

ARSENICOSIS AND SOCIO-ECONOMIC DEPRIVATIONS – A CASE STUDY IN MURSHIDABAD DISTRICT, ONE OF THE BACKWARD DISTRICTS IN WEST BENGAL.

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1. Background

Access to the safe water supply is one of the most important determinants of health and socioeconomic development. To overcome the problem of microbiologically unsafe and untreated surface water, more emphasis is given on groundwater use in West Bengal. In seventies the use of surface water got replaced by heavy dependence on groundwater. During 1981-2001, there has been a substantial increase in the accessibility of Hand-pump/Tubewell to the households, whereas there is an impressive decline in the use of well in West Bengal This has been considered as a step that contributed to decreasing the infant mortality rate (Water Aid, 2007). Reports of NSSO (1998) and NFHS (1998-1999) shows that the population of West Bengal, using the tube well water as drinking water is 71.5% and 64.0% respectively. In 1983, however, it was discovered that these tubewells which is the major source of drinking and cooking water in West Bengal, are contaminated by naturally occurring arsenic (Saha, 2000) and is a deadly devastation for safe water supply through hand pump technology in West Bengal. It is estimated that more than 50% districts of West Bengal is affected by this new problem (Das 2011). The problem of arsenic pollution is declared as national problem in 2002. World Health Organisation (WHO) declared arsenic contamination as a major public health issue and informed the state government to deal the problem on emergency issue. WHO revised it's initial guideline value for arsenic in drinking water 50 $\mu\text{g/L}$ (WHO, 1984) to a provisional guideline value 10 $\mu\text{g/L}$ (WHO, 1993). The level recommended by the West Bengal government is 50 $\mu\text{g/L}$ (PHED, 1994). In an attempted compromise, Bureau of Indian Standards (BIS) has recently published revised drinking water standards, listing 10 $\mu\text{g/L}$ for As as the desirable level but 50 $\mu\text{g/L}$ as the legally enforceable standard if alternative sources are unavailable (Chakraborti, 2011).

Drinking water with high levels of arsenic leads to severe health problems. In the arsenic affected villages, the following skin manifestations and other symptoms of arsenic toxicity were detected: diffuse melanosis, spotted melanosis, leuco melanosis, whole body melanosis, keratosis, dorsal keratosis, gangrene, skin cancer etc (Guha Mazumder et.al., 1988, 1988a, 1998b, 1998c,

2000, 2001; Saha and Chakraborti, 2001). Consumption of arsenic contaminated groundwater is causing economic welfare loss (Das, 2011; Roy 2008) particularly in rural West Bengal.

To minimize the damage the best strategy is the provision of safe drinking water in the affected areas to protect human health from arsenic poisoning effect (Smith et, al., 2000). To mitigate the arsenic problem, a number of alternative technological options are available. Some of these options are based on surface water and some are based on treating the arsenic-contaminated groundwater. There is a continuous increase in expenditure for supplying arsenic safe drinking water to the rural sector. Since 1994-95, different measures have so far been taken to provide arsenic free water in the arsenic affected areas of West Bengal. A sum of rupees 876.75 crores has already been spent by March, 2007 (PHED, 2007). But preliminary field observations in Murshidabad district revealed that much thrust has been put on developing technologies for providing arsenic safe water as ‘hardware’ and on promoting their distribution and installation, but lesser attention have been put on the ‘software’ part i.e awareness generation and community participation (Das, 2009,2011).

2. Objective

In this backdrop the present paper based on case studies and field survey carried out in Jalangi, one of the arsenic affected blocks in the backward district-Murshidabad (West Bengal), tries to present the socio-economic deprivations from arsenic unsafe drinking water. The findings of this study may help the policymakers and planners at the national level to determine the target population for prevention and treatment in public health programmes.

3. Methodology

The study has utilized secondary data from various sources; combined with primary data collected during the field survey (2011). Media coverage on arsenic victims, research reports and articles has been utilized as a secondary source. Method of data collection included in-depth key-informant interviews, observations and Focused Group Discussions (FDGs). Both women and men were targeted as informants. Arsenic victims of the villages Khairamari, Debipur, Sadikhardier, Chakchaitan, Pajrapara, Ghoshpara (South) of Jalangi block under Murshidabad district were selected as the primary source. Villages were chosen on the basis of estimated highest average arsenic concentration level. In the context of multidimensional deprivations much information is qualitative rather than quantitative.

4. Arsenic Menace in West Bengal

Detection of arsenic contamination of the groundwater – in the 1980s in West Bengal, the main source of drinking water, has added a new dimension to the already existing water security problems in the state. The arsenic pollution was traced in two blocks of three villages of two districts (North 24- parganas and South 24- parganas) of West Bengal in 1983 (Saha, 2000). The spatial spread of the problem is under assessment continuously by independent experts, research laboratories (SOES-JU) as well as by the government. Despite differences in reported statistics, due to the difference in coverage of their study areas, from different sources there is unanimity over the fact that eight districts of the state are suffering from severe groundwater arsenic pollution problem. These are Nadia, Murshidabad, Malda, South 24-Parganas, North 24-Parganas, Howrah, Hoogly and Burdwan. The five districts- Malda, Murshidabad, Nadia, North 24-Parganas and South-24 Parganas situated at Eastern bank of river Bhagarathi are severely affected and at the Western bank three districts (Burdwan, Howrah, Hoogly) are comparatively less affected. Some parts of Kolkata (Capital of West Bengal) are also affected by groundwater arsenic pollution problem (Das, 2010). Expert committee also disclosed that the intermediate aquifer (second aquifer 20-80 meter below ground level (mbgl)) of the affected areas have shown significantly above the WHO guideline value, i.e. 10 µg/L.

Dermatological survey (Saha, 2001) found that population drinking the same contaminated water, may not all show arsenical skin lesions, but their hair, nail and urine contain high concentration of arsenic. Thus there is a possibility that many of the villagers are sub-clinically affected. Number of people taking the risk of drinking arsenic contaminated water greater than 50µg per litre is around more than 5 million with 10134 people (including children) actually affected (Sengupta, 2006). The current Public Health Engineering Department (PHED) status report (PHED, 2007) of arsenic in West Bengal (on the basis of 132262 water samples) concluded that at present the total population at risk in the state is approximately 28.7 million, 36% out of the total population of 80.21 million (Census,2001). About 16.26 million population (35.48% of the total population of the State) covering 17533 number of habitations are located in the potential risk zone of groundwater arsenic related threat and diseases (NIH & CGWB, 2010). The variation in number of people at risk from various sources emerges from the variation in coverage of their water samples tested and year of reporting.

SOES had screened 2384 villagers in between 1995 and 2000 from 33 villages in 16 blocks and from 9 districts of West Bengal (India) and Bangladesh. Out of these registered people, 1194 (in West Bengal this number is 692) were reexamined between January 2009 and 2010 [I participated effectively in the survey also]. The overall study shows that 169 (in West Bengal, the number is 97) , which is 14% of the registered population, died between the two visits, that is between the periods 1995-2000 and January 2009 – 2010. Only 454 patients out of 1025 (1194- 169), who were registered during their first visit, could be reexamined. This is 44% of the originally registered population. When these patients were re examined, 220 (48.5%) are suspected to be afflicted by Bowens, Non- healing Ulcer/Cancer, and Ascites. In some villages, 80-100% patients are suspected to be suffering from Bowens. [e.g. Chalk-khorgachi 100%, S. Bowens (N=9)] [SOES & DCH Report, 2010]. It is found in various researches that children are the worst victims of groundwater arsenic pollution. Symptoms of arsenic pollution are found in the large number of children in the most affected districts of West Bengal as well as in Bangladesh. In both West Bengal and China, arsenical skin lesions have been diagnosed in children as young as 6–18 months old (Sun et. al., 2006). The Intelligence quotient (IQ) level and the cognitive functions of the children are also affected by the arsenic pollution (M.N.Majumder, 2006, Sun et. al., 2006).

Over Past three decades scientific studies (Chadha D K and Sinha Ray S P, 1999; Chakraborti D, 2001, 2009; Das D et. al., 1996) have been undertaken in West Bengal to understand the sources and extent of the problem of arsenic contamination in groundwater. Possible impacts on human health have been studied through epidemiological investigation (Guha Majumder et. al., 1998, 2000; Saha and Chakraborti 2001; Saha, K.C, 2003). While much is known about the extent and its probable causes (NIH & CGWB, 2010; PHED, 2008; Sengupta, 2006), less is known about the health and socioeconomic deprivations.

5. Arsenicosis and Socio-economic Deprivations - A Case Study in Jalangi Block of Murshidabad District

Governments and other agencies are mainly attentive to identification, mitigation and supply of safe drinking water but little has been done to understand the pains the arsenic patients are going through. Below are some of the case studies which are presented in order to explain some of the harsh realities of the socio- economic impacts of arsenic contamination in drinking water.

5.1 Groundwater Arsenic Pollution Problem in Jalangi

A detailed survey study report by SOES and PHED on the groundwater arsenic pollution problem is presented in table 1 and the Jalangi block is shown in map 1. Each block of the Jalangi block is composed of several clusters of villages with each cluster known as Gram Panchayet (GP) and each GP having several villages. The Jalangi block has 10 GPs and there are 117 villages total. The area and population of the Jalangi block are 122 sq.km and 215538 respectively (2001 census). Sagarpara, Khairamari, Sadikhardiar gram



Figure 1: Arsenic Patient (Source: Field Survey)

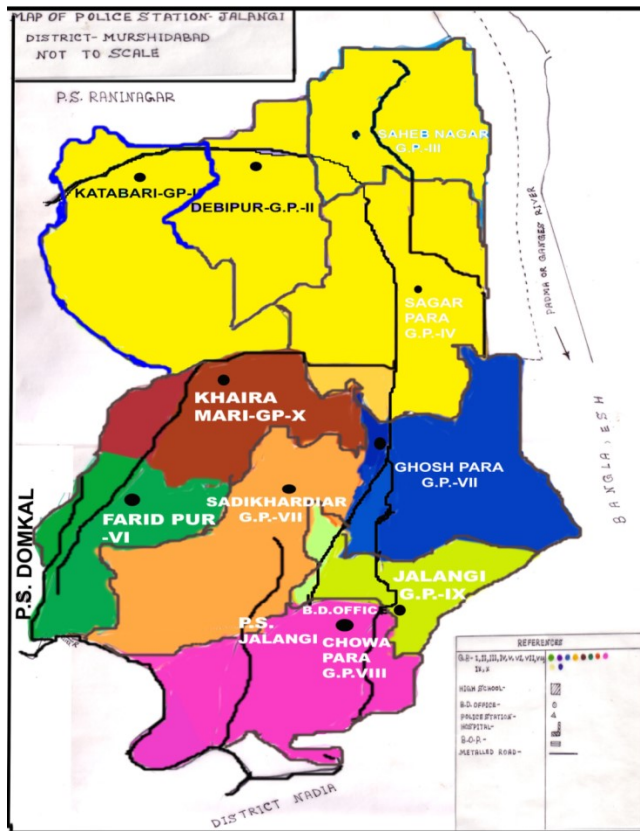
panchayets having groundwater arsenic concentration more than the district average (244 $\mu\text{g/L}$). SOES medical team registered a number of people suffering from arsenical skin lesions and many are sub clinically affected (Rahman et, al., 2005a, 2005b, 2005c). Medical team also screened 912 children below 11 years of age for arsenical dermatosis and other symptoms and registered 40 children (4.38%) and few are with moderate stages of spotted melanosis and keratosis. Pregnancy outcome affected badly due to the exposure of arsenic. Figure 1 shows an arsenic patient.

Table 1: Arsenic Concentration in Jalangi Block

Block	Average Concentration ($\mu\text{g/L}$)*								
	Whole Frequency Distribution			From WHO Level (10 $\mu\text{g/L}$)			From National Standard (50 $\mu\text{g/L}$)		
JALANGI	JPOA	SOES	COMBINED	JPOA	SOES	COMBINED	JPOA	SOES	COMBINED
Sagarpara	172	181.29	177	212.09	211.22	212	278.90	302.42	291
Kharamarai	163	175	169	212.69	201.01	207	286.17	279.21	283
Sadikhardiar	191	122.41	157	269.10	156.60	213	403.10	242.69	323
Faridpur	68.32	80.24	74	116.92	130.47	124	186.29	256.86	222
Ghoshpara	113.45	193.79	154	145.52	214.69	180	204.49	260.08	232
Debipur	96.18	147.77	122	124.55	163.38	144	204.06	223.69	214
Jalangi	144.52	70.83	108	198.70	101.43	150	218	164.94	191
Kantabari	93.16	64.76	79	135.84	97.19	117	197.66	188.65	193
Choapara	65.65	47.16	56	95.04	75.84	85	135.80	121.69	129
Saheb Nagar	68.11	26.75	47	108.84	59	84	211.71	106.13	159
<i>Block as a whole</i>	111.11	138.03	125	156.79	177.53	167	229.56	258.50	244

*Author's estimation based on SOES and PHED survey report.

Map 1: Jalangi Block



Source: Collected from Block Office (Jalangi)

5.3 Mitigation Measures

From 1994, arsenic safe water is supplied in the affected areas mainly by the following mitigation strategies: (a) Installation of Arsenic Treatment Units (ATUs) fitted with handpumps (b) Creation of spot sources (deep tubewells, dugwells, etc.) in the affected areas; and (c) Pipe water supply scheme (based on groundwater and river water as per availability). From the report of PHED (Murshidabad), it revealed that upto March 2007 (Table 2), a total of 99 ATUs were installed through Pradhan Mantri Gramodya Yojana (PMGY) programme, 5 dugwells were installed and 6 PWSS launched under normal water supply project. One swajaldhara water supply scheme is also launched in 2010.

Table 2: Number of Beneficiaries of Different Arsenic Mitigation Measures in Jalangi Block (Up to 2007)

Name of the block	Population (2001)	Population affected	Total number (No.) of Population (Pop) benefited through different mitigation measures						
			Ring well		ATU		PWSS		Total population benefitted
			No	Pop	No.	Pop	No	Pop	
Jalangi	215586	207460	5	1250	99	24750	6	159409	185409
MURSHIDABAD DISTRICT	3997049	2045190	114	28500	1125	282250	47	968530	1279280

Source: PHED (Murshidabad) report, 2003 and 2007 Note: Numbers of beneficiaries are as per project scope.

5.4 Present Status of Alternative Arsenic Safe Water Options

Field observations revealed that much thrust has been put on developing technologies for providing arsenic safe water as ‘hardware’ and on promoting their distribution and installation, but lesser attention have been put on the ‘software’ part i.e awareness generation and community participation. Cost-effectiveness, economic valuation never figured in the agenda. All the ATUs were nonfunctional due to lack of backwashing and maintenance. While surveying, we found several dug wells in different parts of the block now serve as objects of recreation for children or storage space of hay stacks where goats and sheep graze. Due to unwillingness of the villagers to pay for arsenic safe water, to village politics Swajaldhara water supply project were not ‘community-based’, but was managed, operated and maintained by 3 – 4 families in the villages. In some areas it was found that comparatively rich households having greater political influence to divert government funds and schemes towards personal gain, for instance, installation of Arsenic Removal



Figure 2: One Defunct ATU (Source: Field Survey)

Plants, Dugwells and even stand posts of PWSS near their own houses for easy access. There were a number of household in the selected villages where women fetched water by travelling a long distance from some alternative measures (taken by the government) declared arsenic safe by the concerned authority. Monetarily better off educated households with greater access to

information collect safe water either personally by using their two wheeler car or paying money to the low paid villagers. Some villagers stayed away from technology adoption because the plants are far away from their home. During rainy season, women & children are reluctant to collect water over long distance because of the bad road condition. There exists a strong disparity between the coverage and accessibility. Field observations could also show that while some areas are over served by various technologies some areas are deprived of the benefits of installations. Figure 2 shows a defunct ATU.

5.5 Case Studies on arsenic led deprivations

5.5.1 Human Right Deprivation

Once the symptoms of arsenicosis become prominently visible on one's skin, there is hardly anything to do about it. According to the physicians, patients of arsenicosis, if detected and treated early while they are in the first stage of the disease, may recover from it (Hussain, 2003). But the real difficulty lies in detecting the disease in the early phase as it cannot be easily diagnosed then. When the signs of the disease are externally visible, then only the patients come to visit doctors. The story does not end here. The poor and illiterate villagers go to the local quacks. There is no need to mention that the patients then get treatment for diseases other than arsenicosis and the ones which they do not even have as these doctors lack sufficient knowledge and expertise regarding arsenic related diseases. This amounts to a great delay in starting an effective treatment of the health problems caused by arsenic contamination in drinking water and arsenic poisoning penetrates far deeper in the patient's body and expands from one body part to another. Affected population is deprived from proper medical care due to poor health infrastructure. Effective medical care is available in Kolkata city which is 260 km away from the study area.

Satyanarayan Mondal of Chakchaitan village of Sagarpara gram panchayat succumbed to arsenic poisoning 15 years ago. His wife Kusum Mondal was then rearing up their two sons who were minors and still in school. She spent all her savings for her husband's treatment and she could not meet the expenses of her family with the little money she had in her hand after her husband's death. She first asked her parents to support her family financially and thereafter went to her siblings and even to her brother-in-law seeking their monetary assistance so that she could sustain her and her young sons' livelihood. But even after all these she failed to procure enough for themselves and being unable to provide for their education, she stopped sending her sons

to school. Instead she sent her young ones to work as agricultural labourers in others' fields so that they could earn a little money and support the family at that period of dire distress. The children used to get lesser wages because of their young age. Many of Satyanarayan Mondal's colleagues like Bimal Saha, Jiten Mondal, Chandi Mondal, Dhiren, Bijoy, Manoj were from Sagarpara gram panchayet. All of them were police officials and used to work together at the same department. Kusum Mondal has visited the houses of her late husband's colleagues. All of them are now well established, have built their own houses and their children are well educated as well whereas the untimely death of Kusum Mondal's husband caused by arsenicosis made her put an end to the education of her two sons and they now work as daily wage earners. All these happened because of unavailability of arsenic free safe drinking water. Almost each and every family under Jalangi police station of Murshidabad district was a prey to arsenic's fatal attack. Ishar Ali Sheikh of Sagarpara had blisters on his palm that have hardened now. Now he cannot work hard or perform any heavy task. Most of the men of this locality have uncountable black patches on their body. These poor villagers earn money by toiling hard. But at present they cannot work hard as before. They cannot work in the sun for long as they feel a kind of burning sensation on their body and when this happens they have to take rest for quite some time under a shade. From these patients of arsenicosis we came to know that they are quite susceptible to cough and cold and they have become considerably weak and feeble. For this weakness, they usually take longer time to finish a certain task compared to the ordinary healthy people. Nazrul is a 55 year old resident of Sadikhardier village under Sadikhardier gram panchayet. He was engaged in a small business and used to earn his living by selling fishes. However, he exhausted all his savings for his treatment. Suffering from arsenic induced disease for a long time has made him so weak that he cannot go now for fishing as before. If he gets down in the water, his hands and legs become whitish. Moreover he perspires heavily if he is exposed to the sun even for a little time, his skin starts itching and he becomes easily tired. Today it is quite known to everybody that the patients of arsenic induced diseases have lesser working capability compared to ordinary healthy people and their energy get dissipated quite soon which make them feel easily exhausted. Hence the contractors surely want the unaffected people to work as as wage earners under them, not the ones affected by arsenic poisoning. The afflicted ones are offered the work only when there is a shortage of healthy labourers, complained Asadul Sheikh, Obaidul Sheikh.

Once they had worked with full stamina and vigour. Now they cannot undertake any hard work or heavy task.

5.5.2 Social Deprivation

Abul Kalam Azad, resident of Pajrapara village under Khairamari village Panchayet of Jalangi block in the district of Murshidabad is a teacher by profession. He owns a piece of land and is more or less affluent. His family members did everything possible to provide him with proper treatment facilities after he was detected with arsenicosis. But none could save him from the deadly clutches of arsenic. One of the family members reported that the residents of Alok's locality avoid all his family members. The local people believe that if they visit their house or incidentally touch him or his family members, they will be affected by the same disease. . The unaffected people used to leave the road and stand in one side once they saw the affected ones coming along the road. They were not even allowed to take bath in the local ponds. Arsenic gets in the way of marriage of young girls in the afflicted villages. Sabina bibi of Ghoshpara (South) in Ghoshpara gram panchayet and Hasina bibi of Debipur village in Debipur gram panchayet cannot live peacefully in their in-laws' house. Due to consuming arsenic contaminated drinking water, their body is covered by dark patches which they could not conceal and as a result, they have been driven away from their in-laws' house. Hasina's sister Hasena, also a victim of arsenicosis, does not want to get married at all seeing her elder sister's plight being abandoned by his husband within three months of their marriage. The problem of arsenic is not only there in the post-marital life, but its presence poisons the pre-marital life of people as well. The life of Adora Khatun, daughter of Asadul Sheikh, a field labour who lives hand to mouth in Khairamari village under Khairamari gram panchayet, is evidence to that. Negotiations for her marriage took place thrice but she could not get married due to the arsenic caused lesions on her skin. Finally someone agreed to marry her but he demanded a huge amount of dowry to accept a wife who is a patient of arsenicosis. Adora's family could not afford that, so this negotiation also broke off.

5.5.3 Economic Deprivation

Continuous consumption of arsenic contaminated water leads to severely health hazards affects adversely the macro economic variables in the form of lowering labour productivity, lowering income earning capacity, loss of lifetime income, intergenerational poverty, impoverishment, welfare loss etc (Das 2011). Physical disabilities in walking, gripping, breathing problem, weakness caused by chronic arsenicosis resulted in a number of occupational

disadvantages. A number of qualitative analysis have shown decline in the occupational activities and hence their family income. The families in which the health conditions of the patients are critical, all its members have collected the money for these patients' treatment by either mortgaging or selling all their valuables and wealth including land, trees, cattle, utensils or by putting in more hard work or by borrowing money from others. This has made the poor people poorer. Arsenic has been taking away from them whatever little securities and support they had. These families are now stuck in the vicious cycle of poverty.

6. Conclusion

From the preliminary study in the Jalangi block in Murshidabad district of West Bengal, it reveals that the magnitude of groundwater arsenic pollution problem is severe. Continuous consumption of arsenic unsafe drinking water leads to acute health hazards from children to adults. Qualitative analytical procedures used here reveals that arsenic is not only a physical but also a social as well as economic phenomenon. Arsenic victims are living with social isolation, social injustice as well as problematic family issues. People in the affected area are forced to drink contaminated water due to non sustainability of the alternative safe water sources. Arsenicosis arises out of prolonged exposure to arsenic unsafe water use. So it needs appropriate communication strategy for educating people about ill affect of everyday use of arsenic unsafe water and making arsenic safe water source easily accessible. Making children aware of the problem and teaching them about remedies will bring in behavioural changes within the family so far water use behavior is concerned. Females who take care of water, health and food of the family need to be educated on ill health effects. Youth usually with bicycles use more safe water even if they are to fetch from long distances. So targeting youths can generate a business model for door to door safe water delivery system. To overcome the socio-economic crisis, psychological support and employment opportunities should be provided to the arsenic victims.

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