Research Paper Environmental Science

Drinking Water Quality Issues in Chhaygaon and Chamaria Area, Kamrup District (Rural), Assam, India

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ABSTRACT

In the present study, fourteen physico-chemical parameters of the drinking water has been analyzed which is collected from dug wells and tube wells of Chhaygaon and Chamaria Area, Kamrup District (Rural), Assam, India. Phosphate, iron and fluoride were found more than permitted limits. It is found that some water sources of dug wells and tube wells are not very safe for drinking purposes which may affect a large number of people inhabiting in the area.

KEYWORDS Drinking, Water quality, Chhaygaon, Chamaria

Introduction

Water is regarded as one of the most important, precious and indispensable natural resources on earth, covering approximately three-fourths of the surface of the earth. Water is our life. A man can survive for 20 days without food but cannot survive even for 20 hours without water. The earth has a reserve of 75% water of which 97% is of saline nature and only 3% is fresh water. Of the 3%, a little over 2% is tied up in ice caps and glaciers and along with atmospheric and soil moisture, is inaccessible and only 0.003% is readily available to us in the form of groundwater and surface water.

Water is an essential element of human living but it is useful only when it is unpolluted. Polluted water means water which contains foreign substances in it, which alters physical, biological or chemical properties of water. Water is colourless, odourless and transparent substance. But when it is polluted or contaminated, it loses its qualities and becomes unfit for use. Polluted or contaminated water have been found to be injurious to public health for the purpose of domestic, commercial, industrial, agricultural or other legitimate uses or to health of animals and aquatic life. Generally, ground water is mostly chemically and microbiologically nonpolluted and thus safe for drinking and cooking in addition to agriculture or industrial uses. But in recent years there were enormous amount of reports of ground water contamination of arsenic, fluoride or nitrate. There are various ways as ground water is contaminated such as use of fertilizer in farming, seepage from effluent bearing water body. Once the ground water is contaminated, its quality cannot be restored by stopping the pollutants from the source. This contamination causes serious health hazards in long run. To make it fit for use, removal of pollutants is essential. The need of monitor drinking water quality is universally recognized is a necessary safeguard against a large number of health hazard.

North East India is relatively rich in fresh water resource. Average annual surface water potential of 585.6 Km^3 has been assessed in this region, which is highest among all the river systems in India and fifth in the world. Assam has the highest groundwater potential among the northeastern states, but only 12.83 percent of groundwater is currently utilized. The presence of high iron, fluoride and arsenic content has been reported in some parts of Assam. The present study is carried out to determine drinking water quality in the Chhaygaon and Chamaria area, Kamrup District (Rural), Assam. The Chhaygaon and Chamaria area under the Guwahati sub-division is located in the Southern part of Kamrup (Rural) district of Assam. It was found that the water in these areas is more or less free from any harmful effects. Phosphate, iron and fluoride were found more than the permitted limits. Most of the rural people of the study area may suffer from health problems on account of contaminated drinking water.

Methodology

The main ground water sources for drinking purpose in the study area are dug well and tube well. A few numbers of people also uses piped water and spring/river water as drinking water. To have a better understanding of the scenario about the water sources used by the people inhabiting in these areas, a field survey of a total number of 294 households which constitute 10% of total households of 16 villages including the below mentioned sampling villages of Chhaygaon and Chamaria area was also carried out. By viewing the wide use of water by people in the sampled villages, the types of water source were taken into consideration to determine the water quality.

For determining the physico-chemical parameters of study area, a total of eleven i.e. seven sampling villages from Chhaygaon and four sampling villages from Chamaria were chosen. These sampling villages are Takara Dia, Bhathi Para, Kahibama, Burahara, Andheri, Barbakara, Kakarabari, Chamaria Satra, Trilochan, Puthi Mari and Sutir Par shown in Table 1.

Drinking water samples were collected from dug wells and tube wells of different sampling locations of the area during investigations carried out in the year 2013-2014. Separate water samples were selected by random selection and compiled together in polyethylene jars to set a representative sample. P^H, temperature and conductivity were determined quickly after sampling. DO were determined within a short period from collection. The physical parameters studied are pH, temperature and conductivity. The chemical parameters studied are alkalinity, total dissolved solid (TDS), DO, total hardness (TH), calcium, magnesium, chloride, sulphate, phosphate, iron and fluoride.

Table 1: Water sampling location

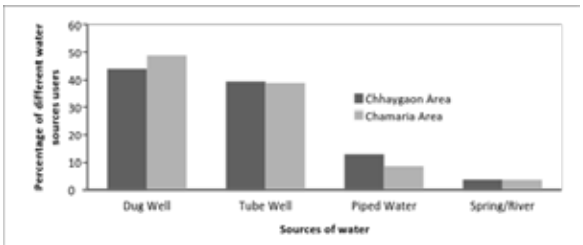
Sample No.	Source	Sampling Villages
I	Tube Well	Takara Dia, Chhaygaon
II	Tube Well	Bhathi Para,Chhaygaon
III	Tube Well	Kahibama, Chhaygaon
IV	Dug Well	Burahara, Chhaygaon
V	Dug Well	Andheri,Chhaygaon
VI	Dug Well	Barbakara, Chhaygaon
VII	Dug Well	Kakarabari, Chhaygaon
VIII	Tube Well	Chamaria Satra,Chamaria
IX	Tube Well	Trilochan,Chamaria

X	Dug Well	Puthi Mari,Chamaria
XI	Dug Well	Sutir Par, Chamaria

Results and Discussion

The percentages of households using dug wells are highest in the area. Tube wells are also one of the main sources of drinking water in the study area. Piped water and Spring/river water is used by a small portion of people. Figure 1 gives a transparent picture about the percentage of households using different sources of drinking water in the study area.

Fig 1: Percentage of different water source users in the Chhaygaon and Chamaria Area



The average results of the physico-chemical parameters for water samples are presented in Table 2

Table 2: Results of physico-chemical analysis of drinking water samples of the study area

Sample No.	P^H	Temp. ^0C	EC mS/cm	Alkalinity mg/L	TDS mg/L	DO mg/L	TH mg/L	Ca Hardness mg/L	Mg Hardness mg/L	Cl mg/L	SO^4 mg/L	PO^4 mg/L	Fe mg/L	F mg/L
I	6.23	25	2.58	90	42	6.51	73	42	31	22.34	4.53	0.55	0.46	2.45
II	7.31	27	3.1	95	46	6.17	107	68	39	15.2	4.92	0.61	0.57	2.21
III	6.55	27	2.1	65	46	6.84	58	43	15	23.1	4.71	0.59	0.56	2.31
IV	6.27	32	3.3	91	106	6.61	39.1	29.7	9.4	44.51	18.42	0.83	0.49	2.38
V	7.61	31	3.2	86	102	7.34	45.20	27	18.20	38.52	18.80	0.74	0.43	2.14
VI	6.82	32	3.3	82	118	6.43	49.6	35.1	14.5	36.51	16.23	0.84	0.42	2.22
VII	6.56	31	3.6	94	92	5.94	80.15	38.06	42.09	42.48	16.23	0.83	0.42	2.21
VIII	7.21	28	2.9	86	48	6.28	56.36	33.6	22.76	42.3	3.98	0.69	1.26	2.36
IX	6.53	27	2.5	90	50	5.34	80.2	53	27.2	29.36	12.36	0.43	1.04	1.67
X	6.80	29	3.1	96	110	7.26	62.25	49	13.25	38.6	8.69	0.64	0.62	1.58
XI	7.02	31	3.5	92	98	8.21	54.92	29.41	25.51	25.1	10.52	0.83	0.48	2.29

No detailed description of the analysis of water quality of the sources has been described here.The results of the water quality analysis of the study area can be summarized as follows -

pH is a numerical expression that indicates the degree to which a water is acidic or alkaline and is an operational parameter. An acceptable range for drinking water pH is from 6.5-8.5 (WHO, 2005). In the present study, the pH values of most of the samples are found within the prescribed limit except in sample I and IV (pH-6.23 and 6.27). The DO content of the water samples are sufficient to sustain life which varies from 5.34-8.21 mg/L. A limit of 250 mg/L chloride has been recommended for drinking water supplies (BIS, 1983; WHO, 1984). The chloride content of the water found much lower than the desirable limit in the study area. Total dissolved solids indicate the general nature of water quality and salinity. 500 mg/L of TDS is considered as desirable limit and 1500 mg/L of TDS as the maximum permissible limit of drinking water as suggested WHO (1971). TDS value varies from 42-110 mg/L in the study area which is less than 500 mg/L in all sites. The iron content of the water found higher than the tolerable limit. The iron content of the study area varies from 0.42 to 1.26 mg/L; it exceeds the desirable limit which is 0.3mg/L (BIS, 1983). The phosphate contents are also found large in all of the sampling points. The maximum permissible limit of drinking water is 0.1 mg/L as suggested BIS (1983). The value varies from 0.43 to 0.84 mg/L in the study area. The calcium and magnesium along with their carbonates, sulphates and chlorides make the water hard both temporarily and permanently. Total hardness contents found less the limit i.e. 39.1 to 107mg/L) in all sources than permissible limit (300mg/L) (BIS (1983). The fluoride concentration are found more than permissible limit (>1.5 mg/L) which may cause mottling of teeth, skeletal fluorosis (bone disorder) in the human body. The sulphate content is lower in study area than the desirable limit which is 150mg/L (BIS (1983).

Conclusion

From the above discussion it can be concluded that some of the water sources of the study area are not very safe for drinking purposes. The study on drinking water of Chaygaon and Chamaria area is an attempt to provide an idea of the water quality of the area for future use. The values generated through the study may help in selecting proper treatment to minimize the groundwater pollution to some extent. Physical as well as chemical and bacteriological contamination of water may affect a large number of people. People of the area should take proper care to treat drinking water before using. Water should be filtered and boiled before drinking specially for infants and old people.

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