

# Arsenic

**Knowledge and Action Network**

Through partners-  
Mahavir Cancer Research  
Sansthan, Water For  
Action and SAMTA



**TRIGGERING BEHAVIOURAL  
CHANGES FOR ACCESSING  
SAFE WATER IN ARSENIC  
AFFECTED VILLAGES, BIHAR**

March 2017

**SaciWATERs**

SOUTH ASIA CONSORTIUM FOR INTERDISCIPLINARY  
WATER RESOURCES STUDIES

## Introduction and background

Arsenic is abundant in the crust of the earth and is found in all environments. It is found in soil, minerals, surface and groundwater. Both natural and anthropogenic sources are responsible for the distribution of it throughout the environment. Arsenic contamination in the Gangetic plains is naturally occurring and particularly prevalent in the shallow aquifers. Shallow aquifers are also a predominant source of drinking water sourced through shallow tube-wells in rural India. Most of the affected regions at risk in rural India are enmeshed in poverty cycles and coupled with poor nutrition, exacerbates the onset and danger of arsenic poisoning.

Addressing Arsenic contamination in water is a complex challenge because it is dangerous in minute quantities ( $>10 \mu\text{g/l}$ )<sup>1</sup>, neither visible, nor does it affect smell or taste. Further, poisoning symptoms appear overtime, are not always characteristic and involve complicated testing and diagnosis requiring high knowledge thresholds. In India 86 districts within ten states are affected, they include Bihar, West Bengal, Assam, Punjab, Karnataka, Haryana, Jharkhand, Uttar Pradesh and parts of Manipur and Chattisgarh (CGWB 2014).

Due to groundwater arsenic contamination, a large number of populations in the arsenic hit area are suffering from melanosis, leuco-melanosis, keratosis, hyperkeratosis, dorsum, non-petting oedema, gangrene, skin cancer and skin lesions in sole and palm. Tubewell revolution since 1980's, has led to serious arsenic menace causing severe health hazards in the population in the recent years. The village people of these contaminated regions are still drinking arsenic contaminated water and are not aware of this fact as well as its consequences.

Strengthening and sustaining efforts to address access to safe water requires collaboration at every level of action. The first steps towards this begin by acknowledging the need for joint action and enabling platforms that utilize consultation, reflection and action. Local governments, apart from line departments like Public Health Engineering, happen to create such platforms through institutions like Village Water and Sanitation Committee (VWSC) which play a vital role in such efforts. However, there is a gap in the necessary capacity to integrate discussions by experts, individuals who have worked or have been working for the similar cause and have an inherent willingness to facilitate and drive action. *Jal Choupal*, was initiated as a systemic effort towards the same.

The vision for Jal Choupal includes building local platforms for promoting free and fair exchange of knowledge for policy and action between community and government departments. The platform initially emerged in response to the extent of water contamination in Uttar Pradesh by concerned individuals within different institutions and facilitated by WaterAid India, Arsenic Knowledge and Action Network<sup>2</sup> and Fluoride Knowledge and Action Network. In Bihar a similar effort has taken root and even endorsed by the PHED within its efforts to integrate approaches into systems within the Government of Bihar campaign Grameen Swacch Peyajal Nischay Abhiyan (Bihar Rural Clean Drinking Water Resolution Campaign). Arsenic Knowledge and Action Network through its network and collaborators in Bihar initiated an understanding of the context within which such a platform can be

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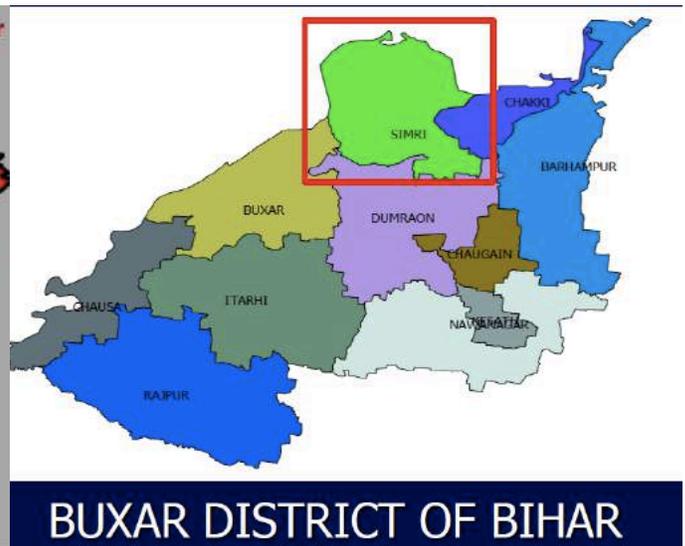
<sup>1</sup> WHO recommends  $10 \mu\text{g/l}$ ; Indian and Bangladesh standard allow up to  $50 \mu\text{g/l}$

<sup>2</sup> Secretariat at SaciWATERS, Hyderabad India

build and how local needs that can be incorporated and addressed through Jal Choupal. This effort was initiated within one of the arsenic affected district of in Bihar-

## Buxar, Bihar

Today, it is estimated that more than 5 million people in the Bihar state are drinking water with arsenic concentrations greater than 50ppb. The ground water arsenic contamination as of 2016 has spread to 16 districts of the state affection 102 habitations. While studies have been carried out to understand that health impact and its prevalence in Bihar there have been few efforts to build awareness among communities for solutions and actions that can be taken to address this contamination. Most communities in affected habitation are not even aware of the problem and continue to exposed to the health burden of arsenic contamination and its related diseases (arsenecosis). The demographic evaluation of arsenic in the ground water has not been done extensively especially in the Buxar district where arsenic poisoning in ground water has a meager reporting.



**BUXAR DISTRICT OF BIHAR**



The Buxar district is situated between 25° 18' to 25° 45' latitude North & 84° 20' to 84° 4' longitude East. Its geographical area is 1624 km<sup>2</sup>. The total population of district is 10,87,676 (Rural 9,96,855 Urban 90,821). The population density is 621 person/km<sup>2</sup> and sex ratio 899 females/1000 males. Buxar is also the most affected arsenic hit area especially the villages located near the river Ganga. Although, the Government funded works are being carried out in almost all the arsenic hit

districts of Bihar but, still people are deprived of arsenic free drinking water and food, as this land area is highly fertile where crops of all types are extensively cultivated.

Among all the villages of Buxar district, Tilak Rai Ka Hatta village in Simri block is the most severely affected area where no recent health related evaluation has been done in the population.

Simri and Tilak Rai Ka Hatta village, a flood plain Diara region of river Ganga in Buxar district was the region selected for initiating the intervention. The village has high contamination of arsenic in the shallow aquifers (groundwater) where arsenic levels are more than 100ppb and the maximum level recorded was 1929ppb (WHO permissible limit is <10ppb). Even though there are such high levels of arsenic in the region, hardly few are aware of the consequences of drinking arsenic contaminated drinking water. Major source of drinking water in this region is shallow tube-wells.

## Program rationale

Buxar, being one of the highly arsenic affected districts, serves as one of the crucial sites for triggering action from local communities by building their capacities through relevant and need-based training program. The campaign as proposed, is on building awareness on water quality issues in general and arsenic as a contaminant in particular and how could communities cope with it within Buxar. Arsenic Knowledge and Action Network believes that strengthening and sustaining efforts to address access to safe water requires collaboration at every level of action. The first steps towards this begin by acknowledging the need for joint action and enabling platforms that utilize consultation, reflection and action. The campaign is an effort towards achieving the same.

## Objective

Buxar, being one of the highly arsenic affected districts, serves as one of the crucial sites for triggering action from local communities by building their capacities through relevant and need-based training program. The program is oriented towards triggering behavioural changes in the community and re-defining role and perspective of service delivery agent on mitigation arsenic affected villages in Buxar, Patna. The awareness program for triggering behavior changes was planned in two phases.

**The first phase (March 2017- completed):** Engaging community members in action require an understanding of the local context, local priorities, available safe water sources, and institutional structures. The first phase of this program was oriented to understand the perception of the communities towards the problem, and prepare for a detailed training and awareness camp within phase 2. It was also to build connection with the local government functionaries and understand what has happened in the village. Building a level of information base on the health burden then also contributed to understanding the current situation.

**Second Phase (June 2017- December Planned):** The awareness program for behavioral change is planned at two levels. For the community through interactive puppet shows followed with conversation, this would build awareness on water quality issues in general and arsenic as a contaminant in particular and how could communities cope with it within. For Government functionaries of the Gram Panchayat, Village Water and Sanitation Committee (VWSCs) and street level bureaucrats in the affected regions, an interactive two day communication campaign will be conducted to identify roles and responsibilities an with program water quality issues. After these communication campaigns and conversations, a village level *Jal choupal* will be convened to talk and initiate systematic plans for mitigation options that can be created within the village in connection with existing program and plans.

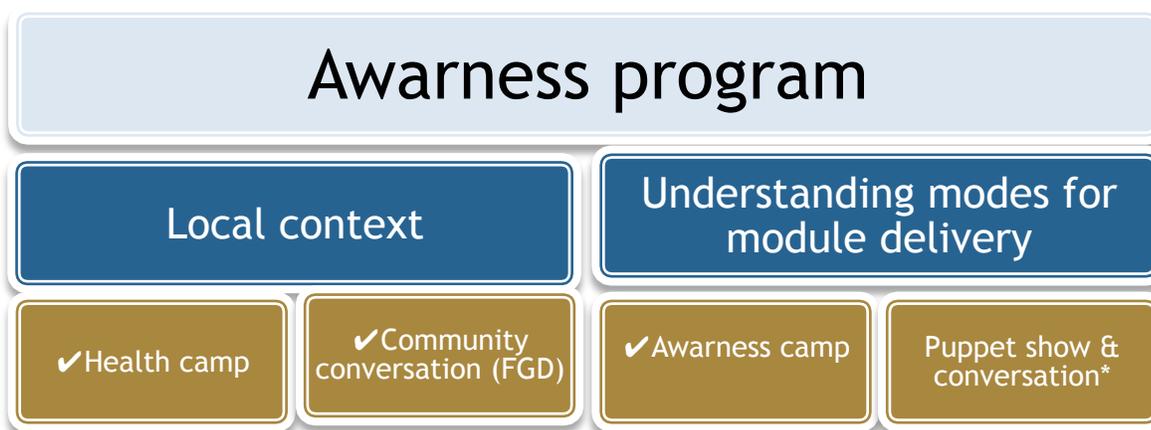


Figure 1: Delivery mode

## Activities conducted:

**Campaign outreach:** The campaign was undertaken through the support of partner organisations of the Arsenic Knowledge and Action Network viz. Water Action, SAMTA, Mahavir Cancer Sansthan & Research Centre (MCSRC) in the selected villages of Simri block in Buxar district viz. Khaira patti Ramopatti, Barka rajpur, Tilak rai ka haata, Boukhlaha patti, Halwapatti, Kesopur and Bharali. These villages were agreed upon by prior discussion and consultation with the team and Water Aid.



**Significant activities undertaken:** The campaign started with a Health Assessment camp organized on 20th-21st March 2017 by a team of eminent doctors and health professionals led by Dr Arun Kumar from MCSRC. Altogether 34 patients were examined for arsenic toxicity. 75 water samples were assessed for arsenic contamination, out of which 100 ppb was the maximum concentration of arsenic reported. Arsenic level of 0-10ppb (below permissible limit) was found in 32 sample, 11-50ppb in 22 water samples and >50ppb in 21 water samples. The highest arsenic level was found to be 300 ppb.



Another set of activities included interactions and focus group discussions over a period of 5-6 days with the communities in the villages listed above with different groups of people like men, women, elderly, youth etcetera. Questions in the FGDs were largely aimed at knowing about the difference in historical and existing sources of water for drinking, irrigation, livestock in the villages, nature of contamination, perceived effects of arsenic contamination and the perception of the community about the range of health problems and other

*Detailed conversation and notes of the events already documented in Hindi*

## Immediate outcomes:

It was reported through the FGDs, that in the listed villages, water was contaminated with both iron and high levels of arsenic. People including the youth, older men and women related the causes of persistent and increasing cases of cancer and other skin diseases, liver issues, diabetes, kidney issues, nausea, etc. to the rising menace of arsenic contamination in water. They highlighted that not only for humans, water is not even fit for the livestock and irrigation. Arsenic has been nicknamed as sweet poison among the community. The government's efforts of solar water pumps were highlighted however such pumps are operational for very limited timings for supplying water hence they do not serve the real purpose. FGDs with elderly men and women highlighted that traditional wells were the best source of safe water for drinking, irrigation and



other purposes.

The participants of the FGDs also mentioned about the relatively lesser depth at which water was available in the traditional wells, which ensured safe water for all purposes and hence no health problems were faced. Livestock used to consume pond water. However, since 1962 and with the current rising use of tube-wells, the depth at which ground water was made available increased drastically. Due to the ease of accessing water through tube-wells, wells became obsolete. No doubt, government has marked

a lot of tube-wells not fit for use, however people are forced to use them in the absence of better alternatives. The FGD participants shared that there has been no awareness from the government on the issue of arsenic contaminated water even though tube-wells have been marked unsafe.



Through the FGDs it was also highlighted that people have started to switch to bottled water as an alternative to drinking water however very few people can afford the same. Even doctors have suggested buying water for drinking purposes. Concern was raised for meeting the water needs of livestock and also ensuring water free from contamination to be used for irrigation. This was due to the traces of arsenic being found in food and milk. Women shared that the kitchen utensils turn red due to stagnant water. They were critical about using iron and plastic pipes for supply of water as against traditional wells being safe sources of water.

From the health camp, major outcomes were the following:

- Total 82 patients were examined in Simri village and 12 patients were examined in Tilak Rai ka Hatta village. 6 cases of cancer cases have been reported in Simri village among them 2 cases of thyroid cancer, 1 case of breast cancer, 1 case of gall bladder cancer, 1 case of skin cancer and 1 case of Non Hodgkin's lymphoma was found.
- General symptoms observed among the population
  - General body weakness
  - Breathlessness
  - Body ache, Joint pains

- Gastrointestinal problems
- Neurological complaints
- Headache, Drowsiness, Nausea
- Weight loss
- Skin diseases
- Indigestion
- Melanosis
- Arsenicosis



- Water samples assessment report: Total 75 water samples were assayed in both days. The samples were given by community members for water testing. Arsenic level of 0-10ppb (below permissible limit) was found in 32 sample, 11-50ppb in 22 water samples and >50ppb in 21 water samples. The highest arsenic level was found to be 300 ppb.
- Hair samples assessment report: Total 20 hair samples were assayed for the arsenic level on Atomic Absorption Spectrophotometer (AAS) at Mahavir Cancer Sansthan and Research Institute, Patna. Arsenic level of <1ppb (below permissible limit) was found in 5 sample and >1ppb in 15 hair samples. The highest arsenic level was found 140.1ppb and the lowest was 0.289ppb in hair samples.
- During camp more than 200 people were made aware about the high arsenic prevalence in the ground water and its toxicity.

## Challenges

Initiating these activities in the selected field sites had a few operational challenges. They included coordination of timing, receiving approvals and budget release among the various agencies involved in initiating the activity. Also, the project durations for activities assigned to complete was relatively short than what would have been ideal. The paucity of time limited the types of activities that could have been implemented in the region against what was originally planned. Hence, some of the other planned activities such as interactive puppet shows and training module planning that was initially planned for could not be implemented. It is with no doubt that with further timely and consistent support for continuing such activities would enhance people's perception, build trajectories for collaboration and mitigation against arsenic contamination and would lead to sustainable outcomes.

## Next Steps (Phase II)

The first phase has triggered community thinking towards addressing the issue of arsenic contamination. Based on the FGDs with people, through the support of Sarpanch of the Gram Panchayat in Simri Panchayat, few locations have been identified for rejuvenating the traditional wells for water. People are now willing to engage in community level program on solutions options. Through the discussions, it came out that planning is needed at ward level for alternate safe water sources as a developmental activity and also awareness is needed to be spread about safe sources of water so that people do not live in a constant fear of diseases.

The phase-II would also include building capacities at different levels to be able to effectively contribute to *Jal Choupal* discussion and through it consequently working for safe water planning and

- Building collaboration between local PHED, district development officers and health workers for convergence in governmental plans along with activities for the region, this convergence to be initiated through communication campaign.
- Building communities understanding of the issues and solution options through interactive puppet shows, community led water testing and interaction with local government agencies for understanding existing schemes that address water and health.

In addition to governmental plans for provision of safe water there are also need to include initiatives for alternate options of safe water such as rejuvenation of wells, household filtration to build layers of coping mechanism to combat rising concerns for health and safe water in arsenic contaminated regions.

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