

Awareness among People for the Use of Pure and Safe Drinking Water in Rural Areas of Katihar District

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Abstract: *Pure and safe drinking water is the prime necessity of the life of human beings. A large part of rural population lacks access to pure and safe drinking water. They usually use biologically as well as physico-chemically contaminated drinking water. In a study (March 2012-February 2015) of drinking water qualities of some of the villages of Katihar district biological contaminations were recorded in higher concentration in river Ganga water ($0.89 \times 10^7 L^{-1}$ to $10.10 \times 10^7 L^{-1}$) followed by dug well water and tube well water. In physico-chemical contamination higher concentration of TH ($26-289 \text{ mgL}^{-1}$), TDS ($306-676 \text{ mgL}^{-1}$) and Nitrate ($00-27 \text{ mgL}^{-1}$) were recorded in dug well water followed by tubewell and river Ganga water. Higher concentration of Fluoride $0.4-1.7 \text{ mgL}^{-1}$ and Iron $0.5-3.9 \text{ mgL}^{-1}$ were recorded in tube well water followed by dug well and river Ganga water. However, tube well water of some of the villages especially near the river Ganges was found to be contaminated with arsenic. To motivate the rural people of Katihar district three separate drives were launched regarding the awareness of local people for the use of clean and safe drinking water. The awareness programmes included local community, local women and school children. A large number of people participated very enthusiastically in the awareness programmes of local community (692 people), local women (163) and school children (301). In awareness programme special emphasis was put on the importance of drinking safe water and the negative impacts of drinking impure water. On arsenic contamination, use of Arsenic and Sono filters were suggested for the removal of arsenic from drinking water. Motivation towards the use of safe drinking water was also organized for school children through Essay writing, Quiz competition, Painting competition and Handbills distribution. Supports of people in awareness programmes were very encouraging. People knew about different methods of obtaining clean and safe drinking water. They also knew about Arsenic and Sono Filters to obtain arsenic free water. They were also encouraged to use surface water to avoid arsenic contamination in affected area. The people were suggested several measures to reduce the ill effects of arsenic contamination. These programmes created a lot of awareness among the people to drink safe water essential to everyone's health.*

Keywords: Rural people, Drinking water sources, Arsenic contamination, Health impacts, Awareness programme

1. Introduction

Awareness programme plays a vital role in understanding problems and their remedies. Awareness on drinking water is essential to sustain life and the inhabitants should have first-hand information of its value. Thus, the issue of quantity and quality of drinking water becomes a fundamental basis of life. Water is essential for sustaining basic human functions, health and food production as well as for preserving the integrity of the world's ecosystems. Access to safe drinking water is important as a health and development issue at national, regional and local level [1]. Safe drinking water does not pose any significant risk to health over a lifetime of consumption. On the other hand, unsafe drinking water can be dangerous for life because a number of diseases are water borne. A large no. of deaths and illness takes place globally due to inadequate knowledge of safe drinking water or inaccessibility to drinking water [2]. Approximately 3.1% of the global annual death (1.7 million) and 3.7% of the annual burden (disability, 54.2 million) are caused by the use of unsafe water and lack of basic sanitation and hygiene. Mostly the poor households and urban slums were exposed to drinking water contaminated by arsenic particles coupled with lack of access to alternative safe water sources [3]. As arsenic contamination co-exists with the other pollutants 90% of the children below

the age of 5 years had suffered from diarrhoea due to ingestion of unsafe water [4, 5, 6].

Adequate knowledge of drinking water and awareness to use a good source of water can be a useful public health intervention which can avert many health related problems globally. Safe drinking water is imperative for public health since 21 of the 37 primary diseases in developing countries are related to water and sanitation [7]. More than 50% of the population has no access to safe drinking water and about 200,000 people die every year for lack of access to safe water. In urban area, 50 million people in 15 cities have no access to safe, affordable water [8]. Especially, the drinking water quality of the areas situated near the banks of rivers in northern India is very poor. In rural India, the situation of availability of pure and safe drinking water is grimmer. Only 5 per cent of pure drinking water is supplied under Government Plans in the villages of northern states. For the rest 95 per cent of drinking water, people are dependent on wells, tube wells, hand pumps and other sources. The situation becomes more pitiable during summer when the wells dry up due to lowering of water table. So the wells are gradually being replaced by hand pumps and tube wells. But drinking water from these sources is equally impure. According to government reports, 85 percent of the water used for drinking in rural areas is underground water. Underground water contains hazardous mineral elements

apart from chemical pollutants. These elements are naturally mixed in underground water. Moreover, nitrates are dissolving in underground water from chemical fertilizers and sewerage. Their percentage is increasing continuously in water. Besides these, arsenic and fluoride are also naturally dissolved in water and they are hard to remove.

Millions of people suffer from problems related to physico-chemically and biologically contaminated water quality. Physical pollutants or impurities can be wastes from agriculture and human consumption as well as from surface run off. Chemical pollutants, largely accounted from the industrial wastes, consist of chemicals and minerals that are harmful for human as well as animal consumption. Arsenic contamination of groundwater is a natural occurrence in many parts of the world, but this problem is more severe in the delta region of the Ganges. The high concentration of arsenic in deeper levels of groundwater is causing arsenic poisoning to a large number of people. Arsenic is a carcinogen which causes many types of cancer affecting skin, lung and bladder besides cardiovascular diseases. Even at lower concentration arsenic contamination may lead to death. Arsenic contamination in groundwater today affects nearly 140 million people in 70 countries of all continents [9]. It has been estimated that one out of five deaths in South Asia is caused by arsenic.

Biological contaminants of water sources, called pathogens, include viruses, bacteria, fungi and parasites. They enter drinking water when the water source is contaminated by waste materials such as human and animal waste and sewage. The most important source of water contamination in developing countries is human faeces due to lack of adequate sanitation facilities. As a result, human wastes heavily pollute rivers, lakes, ponds etc. in developing countries. The situation is scaring among the low income groups of the society. This contaminated water is often responsible for many water-borne diseases. Children are more vulnerable to the use of such water. 15% of children deaths every year are attributable to diarrhoea. In India alone, the single largest cause of ill health and death among children is diarrhoea, which kills nearly half a million children each year [11]. Pure and safe drinking water is not accessible for many in the world, including India. According to a report from the United Nations Developing Programme [12], clean and safe drinking water are not accessible to almost two billion people of the world. The clean water supply includes water from groundwater drawn from a borehole or protected dug well, rainwater or protected spring. It is predicted that by the year of 2025 sufficient access to clean water will not be available for two-third people of the world. Hence, raising awareness regarding safe drinking water among the general populace cannot be ignored.

Katihar is a flood-prone district surrounded by three main rivers - Ganga (South), Koshi (West) and Mahananda (East). During the study, it was observed that many people of the villages of Katihar District were suffering from various types of water-borne diseases due to consumption of contaminated drinking water. The situation becomes more vulnerable especially during the flood. The water in this region was found to be both physico-chemically as well as

biologically contaminated. Hence, it was felt necessary to make rural people aware of the risks of consuming contaminated drinking water and to inspire them to use safe and pure drinking water.

2. The Study Area

Four blocks of Katihar district was undertaken to analyse the physico-chemical, arsenic and biological contamination in different drinking water sources from March 2012 to February 2015. Altogether 21 villages from four blocks namely **Katihar** (village-Sahebpura, Dalan, Makhdumpur and Sirmia), **Manihari** (Village-Baghmara, Baullia, Kumaripur Hat, Krishna Nagar, Narayanpur and Katakoas.), **Amdabad** (Village-Karimullapur, Amdabad, Balrampur, Paharpur, Baluwa and LalBathani) and **Barari** (Village-Madheli, BhaisDiara, Gurumela, Kalkapur and Gurubajar) were selected for awareness programmes. The drinking water sources used by the people in these villages are tube wells, dug wells, railway supply, municipal supply and the river Ganga.

2.1 Chemical Quality of Groundwater of Katihar District

Chemical quality of ground water is important for deciding the suitability for drinking, industrial and irrigation purposes. Ground water of aquifers of Katihar district is usually suitable for drinking and irrigation purposes. The groundwater of Katihar is mildly alkaline with average pH of 8. The arsenic concentration in groundwater above permissible limits has been reported from Manihari, Amdabad, Barari, Kursela, Sameli and Mansahi blocks by CGWB in 2008. The concentration of iron above permissible limits has also been reported from the Dummar (7.0 mg/l) of Falka block and Manihari (3.45mg/l) of Manihari block.



Figure: Study Area (shaded) of Katihar District, Bihar

3. Methodology

In order to create public awareness regarding drinking water contamination, a questionnaire survey was conducted in Katihar district. Three separate drives were launched regarding the awareness of local people for the use of safe

and clean drinking water- **awareness for local community, awareness for local children at school level and awareness for local women** particularly in arsenic affected areas. The methodology adopted for the programmes included mobilization of community, organization of training programmes and workshops. Emphasis was also given to provide understandings regarding relationship amongst diseases, health and pure drinking water and how to get pure drinking water from contaminated one.

3.1 The main activities of the awareness programmes included the following aspects:

- Awareness of local community through group meetings and public meetings.
- Awareness of local school children by organizing training programmes / workshops in schools.
- Quiz, drawing and painting competitions among school children.
- Awareness of local women by organizing group discussions.
- Educating people to avoid the use of drinking water from red marked tube wells as they are arsenic contaminated.
- Educating people about relationship between contaminated drinking water, diseases and health.
- Importance of safe drinking water and sanitation for health.
- Distribution of hand bills for awareness among rural people.
- Encouraging people to fetch water from arsenic free sources such as surface water like river Ganga, dug well and rain water.
- Educating people to obtain pure and clean drinking water through boiling, filtration and rain water harvesting (boiling does not do away arsenic in water). Providing

knowledge about the use of low cost Arsenic filter and Sono filter to obtain iron and arsenic free drinking water in the rural areas.

- Saving patients from the social stigma and breaking the myth that arsenic poisoning is not contagious.
- Encouraging people to take nutritious and healthy food.

3.2 Hand Bills

Save Water, Save Life and Give Water, Give Life.

Always use safe drinking water.

- Don't drink from anywhere when you are thirsty. It is better to take your own safe drinking water or packaged drinking water whenever you go outside.
- Contaminated drinking water is the main cause of diseases in our daily life.
- About 80% diseases (e.g. Diarrhoea, Jaundice, Hepatitis etc.) occur due to unsafe drinking water.
- About 1.5 million children die of diarrhoea every year in India due to consumption of unsafe drinking water.
- 37.7 million People in India are affected by water-borne diseases due to contaminated drinking water.
- Try to drink boiled and cool water, especially during rainy season.
- Use aquaguard or any other water purifier to filter water but boiling water is the best option. However, boiling of water does not remove arsenic.
- Use **Arsenic filter** or **Sono filter** to get arsenic free drinking water.
- Don't use water for drinking purposes from red marked tube wells.

4. Results

Table 1: Awareness Programme for Local Community

Sl. No.	Date of Programme	Village	Panchayat	Block	Participants		
					Male	Female	Total
1	04/05/2012	Dalan	Dalan	Katihar	18	14	32
2	22/06/2012	Tirpara	Katihar	Katihar	32	27	59
3	06/11/2012	Balrampur	Balrampur	Amdabad	26	13	39
4	15/09/2012	Krishnanagar	Dilarpur	Manihari	25	17	42
5	11/03/2013	Katakoas	UttariKatakos	Manihari	11	17	28
6	18/11/2013	Madheli	Jarlahi	Barari	9	13	22
7	10/12/2013	Gurumela	Gurumela	Barari	11	16	27
8	27/12/2013	Paharpur	Karimullapur	Amdabad	22	12	34
9	17/01/2014	Kumaripur Hat	Kumaripur	Manihari	24	19	43
10	12/02/2014	Sirnia	Sirnia	Katihar	24	12	36
11	07/04/2014	Baluwa	Baluwa	Amdabad	38	20	58
12	11/07/2014	Baullia	Baullia	Manihari	38	23	61
13	10/09/2014	LalBathani	Kishanpur	Amdabad	26	23	49
14	13/12/2014	Narayanpur	Narayanpur	Manihari	29	23	52
15	07/02/2015	Baghmara	Baghmara	Manihari	34	29	63
16	18/02/2015	BhaisDiara	Lakshmipur	Barari	37	10	47
Total	16 Days	16	16	4	404	288	692

Altogether 16 awareness programmes for local communities were organized in 16 villages of different Panchayats of 4 blocks of Katihar district from March 2012 to Feb 2015 (**Table 1**). In these awareness programmes, a total of 692 people participated. Among them 404 participants were male and 288 female. The people of village Baghmara of block

Manihari showed keen interest in the programmes and participated in maximum number (63). Minimum participation of people (22 only) was recorded in the village Madheli of block Barari. In all the awareness programmes people participated with immense enthusiasm and eager.

Table 2: Awareness Programme for Local Children in Schools of Villages

Sl. No.	Date of Programme	Name of School	Village	Panchayat	Block	Students		
						Boys	Girls	Total
1	24/11/2012 25/11/2012	Utkramit Madhya Vidyalaya, Makhdumpur	Makhdumpur	Makhdumpur	Katihar	30	38	68
2	09/02/2013 10/02/2013	Jageshwar High School, Gurubajar	Gurubajar	Gurubajar	Barari	42	34	76
3	12/11/2014 13/11/2014	Madhya VidyalayaPatni, Narayanpur	Narayanpur	Narayanpur	Manihari	43	69	112
4	03/02/2015 04/02/2015	Madhya Vidyalay, Amdabad	Amdabad	Amdabad	Amdabad	17	28	45
Total	8 Days	4 Schools	4	4	4	132	169	301

Table 2 depicts about the awareness programmes for local children in schools. A total of 301 students participated in four different programmes organized at four schools in different blocks of Katihar district. Maximum students present in the programmes were 112 in Madhya VidhyalayaPatni of Narayanpur village of Manihari block while minimum students present were 45 in Madhya VidhyalayaAmdabad of Amdabad block. Quiz competitions were the main attractions of these awareness programmes in all the schools. A total of 64 students participated in quiz competitions. The school children participated very

enthusiastically in quiz competitions. Surprisingly, the participation of girl students outnumbered the boy students in these awareness campaigns. They also showed keen interests in knowing the causes and remedies of contaminated drinking water and their ill effects. A total of 36 students participated in an essay writing competition on **“Safe Drinking Water for All”**. Out of them 3 students were awarded with first, second and third prizes in each school. Only 16 students participated in painting competition. In painting competition 3 students were awarded for the best paintings.

Table 3: Awareness Programme for Local Women

Sl. No.	Date of Programme	Village	Panchayat	Block	No. of Woman Participants
1	03/03/2013	Baulia	Baulia	Manihari	31
2	10/07/2013	Baghmara	Baghmara	Manihari	42
3	05/02/2014	Paharpur	Karimullapur	Amdabad	18
4	20/12/2014	Kalkapur	Sisia	Barari	38
5	13/01/2015	Katakoas	UttariKatakoas	Manihari	34
Total	5 Days	5	5	3	163

Participations of local women in these awareness campaigns are depicted in **Table 3**. A total of 163 women participated in five awareness programmes for local women organized at five villages of different Panchayats of Manihari, Amdabad and Barari blocks of Katihar district. The women of village Baghmara of Manihari block exhibited maximum participation (42) while minimum participation of woman (18) was in Paharpur village of Karimullapur panchayat of Amdabad block. The local women were found more curious and health conscious and participated in appreciable number. They were looking motivated during the awareness programmes. Some of the women covered a long distance to participate in the programmes. Concerned questions on the importance of pure and clean drinking water for health, hazards of contaminated drinking water, methods to obtain pure drinking water from contaminated drinking water, use of Sono filter and Arsenic filter etc. were frequently asked by them.



Figure 2: Awareness Programme for Local Children in School.



Figure 3: Awareness Programme for Local Community & Local Women

5. Discussions

We all know that water is life but sometimes this water can be dangerous for life because most of the diseases are caused by the contaminated water. Most of the viruses, bacteria and protozoa enter in our body by using this aquatic media. In case of cooked food, bacteria and protozoa die due to boiling and virus DNA and RNA structures get destroyed. But this does not happen in case of drinking water. The diseases like Typhoid, Cholera (bacteria affected) or Hepatitis, Jaundice (virus affected) or Amoebiasis (protozoa affected) diseases have adverse effects on human body. To keep ourselves healthy, we must drink clean, safe and germ free water. Water can be purified and made germ free by using different methods such as filtration, sedimentation, boiling and using water purifying tablet. But rural areas of many blocks of Katihar district are arsenic affected and drinking water is also contaminated with many physico-chemical and biological impurities. In such areas, neither does the government help the people properly nor do the people pay proper attention for obtaining pure and safe drinking water due to poverty and poor education. Doria also suggested the general public is an important factor in water management [13].

Jago Gramin Jago, Suddha Jal Piyo and Bimariyon Ko Door Bhagao.

With the above mentioned slogan, the awareness programmes were started in different villages of Katihar district. Altogether 16 awareness programmes for **local community**, 4 awareness programmes for **local school children** and 5 awareness programmes for **local women** were successfully organized. A total of 692 people in local community, 301 students in school and 163 women in local women awareness programmes participated. In local community programme, male participants outnumbered the

female participants. It may be due to male dominated society, pardapratha for women, hesitation of women in going out of home due to social customs and illiteracy. It may also be due to lack of freedom for women to participate in any social meeting or organization and lack of knowledge regarding the importance of awareness programme. Maximum participation was witnessed in the awareness programme in Manihari block. This may be due to its larger population and greater urbanisation. Some of the people were already educated and aware. They also knew the importance of awareness programme. Such programmes are also being organized by YAEF in Nepal which is a community based non-profit membership organization established in 1994 A.D.

Training of future generation is essential for the success of any social awareness programme. So four awareness programmes were organized at school levels. A total of 301 students participated in these programmes. The students of Madhya Vidhyalaya Patni, Narayanpur (Panchayat Baghmara) of Manihari block showed maximum participation which may be due to good educational environment of school and sincerity of teachers. Minimum students were present in Madhya Vidhyalaya, Amdabad at Amdabad block. This may also be due to the late commencing of the programme at about 2 pm due to some unavoidable circumstances. A majority of students did not turn up to the school after taking MadhyanBhojan (mid day meal).

Essay writing, painting and quiz competitions were also organized in the schools. In all the awareness programmes students showed very keen interest in knowing the importance of safe and clean drinking water and methods to get pure water from different sources. In all these programmes teachers cooperated very much. Sahyadri College of Engineering and Management also conducted an awareness programme on the benefits of drinking water at Government Primary School at AdyarPadau [14]. Separate awareness programmes were also organized for local women because they usually avoid or hesitate to participate in community programmes with men due to social trends and bindings. They also feel difficulties in asking questions amongst men. So when exclusive awareness programmes were organized for them, they participated in appreciable number and raised many queries. Generally male members and children ask the female members of the family for water and food. So it is more important to raise awareness of women about safe drinking water than men. Such awareness programmes for women regarding the use of safe drinking water and sanitation in urban and rural areas of Pakistan had also gained much importance [15].

By spreading awareness about safe use practices of natural water, the ill-effects of unclean drinking water can be minimized. People should also be made aware about the consequences of misuse of water so that this precious resource is available for many people over a sustainable period of time.



Figure 4: Filters for Arsenic Contaminated Water

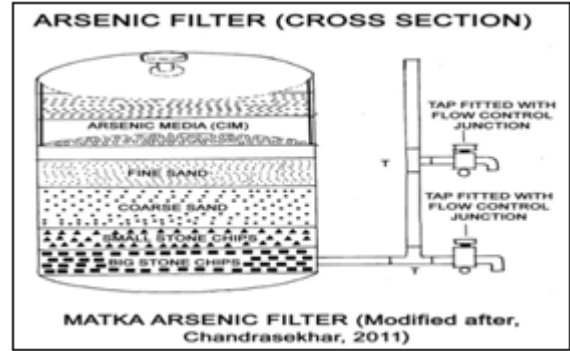
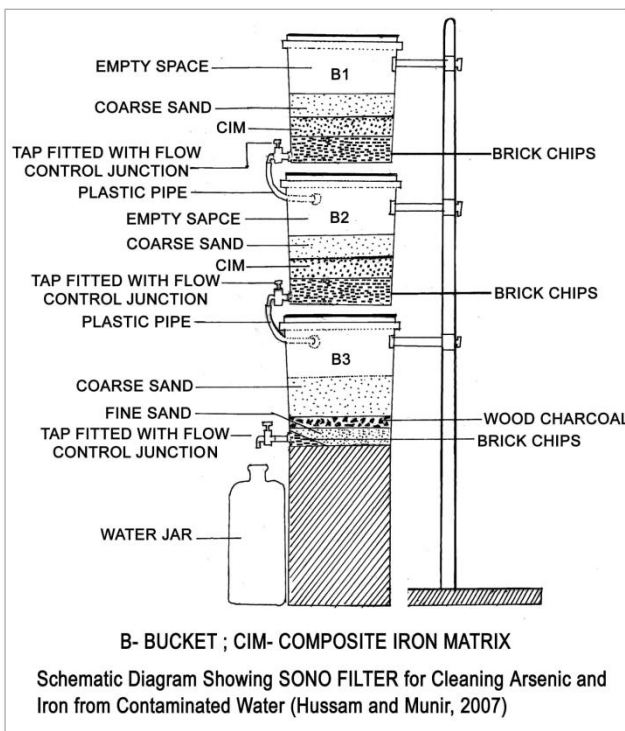


Figure 5: Schematic Diagram of Filter

5.1 Suggestions

- Regular awareness programmes for drinking water quality and sanitation should be organized in rural areas.
- Use of water purifier to filter water should be encouraged to avoid contamination and to obtain safe drinking water. Filter water is essential as the dust particles can contribute to forming stone around kidney. However, aquaguard, a popular water purifier has one demerit that it kills the good bacteria present in the water along with the bad ones.
- R.O. water purifiers are preferable as they have filters for chemicals, calcium and other deposits as well as bacteria.
- Use of Arsenic Filter or Sono Filter should be encouraged in arsenic contaminated area. Government should make a detailed plan for providing these filters in the areas with greater arsenic contamination.
- *Ceratophyllum demersum, Alisma plantago, Lemna, Colitriche stagnalis, Egeria densa, Elodea canadensis, Juncus sp., Potamogeton orchjreatus, Oscillatoria, Chara etc.* Plants are hyper accumulator of arsenic from soil. These plants can absorb 93% of arsenic from soil. So plantation of these plants would be effective to control arsenic problem in arsenic affected area [18].
- Filtered water taken from river Ganga and dug wells are comparatively safe for drinking from physico-chemical and arsenic points of view.
- During flood or monsoon period, drinking water must be boiled. However, boiling does not remove arsenic and other chemicals. It only removes physical and biological impurities.
- Railway supply and municipal supply water are usually free from different contaminants.
- Physico-chemical and biological analyses of different drinking water sources should be done annually.
- People should be made aware that sanitation also includes the provision of clean drinking water.
- A total ban on open defaecation should be strictly implemented because it is one of the main causes of contamination of surface and subsurface water. In this context, government must help those who cannot afford home toilets.
- Sewerage system should be well developed and well maintained.
- Government schemes for safe drinking water should be implemented properly.
- People should be encouraged to fetch water from rivers, ponds, wells and also harvest rain water which is free



Schematic Diagram Showing SONO FILTER for Cleaning Arsenic and Iron from Contaminated Water (Hussam and Munir, 2007)

from arsenic contamination. Water taken from tube wells may contain arsenic.

- Don't use red marked tube wells for drinking water.
- Break the myth that arsenic poisoning is contagious and save patient from social stigma.
- Take always nutritious and healthy food.
- Food items rich in protein and vegetables from cabbage family act against arsenic poisoning.
- Calcium and Phosphorous rich diets should be recommended to the villagers to counteract the rate of accumulation of fluoride in the human body.
- Effluents from households, hospitals and industries should be discharged properly after sterilization.
- Storage water tank should be kept clean.
- Leakage in the key, main and supply pipes should be checked periodically by automatic leakage detection systems.
- The Gram Panchayats should be motivated to take a proactive action and work hand in hand with NGOs in the management of rural water supply.
- Electronic media should play an important role in mass awareness programmes on drinking safe, arsenic free drinking water.
- Women should be trained as the **water managers** for the better utilization of the water.

6. Conclusion

Overall, these programmes increased the awareness regarding drinking water quality and health amongst all classes of the community. Especially it was very useful for rural women and school children. General public came to know about their rights and the need for safe and clean drinking water. They also learnt their duties to conserve safe and clean water. It was observed during the awareness programmes that all government projects like rain water harvesting in schools, arsenic filter provided by UNICEF in schools and arsenic and iron removal plants in different areas of Katihar district were not functioning successfully due to carelessness, irresponsible attitude and ignorance of the concerned departments as well as lack of awareness of local people. Lack of awareness has been a major roadblock to many of the projects being run by the government as well as the non-governmental organizations. The awareness programmes in concerned villages made the people aware regarding the government projects and inspired them to help these projects run successfully. The programmes also made the local people aware of the importance of sanitation in daily life. They were persuaded against open defaecation and misuse of water. Many people enquired about the cost and availability arsenic filters (Arsenic Filter and Sono Filter). Once the general public is made aware about their rights and the needs for safe and clean water, many of our water worries can be removed to a great extent.

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