PERCEPTION OF WATER AND HEALTH IN THE CONTEXT OF ARSENIC CONTAMINATION IN MATLAB, BANGLADESH

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Abstract

Objective:

Understand the villagers' perception of drinking water quality and taste in relation to arsenic contamination and health.

Methodology

An ethnographic study including eight focus group discussions, nine in-depth interviews, timeline, and observational techniques were applied to collect information during August 2001 - May 2002 in two villages of Matlab, Bangladesh.

Results

Tube-wells became the main source of drinking water after shifting from surface water in the early 1980s in the study villages. Villagers perceived that tube-well water possesses iron and is tasteful; canal or river water is iron and arsenic free but germ contaminated; pond water is muddy, greenish, and unpleasant to drink. Canal or pond water is mainly used for cooking and washing. Housewives make the decision regarding source and use of water. The young and literate villagers reported that tube-well water now possesses arsenic and causes blackening of skin and hardening of palms and soles. The old and illiterate people reported that tube-well water causes arthritis. Some villagers perceived that boiling or filtering or using water-purifying tablet removes arsenic from water. Several women reported that arsenic contaminated water smells like kerosene. Some villagers are planning to install deep-drilled tube-well as they are perceived to provide arsenic free water. Most of the key informants reported that they would not believe the harmful consequence of drinking arsenic contaminated water without seeing any arsenic patient.

Conclusion

Awareness among the villagers about arsenic contamination and its consequences should be raised on an urgent basis.

Keywords: Bangladesh; Arsenic; Perception; Water; Health

1 INTRODUCTION

Safe water promotion had a central role in reducing the incidence of many waterborne diseases or water related communicable diseases in world during the last century (1). In Bangladesh, using groundwater instead of surface water is thought to have contributed significantly to halving infant and under 5 mortality rates (2).

Until the mid-1970s most villagers obtained their domestic water from hand-dug wells or natural ponds, which were often contaminated with bacterial pathogens (3). Then the national government, UNICEF, and other agencies began a program of sinking tube wells and hand pumps to bring clean underground drinking water into villages, and extensive health education efforts to convince people to use that water. Unfortunately it was not realized until many years later that high levels of naturally occurring arsenic leached into this water, leading to chronic poising in many people who drank it. It is mentionable, tube wells that were installed were not tested for arsenic contamination (4).

The contamination of ground water by arsenic in Bangladesh is the largest poisoning of a population in history, arises from an unfortunate combination of three factors: a source of arsenic (arsenic is present in the aquifer sediments), mobilisation (arsenic is released from the sediments to the groundwater) and transport (arsenic is flushed away in the natural groundwater circulation).

The people of Bangladesh are being slowly poisoned; up to 57 million of Bangladesh's 130 million inhabitants are drinking water that contains harmful concentrations of arsenic (5). The World Health Organization's provisional guideline is that drinking water should contain no more than 10 µg/l of arsenic (6), though the Bangladesh standard is 50 µg/l. Water samples from many Bangladeshi tube wells have concentrations exceeding these values, with extreme concentrations greater than 500 µg/l (5,7)

The cumulative effect of drinking water such water over long period begins with ulcerating sores on the hands and feet and may end fatally with several forms of cancer (3, 8). Estimates of the number of persons potentially affected are as high as 18 million (3). Ironically, this calamity is an unintended consequence of well intended development project.

A clear dose response relation exists between arsenic concentration and skin and internal cancers, with a latency period of up to 20 years (4). Studies in other countries where the population has had long-term exposure to arsenic in groundwater indicate that 1 in 10 people who drink water containing 500 micrograms of arsenic per litre may ultimately die from cancers caused by arsenic, including lung, bladder and skin cancers (4). The clinical manifestations of arsenic poisoning are myriad, and the correct diagnosis depends largely on awareness of the problem (9).

The Bangladesh arsenic mitigation water supply programme was set up in 1998 an attempt to assess the scale of the problem and implement some solutions. However, little practical action has been taken; Geologists still do not know enough about the properties of the aquifers to be certain that digging deeper wells will help; reverting to surface water and rainwater, even if treated, still carries the risk of communicable disease; and high tech solutions rarely work in developing countries (8).

Despite of these, tackling such unexpected natural calamity, experimental and non-experimental public health interventions have been made, mostly showing the provision of neighbourhood ‘safe tube well’. But this strategy receives less systematic attention among the village people, and still they are drinking or using arsenic-affected water for cooking (10). Some of argue that

although the population might have absorbed the message about safe tube well (11) and 94% privately owned (12); the use of 'safe tube well' may be limited as the accessibility in neighbourhoods' tube well is limited. Another study suggests that due to lack of alternative water supplies, 25% of the identified arsenic patients were still drinking water from contaminated tube wells (13). Some of argued that lack of knowledge has hampered the mitigation initiatives (15). It is clear that either message 'life threatening danger from arsenic contamination water' was not clear to the public or they are confused about trusted tube well water being newly labelled as 'unsafe' or suggesting provisions were not suited well for them.

Beside this, the shift in drinking water source from surface to tube-well also accompany by radical changes in the perceptions about drinking water quality, taste, relation between water and health. With the new challenges of arsenic contamination and their tackling may necessitate a modification of people's behaviour. Thus, it is important to reassess the current situation in terms of peoples' perception about water.

It is against this background that the present study was undertaken to understand the attitude and perception about arsenic in tube well water and its health consequences by applying social science research methods. It is expected that the findings will be helpful in designing mitigation interventions or improving the existing ones.

2 MATERIALS AND METHODS

2.1 The study area

The study was conducted in the Matlab, a field site of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B: Centre for Health and Population Research), an international institution based in Bangladesh. The field site is spread over an area of 18,386 hectares of land in 142 villages with a population of 220,000. The present study was conducted in Munsabdi and Bhati Rasulpur villages which also have most of their tube-wells contaminated with arsenic. Both the villages are having some arsenic mitigation programmes such as three-pitcher filter and use of surface or rain water. The mitigation programmes are implemented by a national non-governmental organization called BRAC. All the tube-wells in Bhati Rasulpur were tested for arsenic, the ones with more than acceptable level are coloured red and the others as green.

Munsabdi is situated in the municipality area of Matlab Thana and outside of the embankment of Meghna River meaning that it is subject to flooding. A canal passes through the south of the village and connects the Meghna and Dhona Goda River. The village is supplied with electricity. Television is common in the households of the wealthier families. The inhabitants are from Prodhanbari, Khankarbaree, Mollabari and Kazibari. 23 tube wells and 17 ponds are in this village.

Bhati Rasulpur is different from Munsabdi, more rural than the other villages and situated inside the embankment of Meghna River. A canal splits the village into two parts; villagers use canal water for irrigation. There is no electricity in the village, kerosene lamp is the main means of lighting, and televisions are uncommon. The inhabitants of the village are known as Dewan *Baree or Sharkar Baree.* There are 24 tube-wells and 9 ponds in this village.

Rice is the main crop and cultivated twice in a year. More than fifty percent of the households have trouble meeting their yearly expenditures. Most families, which consist of 5 to 6 members, depend on one earning member. Women do not usually go out for work. Since a large proportion of the population is landless, agricultural labor, sharecropping, and fishing represent the main sources of livelihood in Matlab. The modes of transport used to go to the town are manual driven tri-cycle or small boat.

2.2 Method of data collection

A team of three social researchers, with long experience in qualitative research collected information for this study during August–September 2001 and two Research Assistants assisted them. Data were collected using focus group discussion and in-depth interviewing. In addition, village mapping, wealth ranking, matrix ranking, timeline and observational techniques were applied to gather information.

The first phase of the study was conducted by an exploratory study. An informal discussion with BRAC staffs was held to know the arsenic related information in Matlab. The study villages were selected with the help of BRAC staffs. Two village maps were drawn with the help of the villagers to know the socioeconomic and physical setting of the study villages. Those maps contained location of water sources, main road, and households. Timeline was used to know the history of drinking water sources used by the people living in the study villages. *Wealth Ranking* exercise was carried out with the villagers to define and determine the different socio-economic groups of households in the study villages. Household economical status was ranked using their annual income and expenditure as defined by the villagers. Poor households are defined as *kheya deya batshara ghat-ti thakey* (annual earnings are less than cost of annual consumption) and the better off *kheya deya batsharey eai thakey* (annual earnings are more than cost of annual consumptions). Matrix ranking was used to find out a clear picture of priority, quality and access of different water sources in each village. Two hours observation was made to see the use of tube wells marked with red level (arsenic contaminated) in *Bhati Rasul pur Dewan Bari*.

The second phase of the study involved analyzing the information of the exploratory study. A questionnaire guideline was designed to collect data through different methods. The guideline included information regarding attitude towards the different water sources, taste of water, practical issues regarding access to water, handling of water and use of drinking water and perceptions relating to water and health and diseases. The arsenic-related health effects are often not visible but some individuals (unknown frequency) have developed arsenic-related skin lesions. Are there any attitude formed regarding these skin problems and to what extent are those perceived as related to water? Are there any attitude formed about arsenic in drinking water? Is there an awareness of the problem, and how is this problem perceived?

A list of informants for data collection using different methods was prepared with the help of BRAC staff members. The researchers themselves collected data. The male researcher collected information from male informants and the female from female informants since females were reluctant to talk with male outsiders due to cultural reasons.

A total of eight focus group discussions were conducted, four groups with young males and females and another 4 with older males and females. Total nine in-depth interviews were conducted with key persons including schoolteacher, Imam, *Matabbar* (village leaders who involve village judiciary), ward commissioner, shopkeeper, village doctors, housewife, household head, and a member of the local youth club.

2.3 Methods of data analysis

The detailed notes that were generated from the repeated and lengthy interviews in using different techniques were organized into pertinent categories and tabulated for frequency distribution. Tables were assembled to indicate the frequency of responses regarding each category of data. Although not tested statistically because of the small sample size. The quantification of the data suggested several trends. Information collected by different methods and researches were linked and triangulated to determine consistency.

3 RESULTS

3.1 Attitude towards and perceptions about different water sources

3.1.1 Shift in drinking water from surface to tube well

Surface, tube-well, and rain are the three main sources of water in the study area. River, canal, and ponds are the sources for surface water. Villagers first saw the tube-well in their village during the late 1950s (see appendix table-1). The villagers dug mass tube-wells in the early 1980s and started to shift their practice of drinking water from surface to tube-wells. Currently the entire village drinks tube-well water and uses surface water for other washing purposes. Villagers stated that few years ago some office staff came to village and motivated people to drink tube-well water, because surface water was germ contaminated. But now office staffs are not promoting use of tube-well water. Therefore, villagers are at total confusion about use of water.

3.1.2 Tube-well water is clean and tasteful but arsenic contaminated

The respondents reported that tube-well water is clean, tasted pleasant, and contained vitamin but arsenic contaminated. They also stated that tube-well water is full of iron. A few respondents reported that it has a smell. The owners of the tube-wells also use the tube-well water for washing purposes. An old woman said that river and tube-well water are identical, both are linked under the ground, i.e. river water is brought to the tube-well through pump. She also said that tube-well water was used for treating diarrhea patients in the past, but normally people drank surface water, but currently people are drinking tube-well water all the time. An old woman (aged around eighty years) reported that tube-well water possesses *khachra* (iron), which bites in the stomach (*naaree tey kamar dai).* So it is better to drink after storing for some time, as the *kachra* settles at the bottom of the *kalshi (pitcher*) as *talanee (*sedimentation), making the water good for health (see appendix table-2).

3.1.3 River or canal water is easily accessible but contaminated with germ

The source of canal water is the rivers. According to the villagers, this water is easily accessible, of low cost and arsenic free but it is contaminated with germs. They reported that canal water is contaminated due to sewerage from open latrines, dead animals, and the like. Most of the latrines are drained to the canals, people dispose dead animals in the canal, and also wash animals in the canal. The canal water is used for cooking, washing, and bathing but not for drinking. They said that the fire (heat) kills all germs in the water during cooking. Washing and bathing entails an external use of water, it is thought that contaminated water or its germs is not harmful when used for the exterior parts of the body. But some villagers reported that the canal looks *tol-toley* (fresh and clean) due to *Joar and Bhata (tide)* in the river (see appendix table-2).

The river is far away from the some households; therefore they do not have easy access to river or canal water. The villagers, who were living on the bank of the rivers or canals, they use river/canal water for domestic, washing, and bathing purposes. There is a positive perception about river water; it was thought that river water is the best water for health, there is a proverb that *jater may kala bhala , nadir pani ghoila bhala* (a girl of good family is better than others even if she has dark complexion and river water is better than others even if it is turbid.

3.1.4 Pond water is arsenic free but it is turbid, tasteless and it has bad smell

Villagers stated that pond water is arsenic free and easily accessible but it is stagnant, dirty with a greenish appearance. A woman said, “Nobody drinks pond water nowadays, it is turbid, contains clay, *khaitey ruchi chai naa* (do not feel like drinking).” A respondent reported, “Ponds

are being used for fish culture using fertilizers and insecticide. The water is used for 'bad' purposes, the majority of the respondents among the women reported that they used the pond water to wash children's dirty napkins soiled with urine and stool, and as a source of water for washing after defecation (see appendix table-2) so not suitable for drinking.

3.1.5 Rainwater is best of all but not easily accessible

Rainwater is better than other. It is clean, no smell, iron less, germ less and arsenic free but not available in all the time of the year (see appendix table-2). It is available during rainy season and rare in other seasons. It is costly to store and retrieve and it is difficult to preserve safely.

3.1.6 Housewives decide the source of water for drinking and cooking

Most of the respondents mentioned that women decide on the source of water to be used for drinking and domestic purposes. Males do not interfere about this as they perceive it as the domain of females, and as money is not involved in this decision. One woman reported that she considers the opinion of educated members of her family in deciding water sources.

3.1.7 Canal or river is the public property but tube-well is not for the poor

A canal or river is the natural surface, made naturally, no one is able to claim ownership; everyone has equal rights of access regardless of whether they are poor or rich. But tube-well is not accessible to the poor. Poor villagers reported that they do not own tube-well, therefore, they are not always allowed to get water from tube-well. The owner of the tube-well is able to use its water for all kinds of purposes, even for bathing and washing clothes.

3.2 Perceptions related to water and health

3.2.1 Tube-well water causes arthritis, blackening of skin and hardening of palms and soles

The villagers perceived that tube well water is a cause of *baat* (arthritis), *shariray kaala daag poara* (blackening of skin), and *haat paa fetay jawaa* (cracking of palms and soles). (A respondent reported, "We drink tube-well water *thaikka* (having no alternative), it causes *baat*, *chudha ainee luker baat* (majority of the peoples suffer from *baat*)." The villagers, who are young or literate reported that tube-well water possess arsenic and causes of *shariray kaala daag poara (*blackening of skin) and *haat paa fetay jawaa* (cracking of palms and soles).

3.2.2 People do not see the arsenic patients

Nobody in the village saw any patient with arsenic related problems in their village or not even in the neighbouring villages. Another young male respondent said that without seeing any patient he would not believe about the consequence of drinking arsenic contaminated water. One woman reported that she did not see the arsenic affected patients, so she cannot say any thing about this.

Another woman reported that many women suffer from skin diseases like *Daad and behouse* (eczema)*, and Shetee* (vitilogo) in this village and people tend to avoid them. It seems that strong attitude about the arsenic affected patients is yet to be formed mostly because the villagers yet to see arsenic affected patients. But a female household head mentioned that she would expect separate bed and food for arsenic patients but they should not be stigmatized, "how a family member can possibly be stigmatized."

One farmer told, "*ammara murkha manose, amara ki hawiley ki hawi taa jannina, rough hawley, dakterer kachey jai, dakter baley dai ke haweycha* (we are illiterate, we do not know the relation between water and health and disease, if we fall ill we would consult a doctor, the doctor tells us what to do.)"

3.2.3 Surface water causes of diarrhea and scabies

Majority of the respondents both male and female relate surface water with diarrhea. Surface water is also a cause of dysentery, *khuchpachra, and gota-gati* (scabies). Some respondents also reported that it was the causes of *Chulkani* (scabies)*, Gastric* (acidity)*, and Liver dusita hawa* (spoiling of lever). Only two respondents relate water with health with quantity of water for the body. In their view, *kaam pani kahailey sharir jim jim korey* (if you drink insufficient water your body tingles). Several people mentioned that *kharap pani kahailey sharir bhalaw thakbeyna and bhalow pani khailey sharir bhalaw thakbey* (drinking bad water will not keep the body well, and drinking good water will keep the body well) referring surface water as bad water.

3.2.4 Increased awareness on red and green level tube-well

It was found that most of the respondents in *Bhati Rasulpur* in both focus group and in-depth interviews mentioned that tube-well water had been tested and marked red and green depending on the level of arsenic contamination. The red ones are contaminated. They stated that they were aware about the arsenic in drinking water and they do not use red tube-wells. The young and literate people of *Bhati Rasulpur* also reported that tube-wells were tested in this village by the NGO staffs; they marked with red and green colour in the tube-well. An old woman mentioned, "*lal tube well iar pani khailey oajana roug hawi, jay ruger kuna oashadh nai* (if some one drink water from red marked tube-well than they will attacked by unknown disease without any treatment)." She also mentioned that she received this message from the people who tested the tube-well water. But in *Munsabdi* village where tube-well water had not been tested only a few respondents who were either educated or had access to television or radio was aware about the arsenic problem. The difference in awareness between the two study villages is clear and it appeared that testing of tube-well water and dissemination of information to the people contributed to the increased level of awareness.

3.2.5 Arsenic contaminated water has a smell like kerosene and causes allergy

Several respondents reported that arsenic free tube-well water is white and look like *daber panee* (water of green cocoanut). One female mentioned that arsenic contaminated water had a smell like *kerosene.* A primary school teacher reported, "arsenic contaminated water is a cause of allergy, some days ago, my tube-well was labeled red, we stopped drinking water from this tube-well, and started to collect water from a green labeled tube-well at my neighboring household, all of my family members who had been suffering from allergy problems were cured". He showed the black spots in his hand and leg and said that these were due to my drinking of arsenic contaminated water.

3.2.6 We do not have the time or the patience to think about drinking water

Most of the male respondents expressed the view that they are afraid to take decisions about sources of drinking water. "It is a matter of woman", women are responsible for collecting water, and it does not involve money as it is usually collected from easily available sources. One farmer told, "*shara din kaj korey, rudrer madhey jakhan dhaan laiya bari asley jay testa pai takhan pani bach-bichar karaar sama nai, ja pai tai kahai, jadi jiban moran samassa hawi tabey katha"* (We work all day in the field facing the sun, when we return home with the paddy

full of thirst, we do not consider what should drink and what not, we drink whatever we find, if it was a matter of life and death then we would consider it".

3.2.7 Modern technologies is the cause of health hazards

The elder people reported that modern utensils including plastic and utensils made from silver, use of chemical fertilizers and insecticide are the causes of all diseases. In the past, people used tools made from clay, cow dung and ash were used in agricultural fields, and no insecticide was used in the field for crops. In their view, chemicals enter in the body through chemical contained food or chemical made equipment as a result the human body is attacked with several diseases. One respondent mentioned that they slept on the ground in the past and all disease passed to the ground, now days all of the people use *khat (*made of wood and used for sleeping) and diseases cannot pass to the ground.

3.3 Mitigation of the problem

3.3.1 Wrong understanding of arsenic removal methods

Some people reported that they were purifying arsenic contaminated water by using water purifying tablets or boiling the water. About one-third of the respondents in in-depth interviews reported that arsenic contaminated water could be drunk if collected and let to stand for 24 hours, they received this messages from the people who screened tube-wells for arsenic. Some people are collecting water from the canal using a clothes made filter which they perceived will remove arsenic from the water (appendix table-1).

3.3.2 Deep-drilled water is arsenic free

The villagers believed that deep-drilled tube-well had no arsenic and some of them were installing a deep-drilled tube-well or were planning to do so.

Some people were collecting drinking water from the *teen kolsi* of Community Nutrition Centre (CNC), it is provided by Bangladesh Integrated Nutrition Programme in *Bhati Rasulpur.* But its water is not sufficient for the villagers, it is for CNC members.

3.3.3 Arsenic mitigation is the responsibility of the Government of Bangladesh

According to the view of the younger people, rainwater may be collected and used during rainy season but what would happen during winter season. One old man reported about rainwater use in *Kachua.* There rainwater has been collected in a house and the village people collect drinking water from the house and the government initiated it. He told that in our village government might also be taking such initiative.

The young group said that the youth club would be willing to work for arsenic mitigation, but they were unsure of what to do. They reported that if any agency advice them to work they would work to solve the arsenic problems. One respondent said that they can work but at the beginning every body will agree to pay the cost, finally they will not pay the cost.

3.3.4 Willingness to pay for arsenic free water

Many respondents told that people would agree to pay 10-20 Taka (1 US$=56 Taka) monthly for arsenic free water. One educated young man said that they will pay for the first few months but they would not continue to pay. One old-aged (56) person said that if it would be a life and death problem we will pay money for this, such as we are paying money for the medicine and to

doctors due for illnesses. Majority respondent's viewpoints are that government is responsible for solving the arsenic problems.

3.4 Social context of the problem

3.4.1 Collecting arsenic free water is a process involving a long queue

In *Bhati Rasulpur,* it was found that in the past 25 tube-wells served for 107 households, but now only eight tube-wells are arsenic free. But there is no access for all the people in all eight tube-wells. Villagers reported that many owners of the tube-wells are forbidding them to collect drinking water because the tube-wells can be become out of order. As a result, many of them are collecting arsenic contaminated water from the red marked tube-wells. People are collecting water from few arsenic free tube-wells owned by generous people standing in long queue. Usually the rich people are the owner of tube-wells. It is impossible for the poor who are living from hand to mouth to install tube-wells.

3.4.2 Fear and concerns

According to a female respondent, villagers are afraid of arsenic contaminated water and its adverse health effects. Villagers said in a focus group discussion, "Nobody will give money for water, at the beginning every body will promise to give money but finally no body will give. On the other hand most/all of the village families are poor, they will not be able to bear the additional expenses for water." It appears that female were more anxious regarding the arsenic problem than males. At the time of making time line for water history in *Bhati Rasulpur*, most of the women opined that nobody will take the responsibility; only if you arrange arsenic free water for us only then we will get safe water, otherwise not. We talked with *matabbar* (leaders) and educated persons in the village but nobody are taking any action.

4 CONCLUSION

Villagers' attitude and perception towards different water sources were different depending on the taste, quality, and access of water. They were using different water sources for different purposes. Villagers related the use of different water sources with the causes of several diseases. They have heard about the arsenic contamination and its health effects but they would not believe in it without seeing any patients. They mentioned that arsenic mitigation was the responsibility of the government. There is an urgent need to design arsenic mitigation programme considering the villagers' perception of water and health in the context of arsenic contamination.

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Appendix

Table 1. Time line on drinking water sources

Bhati Rasulpur		*Munsabdi*	
Year	*Activities*	*Year*	*Activities*
1955	First one tube-well installed	*1971*	Government provided one deep tube-well for irrigation, nobody did use this water for drinking
1975	Another two tube-wells installed, people started to drink tube well water	*1976*	14/15 hand tube wells were installed by government, but all villagers did not get access
1983	More than ten tube-wells installed and availability of safe water	*1990*	One sallow tube-well was set up for irrigation purpose, villagers did not use for drinking
1988	One Sallow tube-well installed but people did not use this water for drinking	*1999*	Government provided four hand tube-wells and received Taka 6000 (1 US$=56 Taka) from the villagers
1995	Another one Sallow tube-well was set up for irrigation purpose		
January 2001	ICDDR'B provided strainer, which made by cloth. This is use for straining pond water		
July 2001	Three Kolshi filter installed in the CNC (Community Nutrition Centre). Only CNC beneficiaries can use this water.		

Table 2. Matrix Ranking on drinking water sources

Bhati Rasulpur

	Water sources				
Water quality	*Pond*	*River*	*Rain water*	*Tube-well*	*Total score*
Clean water	0	1 (10)	5 (50)	4 (40)	10
Tasteful	0	1 (10)	2 (20)	7 (70)	10
No smell	0	3 (30)	6 (60)	1 (10)	10
Iron less	2 (20)	2 (20)	6 (60)	0	10
Salt less	2 (20)	1 (10)	4 (40)	3 (30)	10
Arsenic free	3 (30)	3 (30)	4 (40)	0	10
Germ less	0	0	6 (60)	4 (40)	10
Easy accessible	5 (50)	3 (30)	0	2 (20)	10
Total	12 (15)	14 (18)	33 (41)	21 (26)	80 (100)

Munsabdi

	Water sources				
Water quality	*Tube-well*	*River/Canal*	*Rain water*	*DTW*	*Total score*
Clean water	2 (20)	0	4 (40)	4 (40)	10
Tasteful	6 (60)	0	1 (10)	3 (30)	10
Iron less	0	3 (30)	5 (50)	2 (20)	10
Salt less	1 (10)	0	5 (50)	4 (40)	10
Arsenic free	0	1 (10)	7 (70)	2 (20)	10
Germ less	1 (10)	0	5 (50)	4 (40)	10
Low cost	2 (20)	6 (60)	2 (20)	0	10
Easy accessible	4 (40)	5 (50)	0	1 (10)	10
Total	16 (20)	15 (19)	29 (36)	20 (25)	80 (100)

Figure in parenthesis indicate the percentage