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ANALYSIS OF GROUND WATER IN AND AROUND PYDIBHEEMAVARAM INDUSTRIAL AREA, SRIKAKULAM DIST, ANDHRA PRADESH, INDIA

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ABSTRACT
Over usage of ground water is influences quality of water. Present situation ground water quality is important factor at the time water shortage and human health in terms of water borne diseases. In the present study area, mainly focused on physic chemical parameters *i.e*., pH, conductivity, Temperature, Turbidity, Total Dissolved Solids, Chlorides, Sulphates, Phosphates, Total Hardness, Total Alkalinity, Nitrates, Fluorides, Sodium, Potassium and Dissolved Oxygen of ground water in and around pydibheemavarm village. Some of the parameters concentrations were indicate above the ground water quality permissible levels of World Health Organization (WHO) and Bureau of Indian Standards (BIS).

KEYWORDS: water quality, Pydibheemavaram and human health.

INTRODUCTION

Water is one of the most indispensable resources and is the elixir of life (Ramesh *et al*., 2014). It is believed that ground water must possess degree of purity, free from chemical contamination and microorganisms (Borul and Banmeru, 2012; Rashmi Shah *et al*., 2013). But the rapid increase in population and industrialization together with the lack of wisdom to live in harmony with nature has led to the deterioration of good quality of water; thus, resulting water pollution. Contamination of groundwater by domestic, industrial effluents and agricultural activity is a serious problem faced by developing countries. The industrial waste water, sewage sludge and solid waste materials are currently being discharged into the environment indiscriminately. These materials enter subsurface aquifers resulting in the pollution of irrigation and drinking water (Forstner and Witman, 1981). High rates of mortality and morbidity due to water borne diseases are well known in India.

MATERIALS & METHODS

Pydibheemavaram is a small village nearby highway and after industrial development most of the industries like bulk drug, acid base and chemical were located within few decades. Most of industries are mainly depending upon ground water samples collected from Sample collection: Grab sampling has been employed to collect groundwater samples. The samples were collected in polythene containers of 2 liters capacity for physicochemical analysis after pumping out sufficient quantity of water from the source such that, the sample collected served as a representative sample. The samples thus collected were transported to the laboratory by observing all precautions laid down in the Standard methods (APHA, 2005). The Sampling locations and the nearest industries are given in Table1.

RESULTS & DISCUSSION

S. No	Parameter	S1	S2	S3	S4	S5
1	pH	7.18	6.52	7.23	7.56	7.21
2	Turbidity	0.5	1.2	1.0	1.9	2.5
3	Conductivity	1128	1312	1856	2082	2217
4	Temperature (^{0}C)	28^{0}C	27^{0}C	25^{0}C	28^{0}C	24^{0}C
5	TDS	756	889	1276	1383	1479
6	Chlorides	216	223	323	348	325
7	Sulphates	50	30	65	42	58
8	Phosphates	2.9	1.8	4.1	1.1	1.8
9	Total hardness	257	314	276	303	285
10	Total alkalinity	298	263	213	356	349
11	Nitrates	4	3	8	9	6
12	Fluorides	0.9	1.1	0.7	0.9	1.0
13	DO	3.12	3.20	1.43	2.45	1.86

(Note: All values are expressed in mg/l except pH and EC)

pH has been categorized under secondary drinking water standard as it does not pose a health risk. In the present study, pH value of all the water samples were in the range from6.52 to 7.56 as per BIS standards of water permissible

range is 6.5 - 8.5 and maximum limit is 9.2. In the present study, the turbidity of water samples was ranges from 0.5 to 2.5 NTU. The WHO desirable value of turbidity is 10 NTU and maximum limit is 25 NTU. The amount and nature of many dissolved substance in water influences water quality in terms of electrical conductivity. In the present study, the Electrical Conductivity is varied from 1128 (S1) to 2217 (S5) µS/cm. The recommended permissible limit for electrical conductivity (EC) is 300 us/cm. By analyzing the results 90% samples showed EC lower than permissible limit. Total dissolved solids are the concentration of all the compounds available in dissolved state in water. In the present study, the TDS is ranges from 756(S1) to 1479(S5) mg /l. The highest value among the four is observed in S2.Almost all samples are above the limit so no much effect will be observed due to this parameter. Total alkalinity (TA) is one of the few measurable quantities that can be used together with other quantities to calculate concentrations of species of the carbonate system (CO_2, HCO_3^-, CO_3^{2-}, H^+, OH^-)(Dieter A *et al*., 2007). In the present study, the alkalinity of water samples varied from 213(S3) to 356(S4) mg/l. The desirable value of alkalinity of drinking water is 200mg/l and permissible value is 600mg/l. In the present study all the samples are above the desirable levels which may lead to corrosive effects of acidity, lessens the protection or buffering capacity against Ph changes and increases vulnerability towards acid rains. However, HCO_3^- represents the major from since it is formed in considerable amount from the action of CO_3^{-2} upon the basic materials in the soil (Stednick, 1991; Jain *et al*., 1996). Hardness of water is primarily due to dispersion of bicarbonates, chlorides, and sulphates in water, according to classification of total hardness (Durfor and Becker, 1964). The total hardness is represented by $CaCO_3$ which is a main parameter for the water. In the present study, the values for the total hardness varied from 257(S1) to 314(S2) mg/l. According to standards of drinking water the limits of total hardness is 300 to 600 mg/L. These samples water need not have to be softened to make it safe or usable and no health risk will be observed.

The presence of chloride concentrations above 0.5ppm in natural waters should be considered as evidence of pollution (Renn, 1970). In the present study, the Chloride concentration ranged from 216 (S1) to 348 (S4) mg/L. The minimum requirement of chlorides in drinking water is 0.2 to 1 mg/L. The desirable amounts of chlorides according to WHO is 250 to 1000mg/L. As the present studied samples do not posses neither less than the minimum requirement nor more than the permissible amount of chlorides .therefore no adverse effects may result due to this parameter. As the observed values is below the permissible limits. Ground water samples for aquifer were free from chloride and widely distributed in nature as salts of sodium, potassium and calcium and enter into natural water through dissolution of salt deposits.

Sulphates are a naturally occurring anion found almost in all types of water. It gets leached into the ground water by many processes. One of those may be the breakdown of organic substance in the soil as mentioned by Alexander (1961). According to WHO (2004) guidelines for drinking water quality, SO_4^{-2} should be 150 to 400mg/L. In the present study, the SO_4^{-2} concentration varied 30 (S2) to 65 (S3) mg/l. There is a high variation between S2 sample and other samples in case of sulphates .this is due to more presence of minerals containing sulphates in the water than in the others.. Minerals that contain sulphate include magnesium sulphate (Epsom salt), sodium sulphate (Glauber's salt), and calcium sulphate (gypsum). Anyways all the 5 samples do possess sulphates below the danger levels so no adverse effects due to this parameter will b observed. Fluoride is essential for the normal mineralization of bones and formation of dental enamel. It can enter human body through food, toothpaste, mouth rinses and other edible products and course more swiftly through drinking water. In this study, fluoride concentration registered ranges from 0.7 (S3) to 1.1 (S2) mg/l. The presence of fluoride in drinking water is essential and WHO (1984) prescribed 1.5 ppm fluoride as desirable limits in drinking water. The samples do possess the required amount of fluorides therefore no adverse effects are observed in these particular areas.

Nitrates generally occur in trace quantities in surface waters but may attain high levels in some ground waters. In present study nitrates concentration is ranges from 3 (S2) to 9 (S4) mg/L. Drinking water standard for nitrate of 10 mg/L if expressed in terms of nitrogen and 45mg/L in terms of nitrates. So as per the observations no sample exceeded the standard permissible limit. Therefore adverse contributions by nitrates is absent in this samples.

It is one of the most important aspects in evaluating water quality and signifies physical and biological process dealing with the water supply. A good water is should have solubility of oxygen in 7.0 to 7.6 mg/L at 35^0C to 36^0C respectively (Kudesia, 1985). Oxygen saturated water have pleasant taste. In the present study, DO concentration ranged from 1.43 (S3) to 3.20 (S2) mg/L. The maximum value recorded at S4 (4.9 mg/L), whereas the minimum value at S3 (1.8mg/L).Standard limit of dissolved oxygen in drinking water 5.5mg/L. The recommended DO limit for all the domestic purposes is 4-5 mg/L (Garg, 1999). As per the results obtained the samples do possess required BOD which is not harmful to the living beings for drinking.S1,S4 and S5 are more acceptable in the case of BOD rather than S2 AND S3 as the former samples(i.e S1,S4 and S5) do consist of BOD value 1mg/L and lessser than 1mg/L where as the latter ones(i.e S2 and S3)are fairly pure with values greater than 1 mg/L but lessser than the permissible value 5mg/L.

CONCLUSION

It is important to note that ground water pollution is rapidly increasing these days. It was due to such environmental problems that prompted the study in five locations around Pydibheemavaram. Due to continuous increase in ground water usage, rapid increase in industrial establishments, above technique is useful for all wastewater and natural water to remove pollutants and impurities from water and reuse this wastewater to reduce stress of economy country and it also affect the environment and indirectly it helpful to reduce water pollution. Once polluted, groundwater is extremely costly to clean up. It is often not feasible with today's technology, although pump-and-treat is commonly used

with the goal of restoring the water drinking quality: water is pumped to the surface, treated to remove pollutants and then returned to its source. Methods of treating contaminated water include reverse-osmosis, ozonation, coagulation-precipitation, aerobic biological treatment and activated carbon. Some organic pollutants, in fact, react with the iron as the water flows through this permeable barrier and decompose into begin products. Crop cultivators also reported that decrease in their income after industrial establishment in the area. We advised boiled water treatment for drinking purpose in the bore water users.

REFERENCES

Ramesh, K., Nithya, K. and Soorya Vennila (2014) Groundwater Quality Assessment of Kurunthancode Block in Kanyakumari District, India, International Journal of ChemTech Research, Vol.6, No.11, pp 4585-4594.

Borul, S. B., and Banmeru, P. K. (2012) Physico-chemical analysis of ground water for drinking from selected sample points around the Banmeru Science College, Lonar Buldana district of Maharashtra, Journal of Chemical and Pharmaceutical Research, 4(5):2603-2606.

Rashmi Shah, Sharma, U. S. and Abhay Tiwari (2013) Evaluation of Drinking Water Quality in Rainy Season near Tekanpur Area, Gwalior, India, International Journal of Plant, Animal and Environmental Sciences, vol. 3(1). pp 34-37

Forstner, U.K. and Witman G.T.W. (1981) Metal pollution in the aquatic Environment. Springer-Verlag Berlin, Heidelberg, pp 255.

APHA (2005) Standard methods for the examination of water and waste water, 21st Edn, American Public Health Association, Washington.

BIS: (2003). Bureau of Indian Standards IS: 10500, Manak Bhavan, New Delhi, India.

Dieter A. Wolf-Gladrow, Richard Zeebe, E., Christine Klaas, Arne Körtzinger, Andrew G. Dickson (2007) Total alkalinity: The explicit conservative expression and its application to biogeochemical processes, Marine Chemistry, 106, 287–300.

Stednick, J.D. (1996) Monitoring the effects of timber harvest on annual water yield. Journal of Hydrology, 176, 79-95.

Jain, S. and Singh, V.P. (2003) Water resource systems planning and management, Elsevier, New York, 882 p.

Durfor, C.N. and Becker, E. (1964) "Public water supplies of the 100 largest cities in the United States", In Geological Survey Water Supply, U.S. Government Printing Office, Washington, Paper No. 1812, pp. 364.

Renn, C.E. (1970) Investigating water problems. Educational products division, La Molte chemical products company, Maryland.

WHO (1984) The Guideline for Drinking Water Quality Recommendations. World Health Organisation, Geneva, Geneva.

Kudesia V. P. (1985) Water Pollution, Pragati Prakashan, Meerut.

Garg, V. K., Chaudhary, A., Deepshikha and Dahiya, S. (19990 An Appraisal of Groundwater Quality of Some Villages of Jind District," Indian Journal of Environmental Protection, Vol. 19, No. 4, 1999, pp. 267-272.

BIS (1991) Specification for Drinking water ISI: 10500, Bureau of Indian Standards, New Delhi.