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Physico-Chemical Analysis of Underground Water from Silchar Municipal Area of Cachar district, Assam, India.

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ABSTRACT
Water samples were collected from different sources of Silchar Municipal area of Cachar district, Assam, India. Physicochemical parameter such as P^H, EC, Hardness, Chloride, Fluorides, Iron, TDS of sixteen water samples from different sampling sites of Silchar were determined. The experimental results were compared with drinking water quality standards laid down by Indian Council of Medical Research (ICMR) and World Health Organization (WHO) and it was found that only a few water samples are not suitable for drinking and other domestic purposes due to high concentration of iron. Overall all the ground water is clear, odourless and soft. Even few samples contain fluoride ion but the values are much below the permissible limits.

Key Words: Drinking water, ICMR, Physicochemical parameters, Water quality, WHO.

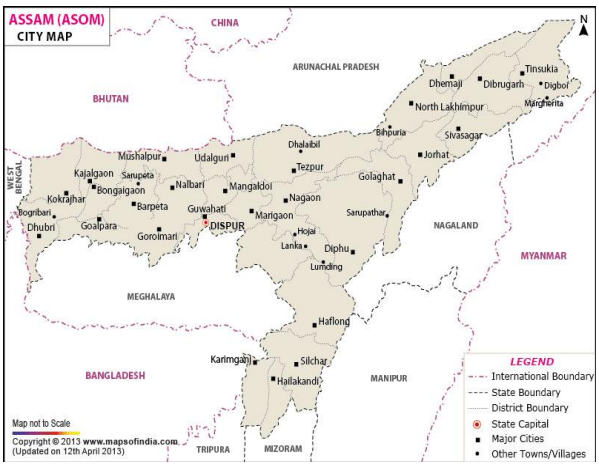
I. INTRODUCTION

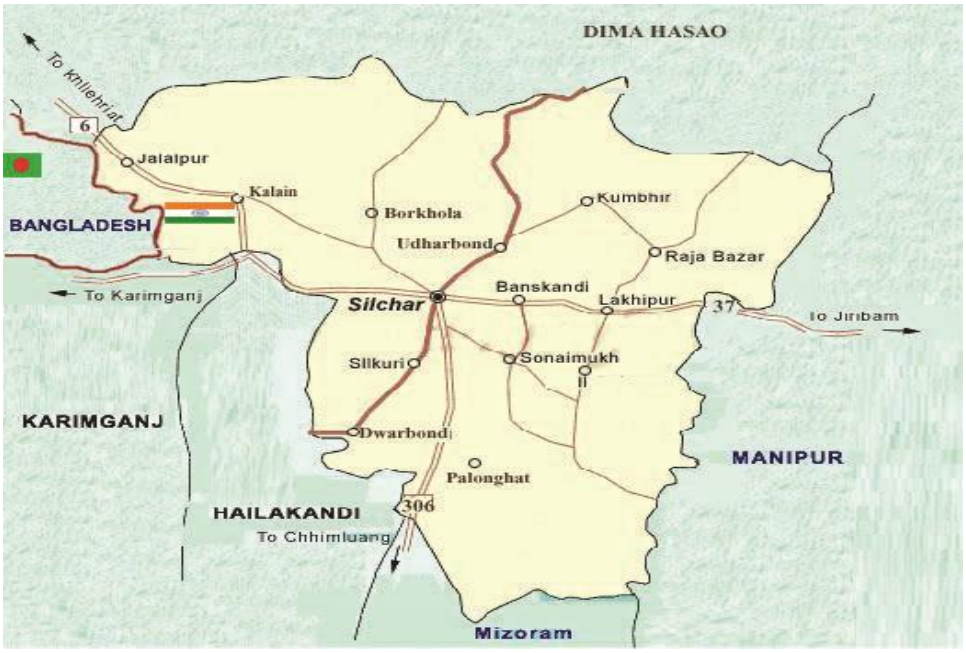
Water is one of the basic needs of life and essential for survival. Fresh water is one of the most important aspect for the survival of all the living beings. It is even more important for the human being as they depend upon it for food production, industrial and waste disposal [1]. The quality of water is of vital concern for the mankind since it is directly linked with human welfare [2]. In India, several states where more than 90% populations are dependent on groundwater for drinking and other purpose [3]. According to WHO, about 80% of all the diseases in human beings are caused by water. Once the groundwater is contaminated, its quality cannot be restored back easily and ways and means have to be devised to protect it [4]. Underground water gets contaminated primarily due to uncontrolled use of fertilizers, herbicides and pesticides and unplanned use of industrial and urban wastes [5]. The basic aim of our study is to check physico-chemical parameter of the underground drinking water in around the Silchar municipal area and make awareness about the harmful effect of these parameters present in excess of permissible limit laid down by WHO and Indian Standard.

II. MATERIALS AND METHOD

2.1. STUDY AREA :

Silchar is situated in Cachar, Assam, India. Its geographical coordinates are 24^0 49' North, 92^0 48' East.





Map of Cachar

2.2. SAMPLING

For collecting water samples, plastic bottle of 1L capacity with stopper was used. Each bottle was washed with 2% HNO_3 and then rinsed 3 times with distilled water. The bottles were then preserved in a clean place. The bottles were filled with water leaving no air space, and then the bottles were sealed to prevent any leakage [6]. Each container was clearly marked with the name and date of sampling.

Table. 1 Water samples from different persons in different places along with preliminary observations.

Sample No.	Name of the person who consume water	Source	Depth ft	Colour	Odour
S1	Pronoy Roy	Boring Water	150	Clean	No odour
S2	Abhijit Bhatacharjee	Tube well	145	Clean	No odour
S3	Atul Bhatacharjee	Tube well	150	Clean	No odour
S4	Asit Mukherjee	Boring Water	130	Reddish	Pungent iron like smell
S5	Krishnendu Roy	Pond	10	Clean	No odour
S6	Rajesh Roy	Tube well	130	Clean	No odour
S7	Bojendram Mohan Sarkar	Tube well	125	Reddish	No odour
S8	Ranjan Dey	Well	30	Clean	No odour
S9	Nayanjyoti Roy	Tube well	145	Clean	No odour
S10	Rasomoy Roy	Tube well	135	Clean	No odour
S11	Manjur Hassan	Pond		Clean	Pungent
S12	Amit Roy	Tube well	140	Reddish	No odour
S13	Kristi Bhagti	Tube well	130	Reddish	No odour
S14	Dipankar Das	Boring Water	145	Clean	No odour
S15	Samrat Dey	Tube well	125	Clean	No odour
S16	Arabindha Roy	Boring Water	125	Reddish	No odour

2.2. EXPERIMENTAL

The water P^H was determined by Systronics Digital P^H meter standardized with buffer tablets. Electrical conductivity (EC) was determined using Elico digital conductometer standardized with KCl solution. Total Dissolved Solids (TDS) was determined by EDTA titrimetric method. Chlorides, Fluorides and Iron was determined by the instrument Spectroquant Pharo 100 M.

III. RESULT AND DISCUSSION

The physico-chemical data of the water sample is presented in the table 2. A comparison of physico-chemical data of the groundwater samples with drinking water standards, Indian, WHO [7]-[8]. and ICMR is presented in the table 3. In the present study P^H was found to be acidic in nature at all the sites ranged from 6.6-6.8. The tolerance P^H limit is 6.5 – 8.5[9]. The EC of water samples shows a slight variation in all the samples. Electrical Conductivity is a useful tool to evaluate the purity of water [10]. The Total dissolved salt was in the range of 60-300mg/L. According to WHO and Indian standards, TDS value should be less than 500 mg/L for drinking water [11]. Total hardness is the indicator of hydrogeology and aesthetic quality of water [12]. Out of 16 samples only seven samples have detectable fluorides ion and the values are much lower than permissible values set by both Indian standard and WHO. Sample no. 11 contains highest fluorides value of 0.87 mg/L. In the present study chloride ranged from 20 to 100 mg/L the values are much lower than permissible values. Chloride in drinking water is relatively harmless however high chloride contents in water bodies are harmful for metallic pipes and agricultural crops [13]. In the present study iron ranged from 0.2 to 2.57 mg/L. The sample nos. S4, S7, S11, S12, S13, S16 are found to have maximum value and above the permissible limit**.**

Table 2 : Physico-chemical parameters of different water samples.

Sample Nos.	PH	EC μmhos/cm	TDS (mg/L)	F- (mg/L)	Cl- (mg/L)	Iron (mg/L)
S1	6.6	460	180	BDL	40	0.32
S2	6.8	540	200	BDL	20	0.19
S3	6.7	430	300	BDL	40	0.36
S4	6.8	433	60	0.10	50	1.77
S5	6.6	478	300	0.13	80	0.02
S6	6.6	567	150	BDL	40	0.29
S7	6.6	543	200	BDL	100	1.16
S8	6.8	459	300	BDL	60	0.18
S9	6.7	458	150	0.10	20	0.14
S10	6.8	543	280	BDL	30	0.16
S11	6.6	643	60	0.87	30	1.57
S12	6.6	487	300	BDL	40	1.32
S13	6.6	418	150	0.57	30	1.00
S14	6.6	627	200	BDL	60	0.14
S15	6.7	439	60	0.65	60	0.33
S16	6.7	421	250	0.55	30	2.57

Table 3: Comparison of groundwater quality with drinking water standards, Indian, WHO and ICMR

Parameters	Minimum	Maximum	Average	ICMR (Desirable Limits)	WHO Standard	INDIAN Standard
P^H	6.6	6.8	6.67	7.0-8.5	7.0-8.0	6.5-8.5
EC	418	643	496			
TDS	60	300	196.2	500	100	300
F^-	0.1	0.87	0.42	1.0	1.0	1.0
Cl^-	20	100	45.6	200	250	250
Iron	0.2	2.57	0.72	0.1	0.1	0.3

IV. CONCLUSION

From the present study it is concluded that the water samples collected from various locations of Silchar comply with WHO standards and Indian Standards 10500-91. Except in few samples, the chloride, which is much lower and iron, which is of higher values than WHO standards and Indian Standards 10500-91.The sample which is richer in iron is not suitable for drinking and other domestic purposes. However this sample can be made useful

by proper iron treatment. The water sample especially sample no. S4 is reddish in colour and iron like smell is totally unfit for drinking purpose. Overall all the ground water is clear and odourless and soft. Even few samples contain fluoride ion but the values are much below the permissible limits.

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