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ASSESSMENT OF GROUND WATER QUALITY WITH SPECIAL REFERENCE TO TOTAL COLIFORM OF A RURAL AREA IN CUTTACK DISTRICT IN ODISHA

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Physico-chemical and bacteriological characteristics of quality of different ground waters in a rural area of Cuttack town were estimated in the laboratory, following methods of APHA 1992. A questionnaire was prepared based on the position and type of latrines, duration of use, number of persons using etc. and distributed in the area of study. Out of ten samples studied, all had some parameters above the permissible level. Microbial analyses revealed that some ground water was most contaminated that the rest. This is a cause for concern for those consuming the well water directly for drinking purpose.

INTRODUCTION

Maintaining quality of water is most important for man since it is directly linked with his daily life. Ground water is a sustainable source of fresh water as its popularity is growing day by day. Though ground water is generally considered safe, it is often liable to contamination through anthropogenic and other sources as alien substance get dissolved in recharging water. Eventually, ground water will become non edible all over the world if immediate action is not taken. According to recent news and reports, most tap and well water are not safe for drinking because heavy metals routinely penetrate and pollute our natural water source. Movement of septic tank effluent through soil and their risk to human health were studied by many scientists [11,12]. Around the world 50 million people were affected adversely through the consumption of contaminated drinking water which resulted in the death of 23 lakhs people [7]. The study area concentrates on a remote village in Cuttack District which is densely populated with inadequate sanitary infrastructure. Few people here use open defecation and few use toilet with septic tank in close proximity to their well. Therefore, it is worthwhile to monitor the water quality of this area in special reference to its microbial study.

EXPERIMENTAL

With respect to the information collected from the residents based on the questionnaire given to them, the study sites for collection of water samples were finalized [8]. Ten ground water samples were collected in presterilised sampling bottles and were immediately brought

to the laboratory for analysis. Water samples were analyzed for physico-chemical properties and bacteriological parameters as per standard methods [3]. The result of analyses are shown in Table 1. The technical data collected to assess concentration of contaminants and the MPN count of total coliform are presented in Table 2.

Table 1. Physico-Chemical parameters of well water

S. No.	pH	EC mmho/L	TDS mg/L	TH mg/L	DO mg/L	Chloride mg/L
S_1	6.83	24	1544	65	8.00	28.00
S_2	6.85	23	1508	65	8.09	33.75
S_3	7.23	25	1706	79	7.35	36.50
S_4	7.50	26	1685	68	6.55	34.50
S_5	6.80	31	2340	90	8.50	45.00
S_6	6.60	32	1820	80	7.50	40.00
S_7	6.80	33	2248	83	7.30	41.80
S_8	6.80	29	1800	85	6.90	38.90
S_9	7.00	23	1508	78	6.50	33.90
S_{10}	6.95	34	1884	79	6.80	38.80

EC – Electrical Conductivity TDS – Total Dissolved Solid

TH – Total Hardness DO – Dissolved Oxygen

Result and discussion

The physico-chemical quality of ground water in the study area is discussed below.

pH is a measure of hydrogen ion concentration in water. Bureau of Indian Standards (BIS), prescribed a pH range of 6.5 – 8.5 for drinking water. In the study area the pH of water samples varied from 6.8 to 7.5 or more, and hence, the samples are found to be slightly acidic in nature.

Electrical conductivity is a measure of dissolved salts in water. In the present study the value of EC varied from 23 m mho/cm to 34m mho/cm. According to WHO and ISI the range of EC for potable water is 0.5 to 5 m mho/cm. The entire water sample in the study area show very high value of EC, showing high amount of dissolved salts [10].

In accordance with EC, Total Dissolved Solid value also varied from 1508 mg/L to 2340 mg/L. The desirable limit of TDS in drinking water, according to Bureau of Indian Standard is 500 mg/L. Excess quantity of TDS leads to wide spread gastric disorders [2]. Due to high TDS the ground water in this area is not only suitable for use in boilers and textiles but also, for paper and food industries in which water boilers are used [10].

Hardness is one of the important properties of drinking water. BIS prescribed a permissible limit of hardness as 300 mg/L.TH of the study area varied from 65 to 90 mg/L which is in the permissible limit.

Non polluted ground water remains normally saturated with Dissolved Oxygen. In the present study DO of ground water samples range from 6.5 to 8.09 mg/L. As per ISI the minimum DO recommended is 3 mg/L. In the present study DO values are above 3 mg/L for all the water samples and hence they are not polluted with respect to DO.

Table 2: Technical data collected and Most Probable Number of total Coliform

S. No.	Distance between septic tank and well	Septic tank age	No. of persons using the septic tank	Well age	Well depth	MPN of total coliform
S_1	Open defecation at 150 feet from the well	-	-	5	25	37
S_2	30 feet	20	200	45	40	89
S_3	25 feet	25	100	25	30	340
S_4	30 feet	25	50	20	35	235
S_5	20 feet	25	100	30	40	1800
S_6	Open defecation at 300 feet from the well	11	12	8	25	22
S_7	40 feet	25	100	20	30	100
S_8	80 feet	25	50	30	25	80
S_9	90 feet	25	50	30	30	Nil
S_{10}	35 feet	10	100	20	30	28

Chloride is a major constituent in waste water. In the present study chloride value range from 28.4 to 45 mg/L. As per the Bureau of Indian Standard [4] the desirable limit for chloride for drinking water is 200 mg/LO. In the present study chloride value is well with in the permissible limit.

MPN count of coliform in well water sample collected from different houses are presented in Table 2. The acceptable limit of MPN/100 ml prescribed for drinking purpose by Indian Standard Limit is total coliform per 100 ml. From the result, it is evident that more than 50% of the sample collected shows higher value of MPN index. The probable reason for the high bacterial load in these ground water sources might be their location in close proximity to septic tanks. The presence of coliform organisms in water was indicative used indicator for potable water [9]. Coliform bacteria will not like cause illness. However, their presence in drinking water indicates that disease causing pathogens could be present in water system [1].

Conclusion

On the basis of the present physico-chemical analysis of ground water in Cuttack, it has been concluded that the ground water quality varies from well to well. Higher value of MPN coliform at a certain well indicates that it is not suitable for drinking purpose. High value of TDS in drinking water is generally not harmful to human beings but a higher concentration of these may affect people who are suffering from kidney and heart diseases. The preliminary think to be done is to keep permissible distance between well and septic tank [5]. Public awareness programme on sanitation, its importance, simple and economical water treatment methods would prove beneficial to avoid water bone disease. Ground water used for drinking and cooking need to be pretreatment to ensure prevention of health hazards.

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