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A Physico-Chemical Analysis and Management of Ground Water Bodies from 20 Locations of Jodhpur District

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ABSTRACT

About 80% of the world population (5.6 billion in 2011) lives in areas with threats to water security. The water security is a shared threat to human and nature. Human water management strategies can affect detrimentally to wildlife. The Sun-City Jodhpur is growing at a rapid rate and various surface and ground water resources to augment requirement of water are insufficient. In the present study water samples of ground water bodies from 20 locations of Jodhpur city and Jodhpur district are collected and analyzed using Indian Standards to find out their suitability for domestic use. During physico-chemical analysis nitrate and fluoride contents are found above permissible limit in many samples.

Keywords: Water Security, Jodhpur city and District, Physico-Chemical analysis, Nitrate, Fluoride, Ground Water Bodies.

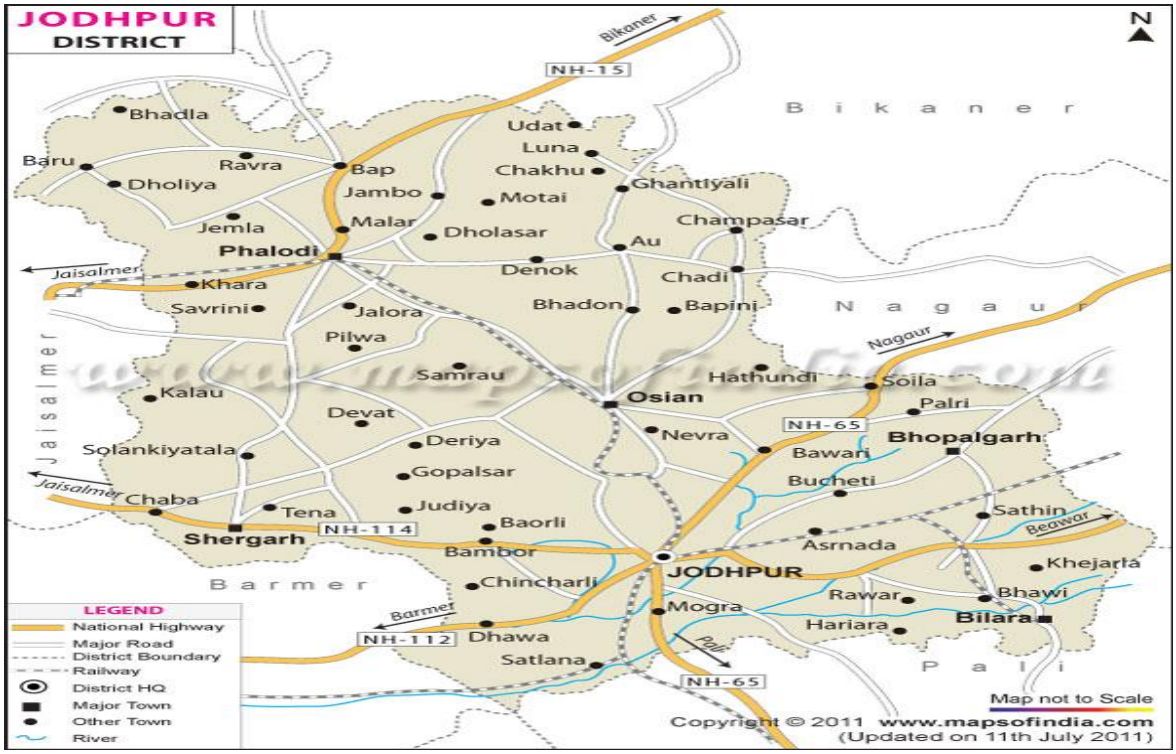
INTRODUCTION

About 80% of the world population (5.6 billion in 2011) lives in areas with threats to water security. The water security is a shared threat to human and nature. Human water management strategies can affect detrimentally to wildlife. The Sun-City Jodhpur was founded by Rav Jodha and it is the second largest city of Rajasthan. The city is growing at a rapid rate and various surface and ground water resources to augment requirement of water are insufficient.

Increasing water scarcity: Water will turn out to be the world's most precious resource soon. Half of the world's population will face acute water shortage by 2030. While the world's population tripled in the 20th century, the use of renewable water resources has grown six-fold. Within the next fifty years, the world population will increase by another 40 to 50 %. This population growth - coupled with industrialization and urbanization - will result in an increasing demand for water and will have serious consequences on the environment. The need of proper management and conservation of water resources is essential to avoid future water problems. Due to increasing population, industrialization and human activities deterioration in water quality is observing now a days. The lakes, wells and bewares in city which were constructed for meeting the drinking water supply are being used as dumping places for waste and waste water. The old civic discipline to avoid the contamination has now disappeared.

MATERIALS AND METHODS

Standard methods of collection, preservation and analysis are adopted. Grab sampling method was used for collection of 20 samples of ground water bodies of Jodhpur District.



The collected water samples were analyzed using standard methods[1-6]. The methods used are presented in table 1. The collected sample places and sample numbers are given in table 2.

Table 1: Methods used for the analysis of different parameters

S.No.	*Parameter*	*Method Used*
1.	pH	pH meter
2.	Turbidity	Water Analysis Kit
3.	Total dissolved solids(TDS)	Total dissolved solids dried at 180 degree
4.	Chlorides(Cl)	Argentrometric Method
5.	Ca Hardness(CaH)	EDTA Titration Method
6.	Mg Hardness(MgH)	EDTA Titration Method
7.	Total Hardness(TH)	EDTA Titration Method
8.	Fluoride(F)	SPANDS Method
9.	Alkalinity	Titration Method

Table 2: Coding of Samples

S.No.	***Sample Code***	***Location***	***City***
1	*S-1*	*Dobi ka Gorba*	*Bala*

2	*S-2*	*Jaynio ka Bas*	*Bala*
3	*S-3*	*Hardev Ram Potli ka Bas*	*Matwalon ki Dhani*
4	*S-4*	*Darey ke Pas*	*Bhavi*
5	*S-5*	*HP Bus Stand*	*Bhavi*
6	*S-6*	*Char Gharo ka Bas*	*Bhavi*
7	*S-7*	*Sr.Sec.School*	*Bhavi*
8	*S-8*	*Jata Bas ke Ander*	*Bhavi*
9	*S-9*	*TW-2*	*Borunda*
10	*S-10*	*Mandir ke Pas*	*Bhopal Garh*
11	*S-11*	*Poata*	*North-East Jodhpur*
12	*S-12*	*Lakshmi Nagar*	*North-East Jodhpur*
13	*S-13*	*Infront Incometax Office*	*North-East Jodhpur*
14	*S-14*	*Devi Singh ki Haveli*	*North-East Jodhpur*
15	*S-15*	*Lal Maidan Girls School*	*North-East Jodhpur*
16	*S-16*	*Gandhi Maidan*	*West-South Jodhpur*
17	*S-17*	*Patel Nagar*	*East-South Jodhpur*
18	*S-18*	*PHED Area*	*East-South Jodhpur*
19	*S-19*	*Railway Hospital*	*East-South Jodhpur*
20	*S-20*	*Shanischer ji ka Than*	*North-West Jodhpur*

The pH, turbidity, total dissolved solids, alkalinity, nitrate ,total hardness, chloride, fluoride contents in the samples determined are given in table 3.

Table 3. Physico- Chemical Parameters of samples

S. No	***Sample No.***	***pH***	***Turbidity***	***TDS (ppm)***	***ALK(M) (ppm)***	***NO_3 (ppm)***	***TH (ppm)***	***Cl (ppm)***	***F (ppm)***	***Total of All Parameters***
Desirable Limit		***6.5***	***-***	***500***	***200***	***45***	***300***	***250***	***1.0***	***1302.5***
Permissible Limit		***8.5***	***-***	***2000***	***600***	***45***	***600***	***1000***	***1.5***	***4255.0***
1	*S-1*	*7.6*	*Trace*	*700*	*500*	*107*	*250*	*300*	*3.8*	*1868.4*
2	*S-2*	*7.4*	*Trace*	*690*	*480*	*107*	*350*	*250*	*4.2*	*1888.6*
3	*S-3*	*7.6*	*Trace*	*3170*	*1530*	*102*	*220*	*1400*	*18.8*	*6448.4*
4	*S-4*	*7.6*	*Trace*	*3170*	*1560*	*105*	*600*	*1300*	*18.0*	*6760.6*
5	*S-5*	*7.8*	*Trace*	*1950*	*810*	*73*	*180*	*670*	*8.4*	*3699.2*
6	*S-6*	*7.7*	*Trace*	*3115*	*660*	*285*	*400*	*1320*	*3.9*	*5791.6*
7	*S-7*	*7.5*	*Trace*	*2725*	*830*	*33*	*340*	*1250*	*6.5*	*5192.0*

8	*S-8*	*8.0*	*Trace*	*690*	*490*	*105*	*360*	*160*	*3.8*	*1816.8*
9	*S-9*	*7.1*	*Trace*	*1350*	*460*	*50*	*490*	*590*	*1.7*	*2948.8*
10	*S-10*	*7.2*	*Trace*	*2550*	*450*	*30*	*400*	*1280*	*2.2*	*4719.4*
11	*S-11*	*7.2*	*Trace*	*1770*	*720*	*352*	*380*	*600*	*3.5*	*3832.7*
12	*S-12*	*7.3*	*Trace*	*1650*	*500*	*450*	*520*	*440*	*2.5*	*3569.8*
13	*S-13*	*7.1*	*Trace*	*2040*	*560*	*60*	*510*	*510*	*2.5*	*3689.6*
14	*S-14*	*7.6*	*Trace*	*2006*	*600*	*225*	*280*	*500*	*3.0*	*3621.6*
15	*S-15*	*7.4*	*Trace*	*2178*	*400*	*175*	*570*	*680*	*2.6*	*4013.0*
16	*S-16*	*7.1*	*Trace*	*1880*	*470*	*390*	*370*	*300*	*5.5*	*3422.6*
17	*S-17*	*7.1*	*Trace*	*1430*	*560*	*80*	*380*	*280*	*1.6*	*2738.7*
18	*S-18*	*7.9*	*Trace*	*1870*	*850*	*200*	*440*	*460*	*3.2*	*3831.1*
19	*S-19*	*7.2*	*Trace*	*3650*	*850*	*400*	*600*	*1240*	*1.0*	*6748.2*
20	*S-20*	*7.8*	*Trace*	*1141*	*250*	*380*	*550*	*320*	*1.1*	*2649.9*

RESULTS AND DISCUSSION

On the basis of total value of all parameters, samples are categorized into two categories-

1.Contaminated Samples(1302.5-4255.0)- S-1,S-2,S-5,S-8,S-9,S-11,S-12,S-13,S-14,S-15,S-16,S-17,S-18 and S-20 .
2. Highly Contaminated (above 4255.0)-S-3,S-4,S-6,S-7,S-10 and S-19.

Determination of TDS is associated with the general acceptance of water by population as its presence in excessive quantities reduces the palatability and imparts bad taste to water. Wide range of TDS values obtained from 690ppm-3650ppm.Nine samples contain TDS values above permissible limit. Nitrate content of the samples varies from 30ppm-450ppm.Except S-7 and S-10 all contain nitrate value above permissible limit. Nitrate has been associated with the blue baby disease in infants or infantile methaemoglobiaemia, which is caused due to bacterial reduction of nitrate into nitrite on stomach. Fluoride content is found to be surprisingly high in all cases, especially in S-3 and S-4 very high. Fluoride content in higher quantities is very dangerous and causes fluorosis decease and ultimately leads to death. Fluoride is released into the ground water through weathering of primary silicate and associated accessory minerals. The chloride contents are found to be spread over a wide range of 160ppm to 1400ppm.Except S-4 and S-19 all samples have total hardness value below permissible limit. Alkalinity level in two samples S-3 and S-4 is very high. S-4 water sample is found highest contaminated where as S-8 is least contaminated.

APPLICATIONS

The results of water quality parameters are useful to educate the Public to prevent the use these contaminated water.

CONCLUSIONS

Water from contaminated water bodies contains very high nitrate level. So do not give this water to infants less than 6 months of age. Avoid drinking this water on a daily basis during pregnancy. Do not attempt to remove the nitrate by boiling the water. This will only concentrate the nitrate making levels even higher. It requires chemical treatment methods to be removed. Water from these resources can be used by cottage industries and for domestic purposes after treatment by means of ultra-sound technology. Water from highly contaminated water bodies can never be used for any domestic or industrial purposes. Water from these sources should be pumped out and should be utilized by- Railways, Parks and Public parks, Development of sewage farms, which require water in large quantity should be encouraged to use this water. In order to make the process of pumping out of water economically viable method water from these sources should be drained out to some convenient depression and develop in the form of natural lake. Water from these sources can be used for pressure washing purpose after removing insoluble impurities by physical methods. The appropriate technology for recycling this water should be developed.

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