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ORIGINAL ARTICLE **OPEN ACCESS**

Studied on Ground Water Characteristics of Certain Areas of Udaipur with Special Reference to Pollution.

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ABSTRACT
Groundwater pollution is a global problem that has a significant impact on human health and ecological services. Our studies reported focus on pollutants in groundwater of geogenic and anthropogenic origin distributed over a wide geographic range, with benefactions from experimenters studying groundwater pollution in India. therefore, this special issue reports on the rearmost exploration conducted in the western India on the sources and scale of groundwater impurity and the consequences for health and the terrain, as well as technologies for removing named pollutants from groundwater. In this composition, the state of the wisdom on groundwater impurity is reviewed. Eventually, some crucial issues for advancing exploration on groundwater impurity are proposed.

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INTRODUCTION

Water is one of the most precious natural resources needed by all the living things for their survival. It maintains an ecological balance between various groups of living organisms and their physical and chemical environments. More than 97 per cent of the Earth's water is saline (1). On an average over 98 percent of the total water of the earth is below the surface. About 90 percent can be treated as ″ground water″ that is water which occurs in saturated materials below the water table. Ground water is of immense importance in our biosphere. It helps to maintain the water level of lakes, wells and rivers both in space and time (2). The amount of ground water in storage is more than 30 times greater than the nearly 48,000 km^3volume in all the fresh-water lakes and more than the 480$km^3$of water in all the world's streams at any given time. The most common dissolved mineral substances are sodium, calcium, magnesium, potassium, chloride, bicarbonate, and sulfate. In water chemistry, these substances are called common constituents. In recent years, the growth of industrial, population growth and technology and water use has increased the stress upon both our land and ground water resources. The quality of ground water has been degraded. Municipal and industrial waste and chemical fertilizers, herbicides and pesticides not properly contained have entered the soil, infiltrated some aquifers, and degraded the ground water quality. Kataria and Shandilya (3) analyzed physico-chemical parameters of ground water of Bhopal. Akoijam (4) evaluated distribution of fluoride in ground water and pollution of shallow aquifers in parts of Imphal Valley, Manipur. Ahar *et al*. (5) conducted the studies on ground water quality at Preavara area, Ahamadnagar district. Srikanth *et al*. (6) examined the lead, cadmium, and nickel and zinc contamination of ground water around Hussain Sagar Lake, Hyderabad, India. Mondal et al. (7) studied the ground water pollution due to tannery industries in and around Dindigul, Tamilnadu and found that the quality of ground water in the area under investigation is deteriorated mainly due to extensive use of salt in the leather industries. Singh and Singh (8) observed water quality of ground water and wastewater of Jaipur city for irrigation purposeand concluded that the concentrations of various parameters are within permissible limit. Boughrous et al. (9) assessed ground water quality in two arid areas of Moracco: Impact of pollution on biodiversity and paleographic implications. Jie-. Jeyaruba and Thushyanthy (10) studied the effect of agriculture on quality of ground water: a case study of Middle-East. Karunakaran et al. (11) studied the physico-chemical characteristics of ground water in and around Namakkal, Tamilnadu.

MATERIAL AND METHODS

Climate of Udaipur city is characterized by sub-tropical monsoon climate as the tropic of cancer passes through Banswara district which is about 145 kms in south of Udaipur city. The climate of the region is

modified to some extent by the altitude, the orientation of hills and the presence of water bodies in the form of lakes. The region experiences three diverse seasons, viz. hot summers (March to June), cold winters (November to February) and annul certain rainy season from the middle June to the end of September. Udaipur city occupies a typical geographic location within the sheltered lap of Aravali and is relatively free from the hot sandy storms, viz, and sunstroke and it seldom experience the high temperature variations of common in other parts of Rajasthan. By virtue of the layout of Aravali, if it is on one hand is unable to check the Arabian Sea branch of the Indian monsoon and on the other hand it successfully receives occasionally but valuable share from the easterly Bay of Bengal. The South North and the East –West oriented river valleys provide easy access to the incoming monsoon winds which account for higher mountains in surroundings.

Laboratory analysis

The aim of the present investigation is to study the accumulation of the studies on ground water characteristics of certain areas of Udaipur district with special reference to pollution. The present study incorporates many such issues which have not been studied earlier, especially with reference to physico-chemical assessment of heavy metals (Cd, Cr, Pb and Zn) in ground water, total coliform bacteria (MPN) in ground water, fluoride, Dissolved oxygen and Biological oxygen demand in ground water of the Udaipur city and its surrounding areas. For the present study water samples were collected regularly for 0ne year from January, 2020 to December, 2020. Seasonally water samples have been collected in 2.5 liter capacity cans after rising is properly from each location. In general, the shorter the time that elapses between collection of a sample and its analysis the more reliable will be the analytical results. Various Physico-chemical and metallic parameter like pH, dissolved oxygen, total hardness, alkalinity, Chloride, C.O.D, total dissolved solids, phosphate, nitrate, were analyzed. (12, 13, 14). The heavy metals concentration was determined by digesting the water samples with concentrate HNO_3 and the analyzed by atomic absorption spectroscopy.

RESULT

To ascertain the potability of various water samples of Udaipur and its surrounding areas are compared with the water quality standards. The results presented are mean of data collected for one year of study. The concentration potential, distribution and effects of such parameters are described. The Indian drinking water quality standards (BIS standards) recommend the value of 6.5 to 8.5 for the pH. In the year 2020 the pH value of ground water samples of Udaipur and its .

Table 1 :Assessment of Ground Water Quality of Udaipur and its Surrounding Area 2020.

Sample No.	Colour & Odour	Tur (NTU)	pH	EC (µmhos/ cm)	TDS	Alkn.	Th	Cl^-	DO	BOD	$SO4^{2-}$	NO_3^-	$PO4^{2-}$	F^-	MPN(100/ml)	Cd	Cr	Pb	Zn
1	Colourless & Odourless	1	7.3	830	763	465	435	386.92	1.2	5.6	210.2	80.21	1.2	0.86	<3	0	0	0	0
2	"	1	7.2	820	510	317	380	275.23	1.5	7.4	118.1	40.2	1.7	0.86	<3	0	0	0	1.86
3	"	2	7.2	550	350	165	210	149.23	2.3	7.2	89.6	110.8	0.51	0.58	9	0	0	0	2.4
4	"	4	7.8	1580	1090	560	590	465.16	5.4	2.1	330.11	11.53	2.1	1.56	3	0	0.002	0	2.286

Zn	1.37	2.84	1.58	2.17	2.71	0	1.07	0	12.9	0
Pb	0	0	0	0	0	0.07	0	0.06	0.01	0
Cr	0.001	0.002	0	0	0	0.005	0	0	0	0.0034
Cd	0	0	0	0.002	0	0	0	0	0.007	0.042
MPN(100/ml)	9	<3	<3	3	35	53	6	<3	26	35
F^-	0.28	0.72	0.58	0.56	0.58	1.7	0.29	0.36	0.72	0.72
$PO4^{2-}$	0.56	0.76	1.03	1.42	1.19	1.42	0.3	0.38	0.26	0.28
NO_3^-	18.41	43.8	52.31	39.87	85.62	53.2	18.21	40.3	54.3	48.22
$SO4^{2-}$	135.1	240.4	120.6	118.6	295.4	145.5	190.2	240.6	235	180.2
BOD	5.3	5.7	5.8	5.4	2.3	3.7	2.7	1.3	1.8	1.9
DO	3.1	2.7	3.1	2.5	5.2	4.6	4.8	7.1	6.6	8.4
Cl^-	250.03	350.76	385.49	210.74	378.65	240.78	345.98	370.45	495.94	286.46
Th	360	415	480	280	560	345	410	490	560	335
Alkn.	356	323	450	160	515	305	391	433	514	317
TDS	530	420	970	510	1453	357	682	656	1308	850
EC (µmhos/ cm)	880	650	1620	750	2200	580	1020	960	1900	1180
pH	7.6	7.3	7.5	7.5	7.8	7.2	7.4	7.4	7.5	7.5
Tur (NTU)	2	1	3	4	6	2	3	4	4	5
Colour & Odour	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,
Sample No.	5	6	7	8	9	10	11	12	13	14

Sample No.	Colour & Odour	Tur (NTU)	pH	EC (µmhos/ cm)	TDS	Alkn.	Th	Cl-	DO	BOD	SO_4^{2-}	NO_3^-	PO_4^{2-}	F^-	MPN(100/ml)	Cd	Cr	Pb	Zn
15	,,	1	7.1	960	610	305	370	240.89	5.3	1.3	140.7	23.4	0.27	0.86	6	0	0	0	0.186
16	,,	2	7.2	860	570	475	480	356.45	6.7	1.2	245.9	108.3	1.86	1.25	<3	0	0	0.03	0.219
17	,,	3	7.4	1300	896	330	520	350.76	8.6	0.92	246.6	12.2	2.3	2.01	<3	0	0	0	0.663

surrounding areas varied from minimum 7.1 to maximum 7.8 and samples were in the range of pH 7 to 8 and none touched the undesirable level. The turbidity values of ground water samples show a wide variation. The value of turbidity in Pre-monsoon was 1 to 6 NTU. See table (1). The total alkalinity values of ground water samples show wide variations. The total alkalinity ranges from 160 to 560. The present investigation reveals that the chloride concentration is distributed and varies at low 149.23 mg/l to high at 495.94 mg/1 in the 2020. Water hardness is an important water quality parameter, especially when the water is being used for drinking purpose. The water containing excess hardness is not desirable for the drinking purpose as the intake of hard water can produce health problems like urolithiosis, cardio-vascular disorder, kidney problems, cancer, etc. Present investigation total hardness in ground water samples shows a wide 210 mg/l to maximum 590 mg/l. The chemical analysis of the ground water samples of the study area show wide variation in the TDS concentration. the TDS values ranges from 357 to 1308 mg/l. The sulphate values ranges 89.6 mg/l to 330.11 mg/l. The present study reveals that EC values in ground water samples show a wide variation. The electrical conductivity ranges between 550 umhos/cm to 2200 umhos/cm. Indian drinking water quality standards states that a value of 45 mg/l of nitrate is considered as the safe limit. The higher concentration of nitrate can cause methaemoglobinaemia and cancer (15). The study period nitrate concentration in the ground water resources show a wide variation. During pre- monsoon sampling, 2020 the nitrate concentration varies from 12.2 to 85.62 mg/l. As per the Indian water quality standards of drinking water a value of 0.1 mg/l of phosphate is considered as the safe limit. A relaxation was given in the maximum permissible limit as the higher concentration of phosphate to 2.0 mg/l. In sampling the phosphate concentration varies from 0.28 to 2.3 mg/l. The fluoride concentration ranges from 0.29 to 2.01 mg/1. The dissolved oxygen ranges from 1.2 to 8.6 mg/l. Biological oxygen demand varies from 0.92 to 7.4 mg/1. Table 1 shows that in the samples having concentration within the range i.e. 3-10 mg/l to the samples shows concentration range 10-53 mg/l which intermediate risk. The result that samples having concentration below 0.002 mg/l to 0.042 mg/l. In the concentration varies from 0 to 0.005mg/l. Lead of the samples having concentration below 0.00 mg/l, to 0.007 mg/1. Zinc is an essential growth element for plants and animal but at elevated levels it is toxic to some species of aquatic life. The United Nations Food and Agriculture Organization recommended level for zinc in irrigation waters as 2 mg/l. The samples having range below 0 mg/l. to 12.9 mg/l of the concentration.

Concentration of Various Physico-Chemical Parameters

Statistical Analysis

In the year the pH and all above mentioned characteristics, i.e., turbidity (r=+0.846), electrical conductivity (r= +0.750), TDS (r= +0.711), alkalinity (r= +0.585), total hardness (r= +0.576), chloride (r = +0.264), sulphate (r= +0.430), nitrate (r=+0.000), phosphate (r = +0.278). fluoride (r= +0.154), dissolved oxygen (r= +0.214), BOD (r=-0.294), MPN (r = -0.150), cadmium (r=-0.116), chromium (r= +0.103), lead (r= +0.072), zinc (r=-0.027).

DISCUSSION

Jain, *et al*. (16) studied the assessment of ground water quality for drinking purpose, Nainital, Uttarakhand, India. Nasrabadi & Abbasi (17) assessed groundwater quality assessment in southern parts of Tehran plain, Iran. S. Dineshkumar, *et al.* 2015 assessed Impact of point source contamination on Eutrophicated water bodies using streeter phelps oxygen sag-reaction model. Kalaivani and Ramesh (18) observed groundwater quality assessment using WQI in south Coimbatore district, Tamil Nadu, India. Jeyaraj et al. (19) reported investigation of physico-chemical and biological characteristics of various lake water in coimbatore district, Tamilnadu, India. Mohamad, *et al*. (20) studied quality of groundwater in an area with intensive agricultural activity. Selvakumara *et al.* (21) reported hydrogeochemical characteristics and groundwater contamination in the rapid urban development areas of Coimbatore, India. Adimalla N & Li (22) studied occurrence, health risks and geochemical mechanisms of fuoride and nitrate in groundwater of the rock dominant semi-arid region. Elumalai V, et al. (23) reviewed groundwater quality assessment and application of multivariate statistical analysis in Luvuvhu catchment, Limpopo, South Africa. Peiyue Li *et al*. (15) assessed sources and consequences of groundwater contamination. Adimalla & Qian (24) reported geospatial distribution and potential non carcinogenic health risk assessment of nitrate contaminated groundwater in Southern India: a case study. The present investigation was undertaken to find out the ground water characteristics of certain area of Udaipur district with special reference to pollution. In this re an attempt has been made to review the nature of ground water quality characteristics of Udaipur and its surrounding areas for assessing its impact on land and ground water.

CONCLUSION

Groundwater is a reliable, safe water source that is protected from BOM surface contamination. When water seeps into the soil, most contaminants are removed from the water. Groundwater is used because it can be contaminated. Many people believe that Rajasthan's climatic conditions are semi-arid to arid and water resources are scarce. More than 70% of the population of Rajasthan uses existing groundwater resources for agriculture, drinking water and industrial purposes. Groundwater in many areas of the state is not suitable for general supply. Many problems related to drinking water quality have been identified. Udaipur even faces a shortage of drinking water due to excessive water consumption and low rainfall every year. The monitoring program should measure groundwater quality with the following objectives: To assess the physicochemical properties of groundwater in Udaipur city with a view to considering its potability and further utilization. Suggestion of remedial measure for improvement in was quality of water. To provide knowledge of water chemistry, which may become especially helpful in showing problems related to ground water pollution.

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