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Arsenic Contamination in Ground Water at Deoghar (Jharkhand)

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ABSTRACT

Arsenic contamination in ground water is one of the major natural calamities of the world to the mankind. In the present study, altogether 20 water samples from 20 different tube wells of the house hold of Deoghar town were collected and analyzed on the spot with the help of arsenic test kit (color comparison method, [semi quantitative]). Final confirmation was made using atomic absorption spectrophotometer. The lowest average value 0.444 ppm was recorded in the south part and the highest average value 1.2 pm was recorded in the north part of the Deoghar town.

Highlights

- The underground water of Deoghar(Jharkhand) contains arsenic level beyond permissible limit of WHO.
- It may lead hazardous diseases to the people.

Keywords*:* Arsenic contamination, Ground water, anthropogenic activity, acute toxicity, Hazardous disease

Arsenic contamination in drinking water is one of the vital natural calamities of the world to the human beings, reported in several countries such as Argentina, Bangladesh, Chile, China, India, Mexico and USA.. The chief source of its introduction into soil and ground water is the dissolution of rocky minerals and ores followed by subsequent leaching as well as runoff and can also be introduced into soil and ground water from anthropogenic activities. Arsenic, an extremely toxic in its inorganic form, is omnipresence element found in various compounds throughout the earth's crust. In Bangladesh large number of tube wells have been reported contaminated with arsenic beyond the permissible limit of world Health Organization (WHO)(Rahman *et al.* 1998, 1999; Ahmad *et al.* 1997, 1999; Dhar *et al.* 1997; Bishwas *et al.* 1998; Tondel *et al.* 1999; Rahman and Axelson, 2001; Choudhary *et al.* 2000). In India, for the first time ground water contamination of arsenic was observed in the West Bengal in 1980s by Haque *et al.* (2003) and Acharyya *et al.* (1999). Recently the problems have also been found in Bihar and Uttar Pradesh. Ghosh *et al.* (2007, 2009), Saha *et al.* (2009) and Singh *et al.* (2014) reported arsenic poisoning in ground water in 16 district of Bihar. A detailed study in the Sahibganj district of Jharkhand state in the middle Ganga plain was carried out to determine the severity of groundwater arsenic contamination and related adverse health hazards due to chronic arsenic exposure (Bishwajit Nayak *et al.* 2008).

Keeping in view the scarce and meagre research activities on groundwater arsenic contamination ,hazardous to human beings of Deoghar town where lakhs of pilgrims come to offer their Ganga jal to Dwadash Jyotirling specially during shrawan month, the present investigation has been undertaken to assess the condition of ground water extracted through tube wells and used for drinking purposes by inhabitants of this area.

Map 1: Jharkhand state

Map 2: Deoghar municipal area

Study Area

Deoghar is one of the 24th district of Jharkhand state. It is situated in between 24° 03′ and 24° 3′ north latitude and between 86° 26′ and 87° 04′ east longitude. It lies above 247 meter from sea level and extends over 119.70 sq. km hectare area. Deoghar is a municipal corporation constituting 36 wards. Total population of the corporation area is 203123 (2011 census).

MATERIALS AND METHODS

Firstly the Deoghar town was divided into four parts i.e. East, West, North and South. In each part of the town five spots (tube wells) were selected for sampling and for analysis of underground water. The water samples were collected in 500 ml. volume of polypropylene bottles which were cleaned and pretreated with HCl. Altogether 20 water samples were collected from 20 different tube wells of the town. Collected water samples were analyzed on the spot utilizing arsenic test kit (color comparison method, semi quantitative). Final confirmation was made using atomic absorption spectrophotometer.

RESULTS AND DISCUSSION

In the present study, arsenic contamination in underground water of Deoghar was studied .The above findings indicate that the underground water of the East part of the town, the arsenic level was recorded from 0.09 ppm to 1.02 ppm with an average of 1.004 ppm and in the West part the water contains 1.00 ppm to 1.03 ppm arsenic with 1.012 ppm average. In the North part the underground water bears 1.00 ppm to 1.05 ppm of arsenic with an average of 1.2 ppm whereas the in the South part of the town arsenic level was recorded from 0.05 to 1.01 ppm with an average of 0.444 ppm. Similar findings of arsenic level were recorded by A. Kumar and R.Kumar in the year 2016 while they were studying ground water contamination of arsenic in Buxar district of Bihar. Further Ghosh *et al.* (2009) and Singh *et al.* 2014 recorded similar

Table 1: Table Showing Arsenic Contimination in Ground Water at Deoghar

(A) East Part		(B) West Part		(C) North Part		(D) South Part	
Location	**Conc. (ppm)**	**Location**	**Conc. (ppm)**	**Location**	**Conc.(ppm)**	**Location**	**Conc. (ppm)**
Baijnathpur	1.02	Belabagan	1.03	Jaruadih	1.05	Castairs Town	1.00
Karnibad	1.00	Indiranagar	1.01	Anand nagar	1.00	Bompas Town	1.01
Bandha	1.01	Civil Line	1.00	Rangamore	1.00	Baban bigha	0.05
Jhousaghari	0.09	Singhwa	1.02	Pokhnatila	1.03	Satar	0.07
Jagriti nagar	1.00	Barmasia	1.00	Salona	1.02	Kalyan pur	0.09
Average	**1.004**	**Average**	**1.012**	**Average**	**1.02**	**Average**	**0.444**

level of arsenic in ground water. Smith *et al.* (2003), Ahmad *et al.* (2004) reported 50% of the hand pump water having arsenic level greater than 200 ppb in West Bengal and Bangladesh respectively.

Long term exposure of inorganic arsenic beyond permissible limit through drinking water and food may lead so many hazardous diseases to the mankind.

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SUGGESTION

As the arsenic is hazardous to human health and at certain locations at Deoghar its concentration is alarming and beyond the permissible limit of WHO. It is suggested that extensive investigation on arsenic contamination in groundwater at Deoghar is required.

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