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Full Length Research Paper

Evaluation of Certain Physical parameters of Ground water in Lingasugur Taluk, Raichur District, Karnataka, India

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Abstract
There are a wide range of groundwater problems in India. Firstly overall quantity of groundwater decreases yearly because of over exploitation and secondly, there is degradation in water quality. This work focuses on a study to assess the extent of arsenic contamination in the study area by testing tube well water by Lab methods which is being carried out at Lingasugur taluk, Raichur District.The majority of the villages surveyed were in the Hutti-Maski schist belt (Schist is metamorphic rock having laminated, flakyparallel layers of micaceous minerals) contain arsenic-rich minerals like Arsenopyrite (Arsenopyrite – 46% arsenic). Hutti Gold Mines in this region seems to be the probable source of contamination. The arsenic groundwater contamination is attributed to the Geogenic origin and the source of arsenic in localized patches is due to the presence of Arsenopyrite. Due to the Mining activity million tons of arsenic tailings is being dumped in open area leading to contamination of groundwater, Arsenic cyanide is used to extract the gold mineral by crushing the tons of ores rock, the final residues are dumped in engineered. Here use of Cyanide (CN) which is characterized by volatility, toxicity and high odor in gold mining. The present study investigates the possible dispersion of arsenic into ground water resources by a gold mine located around Hutti gold mines. Arsenic groundwater contamination has far reaching consequences including its ingestion through food chain which are in the form of social disorders, health hazards and socio-economic dissolution besides its sprawling with movement and exploitation of ground water.

The result of study in brief to study the physical parameters of groundwater and to assess its quality, groundwater samples from tube wells have to be collected monthly from the study area and subject to analysis.

Keywords: *Arsenopyrite, Cyanide,Hutti gold Mines.*

Introduction

Over the past two or three decades, occurrence of high concentrations of arsenic in drinking-water has been recognized as a major public-health concern in several parts of the world. It is widely distributed throughout Earth's crust, most often as arsenic sulfide or as metal arsenates and arsenides. In water, it is most likely to be present as arsenate, with an oxidation state of 5, if the water is oxygenated. Arsenic is introduced into water through the dissolution of rocks, minerals and ores, from industrial effluents, including mining wastes, and via atmospheric deposition (IPCS, 1981; Nadakavukaren et al., 1984; Hindmarsh & McCurdy, 1986). In well oxygenated surface waters, arsenic(V) is generally the most common arsenic species present (Irgolic, 1982; Cui & Liu, 1988); under reducing conditions, such as those often found in deep lake sediments or groundwater, the predominant form is arsenic(III) (Lemmo et al., 1983; Welch et al., 1988). An increase in pH may increase the concentration of dissolved arsenic in water (Slooff et al., 1990).

Utilization of groundwater as a source for domestic, municipal, agricultural and industrial activities continue to increase principally because of the heavy capital outlay and maintenance of surface water development through Dams especially in developing countries (Sangodoyin and Agbawhe, 1992). Another factor which is responsible for the attention being diverted to this source is improved technology manifest by deep boring in form of borehole which satisfies WHO drinking water quality standard (Osot, 2000). Groundwater is abstracted through hand-dug wells; hand-pump operated shallow-wells and submersible pump operated deep well or boreholes (Ojo, 2002). Groundwater is often high in mineral content such as magnesium and calcium salts, iron and manganese depending on the chemical composition of the stratum through which the rock flows.

The chemical, physical and bacterial characteristics of groundwater determine its usefulness for various purposes. Chemical analysis of groundwater includes the determination of the concentrations of inorganic constituent. The analysis also includes measurement of pH and specific electrical conductance. Temperature, color, turbidity, odor and taste are evaluated in a physical analysis

The arsenic-contamination scenario around the world, especially in Asian countries, has changed considerably. Before 2000, there were five major incidents of arsenic contamination in groundwater in Asian countries: Bangladesh, West Bengal, India, and sites in China.

In the present study, physical parameters has been evaluated in ground water samples collected at Lingasugur taluk, Raichur district, in summer season of the year 2014.

Materials and Methods

Study area

Lingsugur is aTaluk in Raichur District of Karnataka State. Lingasugur is located at 16.17°N 76.52°E. It has an average elevation of 499 metres (1637 feet).

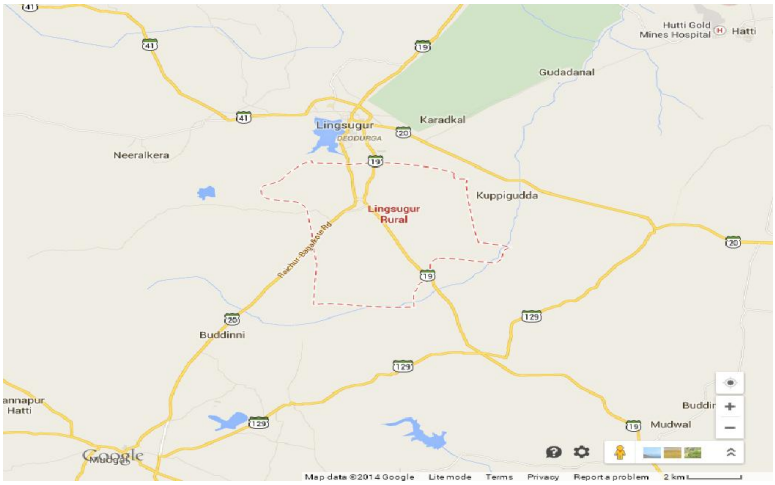

Fig.1. Map of Lingsugur taluk

Sampling and Analysis

In order to study the Arsenic contamination of groundwater and to assess its quality, groundwater samples from tube wells were monthly from the study area. Analysis was carried out for Non-ionic constituents like pH, Electrical Conductivity, Total Dissolved Solids and total hardness will be determined from the study area in Tube Well water at Lingasugur Taluk Non-ionic constituents like pH, Electrical Conductivity, Total Dissolved Solids and total hardness.

Results and Discussion

In general the ground water has no color, no odor and turbidity. In order to study the major ion geochemistry of groundwater and to assess its quality, groundwater samples were collected from the study area and analyzed for various parameters. Forty eight groundwater samples were drawn from the wells which included hand pumps, piped water supplies and miniwater supply schemes and also open wells and analyzed for physicochemical parameters. The below table shows parameters and data obtained in study area.

pH

pH is one of the important factor of ground water. In the study area pH varies from 7.0 to 8.26 samples were within the permissible limit prescribed by Indian standards. The pH of water is this study area is slightly alkaline in nature. It is observed that 70% of samples come under fresh water and 30% of the samples come under brackish water (TDS >1000 mg/l).

Electrical Conductivity (EC)

Conductivity is the measure of capacity of a substance to conduct the electric current. Most of the salts in water are present in their ionic forms and capable of conducting current and conductivity is a good indicator to assess groundwater quality. Electrical conductivity is an indication of the concentration of total dissolved solids and major ions in a given water body. The EC values in majority of samples are higher than permissible limit. High conductance (>1500 µs/cm) was observed for 40% as per WHO (2006) and BIS (ISO 10500:1991) of the groundwater samples and this may be attributed to high salinity in groundwater of the study area.

Table 1. Physico-Chemical analytical data of ground water samples collected at Lingasugur taluk, Raichur District Karnataka

S. No	Area of Sample collected	Temperature ^{0}C	pH	EC (µs/cm)	TDS (ppm)	Salinity (ppm)
1	Aidbhavi	29	7.7	1597	1070	722
2	Gowdur	30.5	7.7	1373	920	617
3	Machnur	30.5	7.57	1152	772	514
4	Rowdalbanda	31.1	8.2	1268	850	616
5	Tawag	30	8.26	2626	1790	1024
6	Hirenagnur	31.2	7.8	4313	2890	987
7	Hutti	30.5	8.3	4328	2900	2480
8	Erapur	29.2	7.9	908	609	409
9	Gejjalghatta	30	7.28	3477	2330	1630
10	Ankasdoddi	29.8	7.6	3910	2620	1850
11	Venkatapur	30.4	7.35	2208	1480	1030
12	Maski	30.8	7.8	3223	2160	1510
13	Antargangi	30.5	7.76	958	642	425
14	Mudgal	29.5	7.72	1313	880	591
15	Niralkere	30.5	7.9	1447	970	560
16	Upperi	30.1	8.1	1356	909	609
17	Chitapur	29.4	7.97	1373	920	590
18	Sajjalgud	29.8	7.98	2835	1900	1320
19	Kamaldinni	30.1	8.2	1641	1100	960
20	Tallekhan	29.7	7.69	1432	960	560
21	Chattar	29.8	7.97	1537	1030	769
22	Hadagali	30.1	7.89	1432	960	560
23	Balihal	29.5	7.98	955	640	420
24	Adapur	30.2	8.1	1447	970	540
25	Timmapur	29.8	7.59	835	560	380
26	Mududinni	30.1	8.3	1537	1030	960
27	Santikallur	29.8	7.97	1328	890	760
28	Mattur	30.4	8.0	1432	960	660
29	Surjapur	29.98	7.67	1134	760	430
30	Gudihal	29.87	8.2	1328	890	780
31	Hunkunti	29.6	7.9	1373	920	590
32	Lingasugur	30.5	8.4	1522	1020	690
33	Mavinbhavi	30.4	7.35	2208	1480	1030
34	Ranpur	30.8	7.8	3223	2160	1510
35	Idanhal	30.5	7.76	958	642	425
36	Kalapur	29.5	7.72	1313	880	591
37	Guntagola	30.5	7.9	1447	970	560
38	Nanchanhal	30.1	8.1	1356	909	609
39	Jaldurg	29.4	7.97	1373	920	590
40	Toralbenchi	29.8	7.98	2835	1900	1320
41	Mallapur	30.2	8.1	1447	970	540
42	Nagarhal	29.8	7.59	835	560	380
43	Tondihal	30.1	8.3	1537	1030	960
44	Bandisunkapur	29.8	7.97	1328	890	760
45	Kachapur	30.4	8.0	1432	960	660
46	Kilarhatti	29.98	7.67	1134	760	430
47	Sunkal	30.2	8.1	1447	970	540
48	Kesrahatti	29.8	7.59	835	560	380

Total dissolved solids (TDS)

The total dissolved solids (TDS) are the concentrations of all dissolved minerals in water indicate the general nature of salinity of water. The total dissolved solids in all the study area varies from 609 ppm to 2900 ppm .Total hardness of groundwater of the study area exceeded the desirable limits (>500mg/l) according to WHO (2006) and BIS (ISO 10500:1991), this hardness of water is due to the presence of alkaline earths such as calcium and magnesium.

Salinity

High conductance (>1500 µs/cm) was observed in collected samples as per WHO (2006) and BIS (ISO 10500:1991) of the groundwater samples and this may be attributed to high salinity in groundwater of the study.

Conclusion

The Study area in Lingsugur is a Taluk in Raichur District of Karnataka State .Lingasugur is located at 16.17°N 76.52°E forms a part of the Peninsular Shield of India. Groundwater samples collected from Residential and Agricultural of this region have been analyzed for various physical parameters to assess its quality for drinking purposes. From the study it can be concluded that the ground water quality has been degraded over the years due to the extensive use of groundwater for Domestic Purposes. While in some region of the study area, ground water samples showed variation in EC and TDS. This reports contamination is due to over exploitation Ground water.High conductance (>1500 µs/cm) was observed as per BIS (ISO 10500:1991) of the groundwater samples and this may be attributed to high salinity in groundwater of the study area. Excess salinity reduces the osmotic activity of plants and thus interferes with the absorption of water and nutrients from the soil.

Ethics

All the authors read and approved the manuscript and no ethical issues involved.

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