technologies that have not yet been learned of, there are already enough reliable options available to move quickly to assist people in their quest for safe water supply. Rainwater harvesting is a household option that costs approximately Taka 5,000 for 3,000 litres. It is not new; it has been used for thousands of years. The issue is whether or how well people are able to conserve the stored water during the dry season.

Pond sand filtration is a community option, costing approximately Taka 42,000. Again not a new technology, it has been used to clean up surface water for many years, especially in the saline affected areas of the country. The issue is that the community has to agree to carry out regular maintenance. Another community option is the protected dug well costing approximately Taka 12,000. These wells tap water from above the arsenic contaminated zone and are a good option where the water table is high enough.

In addition to these traditional and well-known systems, UNICEF /DPHE are trying out other filtration systems, which employ a column filter filled with a media which adsorbs arsenic. Some of these systems can deliver or treat up to 500,000 litres of contaminated water on one filter pack, lasting up to 500 days before the filter media needs to be replaced. These are also effective at removing iron from the raw water and therefore, are even more popular with the community. The capital cost for this type of filter may at first seem prohibitive. However, simple mathematics show that the cost per treated litre is, in fact, very small -- approximately only Taka 0.4 per litre as calculated against the initial capital cost. The cost per litre for the second filter is much, much less when calculated against only the cost of the replacement filter.

In addition, the government is working with its partners to assist in developing a locally produced adsorbent media, which will be ideal for household filtration. So far, this locally produced media seems to hold good prospects and will be a cheaper option for household use. The aim is to reach a stage where affected communities can be informed about a range of options which might be feasible for each given situation; where the community will then decide which is the option they want to choose.

Many people in the past had warned the proponents of the Green Revolution about the dangers of over-extraction of groundwater for irrigation. But the policy-makers in the 1960s did not heed to such warnings. By drilling hundreds of thousands of tube-wells -- both for irrigation and safe drinking water in the villages -- the authorities and planners unwittingly exposed millions of the rural Bangladeshis to the naturally occurring poisons in the groundwater. Now there is no time to waste for the planners and decision-makers. They must act and act decisively to save millions of people from slow mass poisoning by deadly arsenic.

Now, the question that may arise is how to go about in tackling the problem. Here are some ways:

Emergency measures

Raising public awareness should be the starting point for any approach to deal with the arsenic problem

Groundwater treatment technologies that are cheap, efficient and easy to use should be applied at a large scale as an interim or midterm solution

Immediate measures must be taken to protect the health of those living in areas where water is contaminated by arsenic

Improving nutrition and fighting under-nourishment has to be a central element of the fight against the arsenic crisis

Participation of the civil society has to be a key element of designing, planning and implementing remedial strategies

Intra-governmental coordination is a must for effective implementation

Information dissemination and transparency play a key role in effectiveness of remedial strategies while building the confidence of stakeholders, particularly general public.

Long-term policy alternatives

An overall health policy to deal with currently-identified patients as well as those potentially at risk

Food security and improving nutritional quality of the food should be a high priority

Alternative livelihoods should be provided for those who are directly impacted by arsenic contamination as well as their immediate families

Water resource management on a regional or national scale is essential to fully exploit the abundant water resources available in Bangladesh

Scientific research has to be emphasised to reduce uncertainty, with due consideration to local conditions

Drinking water standard has to be re-evaluated based on scientific research, and

Coordination, management and dissemination of information should be undertaken through well-defined mechanisms.

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