

Full Length Research Paper

Study on Heavy Metal Pollution with Special Reference to Arsenic: A Case Study From Lingusugur Taluk , Raichur District, Karnataka, India

Shwetha B and Puttaiah E.T

Department of Environmental Science, Kuvempu University, Shankarghatta, Shimoga, Karnataka, India.

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Corresponding Author:

Shwetha B

Department of
Environmental Science,
Kuvempu University,
Shankarghatta, Shimoga,
Karnataka, India.

Abstract

The present study shows the ground water quality database of rural area, According to WHO (2012) the range above 0.01 mg/l of arsenic in drinking water considered to be unfit for potable and hazard to human health. This paper provides a comprehensive review on the data on arsenic contamination and its sources. A result of arsenic analysis from Domestic tube well reveals that immediate attention has to be taken. The ground water collected and analyzed and it's observed that as concentration increased from season to season .Aiming at improving the quality of ground water and removal of Arsenic using technological methods which are user friendly and cost effective. It is concluded that the domestic water of some tube well completely unsafe for drinking.

Keywords: Raichur, Arsenic, Hazards, Ground water

Introduction

The sum of particulate arsenic and soluble arsenic gives the total arsenic. Arsenic mostly present in water as Arsenate, with an oxidation state of 5, if the water is oxygenated. Natural sources of arsenic are related to various types of rocks and to geothermal activity. Industrial activities, especially mining, can also contribute to an increased arsenic concentration in groundwater. The concentrations of Arsenic vary markedly in the environment, partly in relation to natural conditions and partly as a result of human activity (Plant et al, 2004). Arsenic associated chemicals usually used commercially and industrially as alloying agents in the manufacture of transistors, lasers and semiconductors, as well as in the processing of glass, pigments, textiles, paper, metal adhesives, wood preservatives and ammunition.

Arsenic in drinking water nowadays becomes a global issue. Exposure towards arsenic results in acute poisoning. In India Bangladesh is facing the dangerous health issue because of Arsenic in drinking water. The WHO guideline value for arsenic in drinking water was reduced from 50 µg/l to a provisional value of 10 µg/l in 1993 (WHO, 1993; WHO 2004). The WHO guideline value for arsenic in drinking water was reduced from 50 µg/l to a provisional value of 10 µg/l in 1993. Most western countries adopted this limit in their current drinking water standards (Yamamura, 2003). However, many affected countries still operate 50 µg/l standard due to lack of adequate testing facilities.

Detailed description of common methods for removing arsenic from drinking water is given by Petrusovski et al. (2007). These methods are based on the following processes:

- *Precipitation processes*, including coagulation/filtration, direct filtration, coagulation assisted microfiltration, enhanced coagulation, lime softening, and enhanced lime softening
- *Adsorptive processes*, including adsorption onto activated alumina, activated carbon and iron/manganese oxide based or coated filter media
- *Ion exchange processes*, specifically anion exchange
- *Membrane processes*, including nano-filtration, reverse osmosis and electro dialysis.

Materials and Methods*Study Area*

Raichur is located in the northern maiden region of Karnataka which is drought prone and falls in the arid tract (CGWB 2012) .It has five major taluk. Lingasugur is one of them. Total Area of Lingasugur taluk is 1948 sq km and having population of 34,932 according

to 2011 census. A total of 108 tube wells were observed out of which only 48 tube wells are in working condition. The annual rainfall of Lingasugur taluk is 450 mm in 2015 year. The source of Arsenic is mainly 46% of Arsenopyrite is determined in the study area .

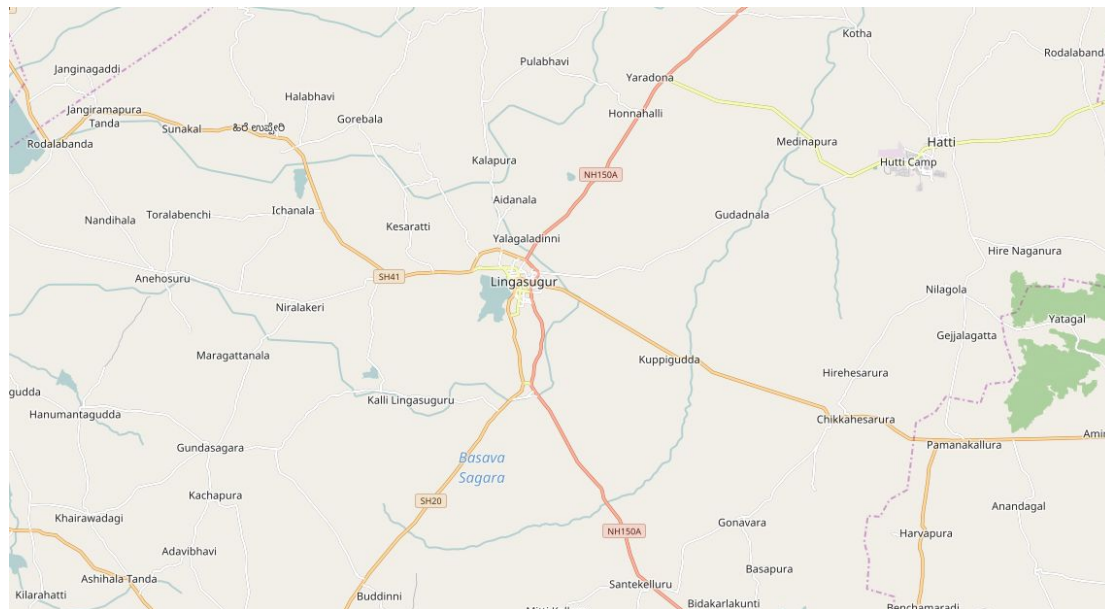


Fig 1: Map showing study area of Lingasugur taluk

Sampling Technique

The water samples from the tube wells were collected at an intervals of 3 months and analyzed for Arsenic by using ICPQMS Arsenic analyzed in the laboratory as per the APHA 2009 standards preservation of ground water samples aims to avoid the contamination, Biodegradation reactions and other physico-chemical reaction in order to avoid that the preservation plastic polyethylene or polypropylene bottles.

A random sampling was used to select sampling points. 48 samples were collected from all over the villages in lingasugur taluk. Samples were protected from direct sunlight during transportation to the laboratory. pH was measured immediately after the collection of the samples.

Results and Discussion

The experimental results are presented in table no 1. Descriptive statistics has been summarized with standard deviation and range is given in Table no 1. In sampling studies pH are within the WHO guidelines.

Table 1: Levels of Arsenic in Ground water at different villages of Lingsur taluk.

Villages	Arsenic (mg/l) 2015 Pre-Monsoon	Arsenic (mg/l) 2015 Monsoon	Arsenic (mg/l) 2015 Post-Monsoon
Aidbhavi	0.03	0.03	0.04
Gowdur	0.1	0.01	0.2
Machnur	0.06	0.06	0.09
Rowdalbanda	0.04	0.04	0.05
Tawag	0.03	0.04	0.05
Hirenagnur	0.19	0.2	0.25
Hutti	0.65	0.66	0.72
Erapur	0.52	0.53	0.6
Gejjalghatta	0.01	0.01	0.02
Ankaskoddi	0.03	0.07	0.08
Venkatapur	0.03	0.03	0.07
Maski	0.03	0.03	0.04
Antargangi	0.05	0.06	0.68
Mudgal	0.03	0.03	0.09
Niralkere	0.02	0.02	0.03
Upperi	0.05	0.05	0.08
Chitapur	0.04	0.04	0.08

Sajjalgud	0.04		0.04		0.05
Kamaldinni	0.04		0.04		0.05
Tallekhan	0.01		0.01		0.01
Chattar	0.03		0.03		0.03
Hadagali	0.06		0.06		0.08
Balihali	0.07		0.07		0.08
Adapur	0.06		0.06		0.07
Timmapur	0.03		0.03		0.05
Muduldinni	0.05		0.05		0.06
Santikallur	0.05		0.06		0.07
Mattur	0.05		0.05		0.06
Surjapur	0.04		0.04		0.06
Gudihal	0.04		0.04		0.05
Hunkunti	0.06		0.06		0.07
Lingasugur	0.04		0.04		0.06
Mavinbhavi	0.05		0.05		0.07
Ranpur	0.04		0.04		0.06
Idanhal	0.09		0.09		0.12
Kalapur	0.03		0.03		0.05
Guntagola	0.05		0.05		0.06
Nanchanhal	0.06		0.06		0.07
Jaldurg	0.43		0.04		0.06
Toralbenchi	0.30		0.49		0.52
Mallapur	0.03		0.03		0.38
Nagarhal	0.02		0.02		0.04
Tondihal	0.3		0.32		0.42
Bandisunkapur	0.08		0.08		0.02
Kachapur	0.34		0.34		0.39
Kilarhatti	0.03		0.03		0.52
Sunkal	0.05		0.05		0.07
Kesrahatti	0.67		0.7		0.73
Mean	0.11		0.104		0.158
SD	0.167		0.164		0.203
Minimum	0		0.01		0.01
Maximum	0.67		0.7		0.73

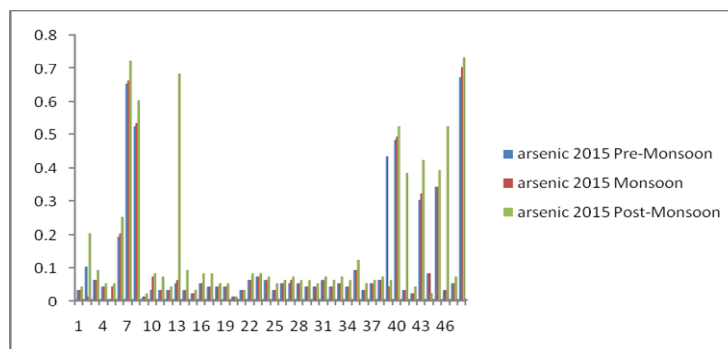


Fig 2: Variations of Arsenic levels at Lingusur taluk

According to WHO/BIS guidelines value for arsenic in drinking water is 0.1mg/l, comparing the results the groundwater content of arsenic within the recommended maximum values for drinking purposes. About 80% of groundwater samples in Lingasugur taluk contain arsenic at an elevated level. Observations imply non-uniform distribution of arsenic in groundwater in the study area.

Conclusion

The present study reveals that the magnitude of the arsenic contamination in groundwater in the lingasugur taluk is bit severe in several villages. The study also found that more than 80% of the water samples had arsenic level more than 0.01mg/l. Keeping in

mind that to improve the quality of groundwater, arsenic removal techniques has to be used to avoid further damage to groundwater table and also to the health of people in respective villages.

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