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Ground Water Arsenic Contamination-A Study of Major Arsenic Affected Districts of West Bengal

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Abstract: ***Arsenic contamination in ground water and its effect on human health is a serious matter of concerns in many countries of the World. The problem is reported since 1978 in West Bengal. People take this arsenic contaminated ground water by different ways e.g. purpose of drinking and also through food chain. There are many types of diseases are caused by drinking of arsenic contaminated water, which are Melanesia, Keratosis, Hyperkeratosis and skin cancer. The problem is found very highly in 9 districts of West Bengal. The paper emphasizes the intensity of arsenic pollution in different blocks of these districts.***

Keywords: Ground water arsenic, human health, purpose of drinking

1. Introduction

Groundwater is the major source of freshwater in many parts of the world for meeting the requirements of domestic and agricultural purposes. Approximately one-third of the worlds population depend on groundwater for drinking purpose (***UNEP 1999***). Beginning of late twentieth century marks the rapid increase of groundwater consumption throughout world ***(Ravenscroft et al., 2009)***. Several parts of the world experiences groundwater contamination due to mixing of different minerals both naturally and due to human activities ***(Onodera et al., 2008)***. Although minerals in groundwater are necessary for human health, but to a certain limit. Above the permissible limit it may create health problem which may range from mild to severe depending on the duration and exposure ***(Kanchan and Roy, 2009, Hung et al., 2004)***.The Arsenic is one of the most important and problematic among these. The occurrence of high concentrations of arsenic (As) in drinking water has been found in several parts of the world. It is well established that ingestion of inorganic As may cause liver, lung, kidney, and bladder cancer ***(Smith et al. 1992)***.

West Bengal lies within the Ganga–Brahmaputra delta basin and is one of the states, which has high contamination of arsenic in groundwater ***(Mukherjee et al. 2008)***.According to the investigation of CGWB occurrence of ground water Arsenic in ground water above 0.05mg/L in some parts of west Bengal is reported since 1978. Based on arsenic concentrations ***School of Environmental Studies, Jadavpur University, Kolkata, India*** have classified West Bengal into three zones: highly affected (9 districts mainly in eastern side of Bhagirathi River), mildly affected (5 districts in northern part) and unaffected (5 districts in western part).

2. Study Area

West Bengal is one of 29 states of India. It is consisted of several Districts, several Blocks, several Gram Panchayat(GP). Arsenic contamination in groundwater is a serious problem in different districts of West Bengal, particularly Malda, Murshidabad, Nadia, North 24- Pargana, South 24- Pargana etc.,The arsenic affected areas in West Bengal form a part of Ganga-Bhagarathi delta comprising succession of quaternary sediments of over thousand meter thickness. The arseniferous tract located mainly within the upper deltaic plain and south eastern part of the delta in the mouth at shallow depth is built of sediments deposited by meandering streams and levees (***Talukdar & Chattopadhyay, 1999***). Most of the arsenic affected areas of West Bengal lie in the alluvial plains formed during the Quarternary period (last 1.6 million years). British Geological Survey (***BGS***) suggested that they might be the primary source of arsenic in the Bengal alluvium.

Aims and Objectives

1) To know the progressive spread of Arsenic in ground water in different districts of west Bengal.
2) To study the intensity of the problem in different districts, different blocks and also different villages in West Bengal.
3) To know the health impact of arsenic contaminated water.
4) To highlight the efforts made by the Government to combat the problem.

Methodology

The information, data have been collected for prepare this paper from secondary sources e.g. various Govt. report, different journals, articles, PHED(Public Health Engineering Dept.) website, SWID(State Water Investigation Directorate) website, Planning commission report etc. After collection of different data here those are analyzed in tabular form and also through some cartographic representations.

3. Results and Discussions

In India Arsenic contamination in ground water was first reported in West Bengal in 1978(Kumar et.al,2009).According to kumar et.al,(2009) ground water in 79 blocks in 8 districts is contaminated by Arsenic and exceeded 50ug/L.

Progressive spread of Arsenic contamination in West Bengal- In early eighties there are few affected villages from North 24 Parganas, South 24 Parganas, Nadia, Murshidabad and Burdwan. According to PHED Report, this problem is expanded rapidly from 78 villages in 1993 to 3235 villages in 2006. The Progressive spread o this problem in a temporal scale is discussed below-

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Table 1: Progressive Spread of Arsenic contamination in West Bengal

Date	*No. of Affected Districts*	*No.of Affected Blocks*	*No.of Villages*	*No.of Affected Municipalities*
MAY,1993	7	34	78	3
SEPT,1995	7	56	388	9
DEC,1997	8	61	1302	9
DEC,1998	8	65	1312	9
DEC,1999	8	67	1550	11
DEC,2001	8	75	2065	11
DEC,2002	8	75	2579	11
MAY,2006	8	79	3235	11

Important Arsenic affected areas in West Bengal-
According to SOES, Jadavpur University, Kolkata(2009) Arsenic affected blocks in West Bengal are 9 and the number of blocks are 111. This map shows the Arsenic affected major areas of west Bengal. The deep red portions show us concentration of Arsenic values above 50ug/L. Those severely affected discrits are Murshidabad, Maldah, Nadia, North and South 24 Parganas, Burdwan, Howrah, Hooghly and Kolkata. The Arsenic values in drinking water of these districts are discussed below-

Table 2: Arsenic Concentration In Different districts of west Bengal

Districts	*Permissible Limit(BSI)*	*Arsenic Concentration in mg/L*
South 24 Parganas	0.05mg/L	0.06-3.20
North 24 Parganas		0.06-1.28
Maldah		0.05-1.434
Nadia		0.05-1.00
Murshidabad		0.05-0.90
Burdwan		0.10-0.50
Howrah		0.09
Hooghly		0.6

Source: Planning Commission of India(2007)

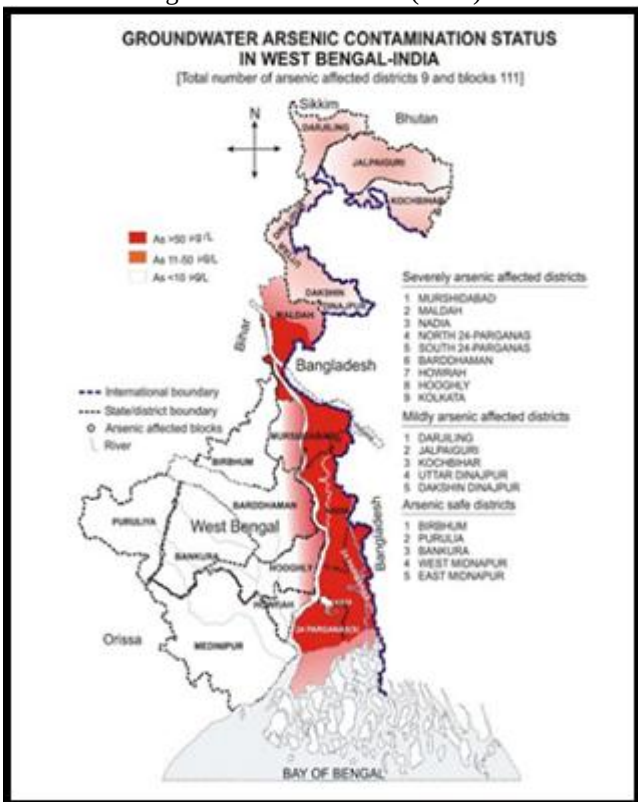


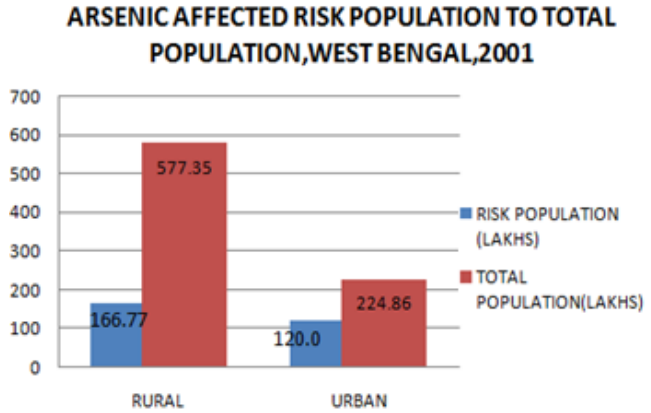
Figure 1: Source- http://www.soesju.org/arsenic/wb.htm

District wise Arsenic affected blocks in West Bengal-

In **Maldah** the Arsenic affected blocks are English Bazar, Manikchak, Kaliachak I, Kaliachak II, Kaliachak III, Ratua I and Ratua II. The name of the blocks of **Murshidabad districts** are Raninagar I, Raninagar II, Domkal, Nawda, Jalangi, Hariharpara, Beldanga I, Suti I, Suti II, bhagwangola I, Bhagwabgola II, Behrampur, Raghunathganj, Murshidabad-Jiaganj, Farakka samserganj, Lalgola and Beldanga II.

Table 3: No. of Arsenic affected blocks in different districts of West Bengal

S. No.	*District*	*Total No. of Blocks*	*No. of Blocks Affected*
1	MALDAH	15	7
2	MURSHIDABAD	26	19
3	NADIA	17	17
4	N.24 PARGANAS	22	19
5	S.24 PARGANAS	29	9
6	BURDWAN	31	5



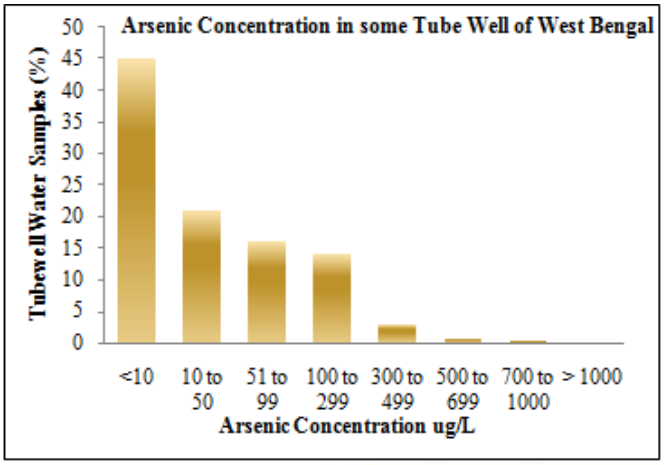
Source- PHED Data, 2001

The Arsenic affected blocks of **Nadia districts** are Karimpur I, karimpur II, Kaliaganj, Nakashipara, Nabadwip, Hanskhali, Krishnaganj, Haringhata, Chakdah, santipur, chapra, Ranaghat I, Ranaghat II, Krishnanagar I and krishnagar II.

In **North 24 Parganas** the affected blocks are Habra I, Habra II, Deganga, Basirhat I, basirhat II,Swarupnagar, sandeshkhali II,Baduria, gaighata, Rajarhat, Amdanga, Bagda, Bongaon,Haroa, Hasnabad, Barrackpore I, Barrackpore II.

Intensity of the problem-
This diagram represents that, the risk population in rural areas is around 166.77 lakhs and the risk population in urban areas is around 120 lakhs. Thus the total risk population of the state is 286.77 lakh out of the total state 2001 population of 802.21 lakhs which is around 37.7%.

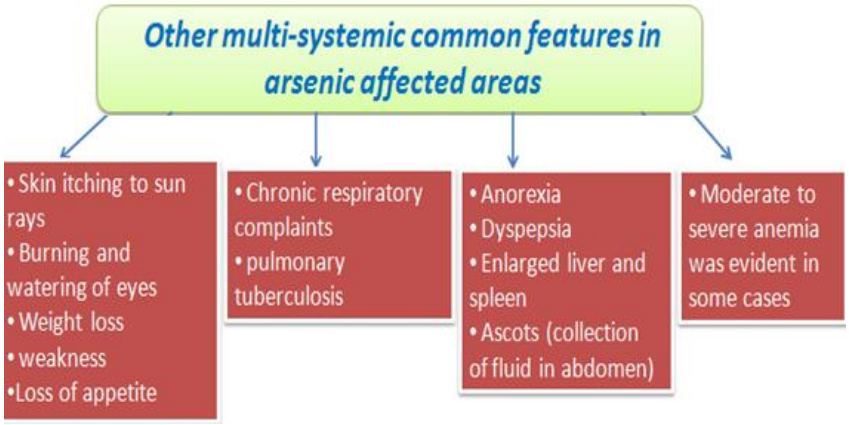
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Source- SOES, Jadavpur University, kolkata

4. Effects of Arsenic on Human Health

West-Bengal is one of the worst arsenic affected areas in the world arsenic scenario. Various types of skin manifestations and other arsenic toxicity were observed from **Melanesia, keratosis, hyperkeratosis, dorsal keratosis, and non pitting edema to gangrene and cancer.**





Source- SOES, Jadavpur University, kolkata

Mitigation measures to combat the problem- To combat the situation Government of India set up Arsenic Task Force and Department of drinking water Supply. The following types of Work have so far been undertaken for arsenic mitigation.

1. New Hand Pump fitted in deeper aquifer,
2. Set up Arsenic Treated Units (ATU),
3. Ring wells at upper aquifer,
4. Piped Water Supply Schemes with pond water as resource,
5. Surface water based Piped Schemes.

Efforts by Government of West Bengal-

1) All the arsenic affected villages to be covered by piped water supply schemes.
2) Attempts to made to cover the affected areas with surface water wherever available.

Some Surface water based piped schemes with river as source in west Bengal are-

a) For Maldah district with river Fulhar and Bhagirathi as source.
b) For South and North 24 Parganas river Hooghly as source.
c) For Murshidabad river Bhagirathi as source.

i) Arsenic Removal Plant (ARP) Fitted directly with Hand Pump: This has been developed by PHED, Govt. of West Bengal. Due to this Plant around 250,000 population in the arsenic affected districts viz., Murshidabad , South 24 parganas, Malda are benefitted.

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ii) Arsenic Removal Plant for piped water supply scheme: There are three such plants constructed by the Government of West Bengal out of State Action Plan as on 31st March 2002 at Sujapur, Kaliachak block of Malda district, Dhaititha, Basirhat block of North 24 pargana district.

5. Conclusion

Keeping in view, the rapid expansion of arsenic in ground water in different districts viz. Murshidabad, Maldah, Nadia, North and South 24 Parganas, Burdwan the rural residents are in alarming position. The impact of arsenic on human health is slow but dangerous; therefore it is called as slow poison. The present study reveals that there is some immediate requirement of some programmes, schemes in rural areas of deltaic West Bengal at micro level. It can be concluded that it is needed to grow awareness among every people about this slow poisoning effect to achieve a healthy life.

6. Future Scope

Further study can be done on some specific district's block wise scenario of arsenic pollution and its effect on human health as well as on agricultural crops also. There is also a scope for study arsenic in food chain, which is very important for ecosystem.

7. Acknowledgement

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