Original article

Arsenicosis and health disparities in arsenic prone area of Gaighata block, North 24 parganas, West Bengal (India)

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ABSTRACT

Arsenic Contamination with groundwater is an enormous environmental threat throughout the world and during the last three decades it is a major concern in indo- Bangladesh Gangetic delta. Arsenic is a slow poison and it enters the human body through arsenic contaminated drinking groundwater using deep tube well and as well as through daily food consumption like rice and vegetables.

Present study is aim to the impact of socio-demographic and socio-economic factors of arsenicosis a total 304 adult participants have been interviewed on the basis of a structured questionnaire in arsenic effected village of Gaighata block of North 24 parganas of West Bengal.

The most significant finding of this present study is that the severe affected with the arsenic related disease among the poor male working groups mainly who are engage to agricultural activities. Poor economic condition and as well as gender related differences generate the overall health disparities among arsenicosis participants. The findings of this study may help the public health planner at national level to determine the target population and as well as arsenic contaminated area for prevention the arsenic related diseases to all arsenicosis individual.

Key words: Arsenicosis, Health disparities, Socio-economic factors, Socio demographic factors, Gender aspects, Gaighata block.

INTRODUCTION

Arsenic contaminated drinking water is a major environmental threat since late eighties. In

our state West Bengal, use of surface water got replaced by heavy dependence on

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groundwater. During next decay the use of groundwater reached a large proportion. In 1983, however, it was examine to that these tube wells which was the major source of drinking and cooking purpose in West Bengal were contaminated with arsenic (Saha 2000). A large part of Gangetic plain with an area approximately 569,749 km^2 and over 500 million populations might be at risk from arsenic contaminated groundwater (Chakroborty *et.al.* 2004). In the year 2002, the problem of arsenic contaminated ground water was declared as a national problem. Since 1988, total 107 blocks from nine districts of West Bengal have been identified with arsenic contaminated groundwater above 0.05mg/L (Chakroborty *et.al.* 2009)Among them five districts North 24 parganas, south 24 parganas, Malda, Murshidabad, Nadia situated of eastern bank of river Bhagirathi are severely affected. Some parts of Kolkata (capital of West Bengal) are also affected by this environmental slow poison (Das, 2010). There were so many exploration from Bangladesh revealed to that the continuous intake of arsenic contaminated water is highly toxic to human health. It causes internal organ cancer also. Existence of arsenicosis and socio – economic factors are correlated in so many studies from Bangladesh (Hadi *et.al.* 2004; Hossain *et.al.*2009; Mahmood *et.al.* 2011). Since last three decades enormous scientific studies have been done in West Bengal to understand the sources and effect on human health of arsenic contamination in groundwater. Very few number of studies followed on socio economic factors related to arsenic affected area and as well as on arsenicosis victim. Present study try to understand how the socio economic conditions generate a health disparity in a society which is already affected environmental slow poison arsenic.

MATERIALS AND METHODS

Study Area: The study area is around 65 km away from Kolkata (capital of West Bengal) and quite convenient to reach by rail/road. Gaighata and Habra II block are of the 20arsenic affected blocks, out of the 22 affected blocks in North 24 Parganas district, where groundwater contains arsenic above 0.05mg l^{-1}(Rahaman *et.al.*2003).Two highly arsenic contaminated districts of Bangladesh, Satkhira and Jessore lies in the Bhagirathi Hoogly river sub basin and the bordering districts of North 24 Parganas (Chowdhury *et.al.*2000). Many people migrated from those two district of Bangladesh. According to Rahaman *et.al.* (2003) about 52.8% and 29.2% of the hand tube well water samples (n=48030) in this district contain arsenic 0.01 and 0.05 mg/l.

Data Collection: In the year 2015-2016, the data were collected from 400 respondents through interviewed method from two village of Sutia Gram Panchayet of Gaighata Block, North 24 Parganas, West Bengal. To find out the arsenic affected areas as well as arsenic concentration level in the tube well water sample the present study completely depend on the survey report published by School of environmental studies of Jadavpur university [SOES(JU)]. Arsenicosis was measured by the observing signs of clinical manifestations and discussing the symptoms. Out of 400 participants, 304 adult participants join in this study. After getting Institutional ethical committee approval, verbal consents were obtained from all participants prior to the commencement of the study. Socio economic factors (like income, occupation, education) and demographic factors (like age, gender) were considered at the time of data collection.

Household selection was done through random sampling. Identify the all habitations those were use of shallow tube well for their daily water use and for which arsenic concentration levels are cross the permissible limit. Arsenic disease related information was collected through both direct interviewed of the member of households and the primary knowledge that we have gathered from the expert dermatologists of local arsenic clinic. In this study many individual also knew about their diseases because of presence of this arsenic clinic. But they do not go to that clinic regularly.

RESULTS AND DISCUSSIONS

In the present study table 1 shows the arsenic level of groundwater of Gaighata block of North 24 Parganas. The survey was conducted by SOES (School of Environmental Studies), Jadavpur University, West Bengal and PHED (Public Health and Engineering Department, West Bengal Govt.). According to that survey four Gram Panchayat of Gaighata Block was highly contaminated with arsenic such as Ichapur I, Ichapur II, Chandpara and Sutia. Present study was conducted in two villages of Sutia Gram Panchayet, Bishnupur and Teghariya.

Table 2 opine that the socioeconomic and demographic features of studied participants. Total 400 participants from two villages of Sutia GP Participated in this study. Out of them 304 adult participant (Male 156, Female 148) response in this study. Mean age of the participant was 37.2 (± 15.2) years. Maximum number (42.7%) of participant in young age group. 21.7 % were within the age group (40 -50), 16.1% were within the age group (30-40), 13.4% fell in the age group (50-60) and only 5.9% having age above 60 years. Among the respondents most (77.3%) of had education only 22.6% had no formal education. 25.3 % respondent completed their upper primary education. A significant number of participants (35.5%) were

engage in agricultural activities; 40.1% of respondents were students, housewives and unemployed. A significant number of participant (68.7%) fall under low income category (Rs.0 to Rs.2000/-). 25.6% fall under middle income (Rs.2000/- to Rs.6000/-) group and only 5.5% fall under high income (above Rs. 6000/-) category.

Table 3 shows that the socio Economic status of arsenic affected and as well as non arsenic effected participants of studied area. Almost 27.9% of the studied population had arsenic lesions on their skin, and internal organ problem due to arsenic contaminated drinking water. 77.6% of studied participant of the productive age group (40-60 years) is affected by arsenicosis. In compare to male, female are less effected by the arsenic. Most of the female come to this arsenic effected area by getting married. So the arsenic effected drinking water is less consume than male those who born this slow poison area. On the other hand most men in the studied village were land less labour and they work on the others land daily wage basis. Most of time generally they have to drink water from irrigation pumps and this is one of the most important sources of arsenic poisoning. More educated people wereappear to be less affected than the less educated ones. Another important observation was that in the lower and middle income groups, the maximum number of people (63.5% and 29.4%) suffering from arsenic related health hazards than in the higher income group. The higher income groups were relatively less effected may be due to their nutritious food consumption and as well as intake of arsenic free mineral water.

Table 4 revealed that the Gender related health disparity among arsenicosis participants. 60% of the arsenic effected participants received medical treatment. A lucid gender disparity was observed in the field of taking medical treatment for arsenicosis participants. Males were more responsive to take medical treatment than women (83% for males and 21.8% for

females). Due to economic crisis and some social bindings creates such type of gender disparity of seeking medical help. Simultaneously in a patriarchal society women are not permitted to go out of home alone and this has restricted them within the confines of the local practitioner. Sometimes their shyness also creates a detachment from medical help.

CONCLUSION

From the overall study of ground water arsenic contamination and its health effect in studied area is severe. The number of arsenic affected male patients is much higher than the female. People who are engaged in agricultural activities were more exposed to this environmental hazard than the individual who were involved in nonagricultural activities.

Poor economic condition is also creating a health disparity among arsenicosis participant. 63.5% participant suffering in this health hazards who already in lower income group. They could not provide proper nutrition and as well as regular medical treatment. Study also shows the men within the age group of 40-60 years are the worst affected by this problem. Gender disparity is also a major problem to find out the female participants who were affected with arsenic. Low income and shyness of women participant can create health disparity in a society.

More knowledge intensive and more frequent awareness programmes have to organize in the affected areas. Along with this programme free medical checkup camp also helpful to the participants of affected area especially for women respondents. Distribution of arsenic free water also an important need in arsenic affected area.

Acknowledgements

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TABLES AND FIGURES

Table 1: Distribution of hand tube well water samples with arsenic concentration range in four Gram Panchayat and highly contaminated mouzas of Gaighata Block

Gram Panchayet	Mouza (J.L.No)	Number of water samples with arsenic concentration range (mg/l)						
		<0.01	0.01-0.049	0.05-0.099	0.1-0.299	0.3-0.499	0.5-0.699	0.7-0.999
Ichapur I	Gaighata-Angulkata (28)	1	4	4	25	5	2	-
	Amkola (29)	5	5	7	12	17	2	-
Ichapur II	Bara(42)	7	10	14	52	-	5	1
	Gutri(41)	5	1	27	70	9	2	-
Chandpara	Dhakuria(50)	72	10	19	24	2	2	1
Sutia	Gazna (90)	4	2	7	6	8	2	-
	Tegharia (89)	6	1	2	4	-	1	4
	Bishnupur (88)	28	20	20	47	17	2	-

Table 2: Socioeconomic and Demographic profile of the studied participants

Age (years)	Number (%)
< 30	130 (42.7%)
30 - 40	49 (16.1%)
40 -50	66 (21.7%)
50 - 60	41 (13.4%)
≥ 60	18 (5.9 %)
Mean	37.2 (±15.2)
Gender	
Male	156 (51.3%)
Female	148 (48.6%)

Educational status of the participant	
Illiterate	69 (22.6%)
Primary	73 (24%)
Upper Primary	77 (25.3%
Secondary	50 (16.4%)
Higher Secondary (12th standard)	15 (4.9%)
Higher Education (> 12 th standard)	20 (6.5%)
Major occupation of the studied participant	
Agriculture activities	108 (35.5%)
Non agriculture activities (Business, Service etc.)	74 (24.3%)
Others (Housewife, students, unemployed)	122(40.1%)
Economic Status (Income group)	
Low income (Rs.0 - Rs.2000)	209 (68.7%)
Medium income (Rs.2000 - Rs.6000)	78 (25.6%)
High income (> Rs.6000)	17 (5.5%)

Table 3: Socio economic and demographic variables among arsenicosis and non arsenicosis Participants

Characteristics of the participants	Arsenicosis participant(N=85)	Non arsenicosis Participants(N=219)
Age (years)		
< 30	4 (4.7%)	126 (57.5%)
30 - 40	7 (8.2%)	42 (19.1%
40 -50	36 (42.3%)	30 (13.6%)
50 - 60	30 (35.2%)	11 (5%)
≥ 60	8 (9.4%)	10 (4.5%)
Gender		
Male	53 (62.3%)	103 (47%)
Female	32 (37.6%)	116 (52.9%)
Educational status of the participant		
Illiterate	31 (36.4%)	38 (17.3%)
Primary	28 (32.9%)	45 (20.5%)
Upper Primary	12 (14.1%)	65 (29.6%)
Secondary	8 (9.4%)	42 (19.1%)
Higher Secondary (12th standard)	3 (3.5%)	12 (5.4%)
Higher Education (> 12 th standard)	3 (3.5%)	17 (7.7%)
Major occupation of the studied participant		
Agriculture activities	45 (52.9%)	63 (28.7%)
Non agriculture activities (Business, Service etc.)	24 (28.2%)	50 (22.8%)
Others (Housewife, students, unemployed)	16 (18.8%)	106 (48.4%)
Economic Status (Income group)		
Low income (Rs.0 - Rs.2000)	54 (63.5%)	155 (70.7%)
Medium income (Rs.2000 - Rs.6000)	25 (29.4%)	53 (24.2%)
High income (> Rs.6000)	6 (7%)	11 (5%)

Table 4: Presentation of gender disparity among arsenicosis participants in respect of taking Medical help

Economic Status of Arsenicosis	Number of arsenicosis participants taking medical treatment		
Income category	Male (n=53)	Female (n=32)	Total (N=85)
low income(≤Rs. 2000/-)	18 (33.9%)	7 (21.8%)	25 (29.4%)
Medium Income (Rs.2000/- - Rs.6000/-)	21(39.6%)	0	21 (24.7%)
High Income (≥ Rs.6000/-)	5 (9.4%)	0	5 (5.9%)
Total	44(83%)	7 (21.8%)	51(60%)

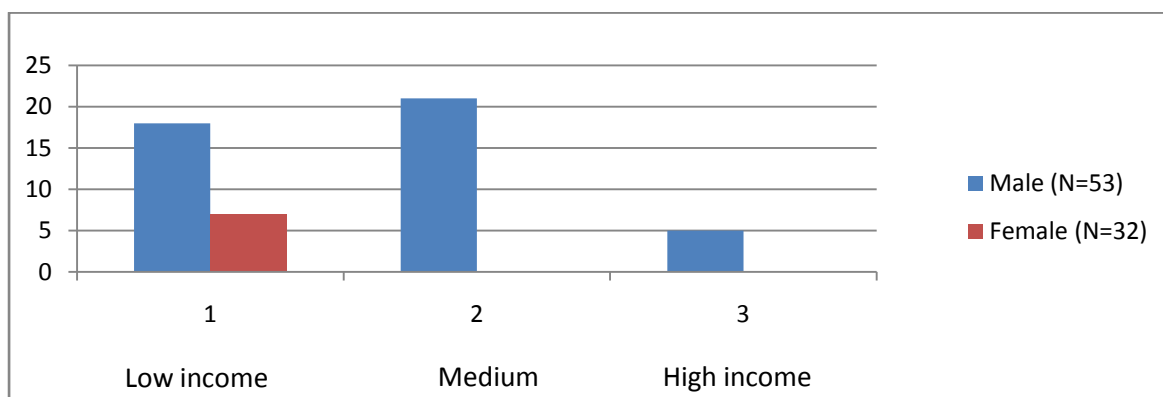**Figure 1: Distribution of Taking medical treatment among arsenic affected participants**

Figure2: Gender disparity in Medical Treatment Behaviour