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A Potable water Quality Scenario of South - East zone of the Bhiwad industrial area (Alwar)

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ABSTRACT

Potable water quality parameters of South - East zone of Bhiwadi industrial area (Alwar) Rajasthan were assessed in this study. Potable water samples were collected from different location of South - East zone and analysis of parameters such as pH, TDS, BOD, COD, DO, Fluoride, Nitrate, Sulphate, TH, TA and Biological parameters were carried. Finding parameters were compared with the WHO water quality parameters. It was found that some of the location under the study fall in polluted zone. The results shown that the areas which near to industries have polluted than the others[1-2,7-9].

Key words: potable water, Parameters, Industrial pollution, Permissible limit, Polluted area.

INTRODUCTION

Pollution of Potable water is an important aspect of environmental pollution with the fast industrialization and urbanization in the world. The principal sources of contaminants of Potable water are mines, petroleum processing units, steel, smelter plants, pulp paper, textile and agriculture industries etc. When the waste water of an industry is dumped into streams, it gets into natural sources and causes change in physio-chemical composition of ground water which ultimately becomes unsuitable for use. Many different chemicals and various synthetic products we use today are usually the main causes of potable water pollution[3-5].

A lot of effluents and wastes discharged by the industries over the years have contaminated the groundwater resources. Bhiwadi is a highly polluted city due to too much industrialization. Many industries leave out his effluents without treatment. This untreated effluent spared on land surface and it enter into aquifer and contaminated the

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potable water. This contaminated potable water cause of many disorders in human being and crops[11].

This paper highlights the various physico-chemical and biological parameters of potable water from various sources of South- East zone of Bhiwadi industrial area, which will helps us to formulate the strategy for mitigating the harmful effects of ions present above the prescribed levels.

EXPERIMENTAL

Material and method

Bhiwadi is located at the East end of Rajasthan in Tijara tehsil of Alwar district. It is within the national capital region, just 55 Kms away from Delhi, 200 Kms from state capital Jaipur and 90 Kms from the district head quarter Alwar. Spread over 3347 acres of land and 3000 acres area proposed for extension, Bhiwadi has about 1455 tiny, small, medium and large industries including MNC industrial units manufacturing various types of products. They include all types of industries like steel, furnance, electronics, engineering, textiles, pharmaceuticals, printing, packaging, cables, rolling mills, food processing, herbal care etc13,15.

Bhiwadi already boasts of big multinational companies, namely, Pepsi, Honda Siel (manufacturers of Honda cars), Orient Craft, Asahi, Jaquar, and Hero Honda, Bausch & Lomb, United Breweries, Ray Ban, Saint Gobain, Federal Moghul, Gillette, Sakata Ink and Ocap Chasis. Other major industries in the city include Relaxo Footwear, Lakhani Footwear, Jacquar Ltd., Harvest Foods Limited, Kajaria Ceramic Ltd, and SEZ of Mahindra and Mahindra. These companies have acquired huge acres of land in Bhiwadi, made crores of investment and employed thousands of people. Bhiwadi serves as a gateway to Rajasthan.

The present study was planned by selecting ten locations located in South- East Zone of Bhiwadi industrial area and potable water samples were collected from selected locations as per standard procedure. The literature survey showed that no potable water studies were made in these localities so far. Hence the present study was undertaken by authors.

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Collection and analysis of potable water samples

The potable water samples were collected in pre cleaned one- liter plastic bottles from borewells, handpumps and open wells located in South- East zone of Bhiwadi industrial area. The potable water samples which collected from different sources, analyzed as per standard procedures to know the chemical status of potable water. These potable water samples were taken two times- pre monsoon and post monsoon[11,17,19]. The analyzed data were compared with the water standards given in the Table. Results of potable water samples of South - East zone are summarized in the Table 1, 2, 3and 4 .

Ten different locations were taken into consideration in this zone. Ten water samples of different sources were collected and analyzed as per standard procedures mentioned earlier to know the physic-chemical & biological status of potable water. These potable water samples were taken two times- pre monsoon and post monsoon. The analyzed data were compared with the water standards[3-5,8-10] .These results are summarized in the Table: 1, 2, 3 and 4.

DISCUSSIONS

pH: The range of pH of potable water samples was found to vary from 6.7 to 8.5 for pre monsoon samples and 6.5 to 8.5 for post monsoon samples. The pH value varies from 6.5 to 8.5 for both sessions. All pH values of both sessions are found within range according to ISI standards.

Color: The color of potable water samples of pre monsoon and post monsoon are not same. This is indicative of large amounts of organic chemicals and inadequate treatment. There may be little health concerns due to the availability of color in the potable water. However, it is aesthetically unpleasing.

Odor: Certain odors are indicative of organic or non-organic contaminants that originate from municipal or industrial waste discharges or from natural sources in the potable water samples.

Turbidity: Turbidity of the South – East zone was found within range 0.7 to 24.9. The values for the pre monsoon samples was found 0.3 to 16 NTU and village Harchandpur and Kartar colony area samples have higher values than the permissible value. In post

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monsoon samples, the range of turbidity was found 0.9 to 6.8 and all samples have turbidity values within the range.

Electrical conductivity: Electrical conductivity of this zone was found between 260 to 1677 microsiemens/cm. The Tables: 1 & 2 reveal that harchandpur and Bidhuri colony area samples have high conductivity than other sources. This is due to pollution of potable water by percolated effluents.

Dissolved Oxygen: The DO values of the South – East region for pre monsoon samples was found in the range from 3.6 mg/l to 4.7 mg/l and for the post monsoon samples from 3.5 to 4.9 mg/l. It indicates that the water is contaminated and it is difficult to survive any aquatic species in this water.

Total coli form: The total coliform range was found from 1MPN/100 to 45MPN/100 for both sessions, which show the presence of coliform and water is bacteriological contaminated. Ground water sample of Bilaheri, Harchandpur, Kartar colony and Bidhuri colony area samples have more total coliform than the permissible limits as per described in IS : 10500-1991.

Total Hardness: The Table: 3 & 4 reveal that the values of total hardness vary from 230 to 1520 mg/l for the pre monsoon samples and Ca and Mg Hardness varies from 75 to 650 mg/l and 45 to 190 mg/l respectively. For the post monsoon samples range of TH was found between 269 to 987 mg/l and Ca, Mg Hardness range, 110 to 345 mg/l and 49 to 209 mg/l respectively. All samples have higher values in the both sessions than the desirable limit as compared to IS-10500-1991 parameters.

Sulphate: Sulphate values were found in the range from 119 to 796 mg/l and 208 to 890 mg/l for pre and post monsoon samples respectively. Village Harchandpur, Naya gaon and Kartar colony area samples have higher sulphate values in the both sessions than the permissible limits due to industries effluents percolating in the potable water[18].

Chloride: The chloride contents in the all ground water samples were found in the range from 189 to 980 mg/l and 359 to 1080 mg/l for the pre and post monsoon sessions respectively. Harchandpur, Capt. Harprasad colony and Kartar colony area samples have higher Chloride value for the post monsoon samples than the permissible limits.

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Table 1: Physical & Biological Parameters of South- East zone: Pre- monsoon samples

Location / Source	pH	Color	Odour	Turbidity	Conductivity	Total Coliform
E.S.I Hospital(HP)	7.0	colorless	Unobjectionable	<0.7	280	3
Mundana (BW)	7.6	Clear	Unobjectionable	1.0	458	< 2
Bila Heri(BW)	6.8	Clear	Unobjectionable	8.9	990	11
Naya Gaon(BW)	6.9	Clear	Unobjectionable	5.5	690	7
Harchandpur (HP)	8.5	Slightly brown	Unobjectionable	12.9	1677	15
Sarpanch colony (HP)	6.7	Clear	Unobjectionable	0.6	456	8
Bidhuri colony (BW)	8.0	Reddish	Unobjectionable	10.2	1345	6
Captain Harprasad colony (BW)	7.1	Clear	Unobjectionable	1.02	370	5
Kartar colony (BW)	7.7	Black brown	Unobjectionable	24.9	879	45
Stadium (HP)	7.3	Clear	Unobjectionable	4.8	457	1

HP = Hand pump BW = Bore well

Fluoride: The Tables: 2 & 4 reveal the range of fluoride in this zone for the pre monsoon samples varies from 0.09 to 2.5 mg/l. Harchandpur and kartar colony samples have higher fluoride values then the permissible limits. The fluoride range for the post monsoon samples 0.9 to 6.3 mg/l and Bilaheri, Capt. Harprasad colony, Harchandpur and kartar colony area water samples have higher fluoride values than the permissible limits[19].

Iron: The range of iron for the pre monsoon samples varies from 0.03 to 6.3 mg/l and Harchandpur and Capt. Harprasad colony area samples have higher values than the permissible limits. Iron values for the post monsoon samples was varies from 0.09 to 15.9 mg/l. The Table 4: show that Harchandpur, Capt. Harprasad colony and kartar colony area sample have higher values than the permissible limits in the post monsoon sample[22].

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Table 2: chemical Parameters of South -East zone: Pre- monsoon samples

Location / Source	DO	Cl^-	TDS	SO_4^{-2}	F^-	Fe	Hardness	Ca- Hard Ness	Mg-Hard Ness
E.S.I Hospital(HP)	4.4	189	1098	245	1.2	0.09	450	165	89
Mundana (BW)	4.6	642	1105	389	1.0	ND	970	289	110
Bila Heri(BW)	4.2	490	754	119	0.09	0.17	630	150	95
Naya Gaon(BW)	3.9	742	959	690	ND	ND	290	110	65
Harchandpur (HP)	3.6	389	2170	796	2.5	6.3	1170	430	190
Sarpanch colony (HP)	4.5	987	1789	279	0.8	1.0	230	75	45
Bidhuri colony (BW)	4.7	790	654	179	1.2	0.03	590	178	85
Captain Harprasad colony (BW)	4.4	1017	3245	580	1.9	2.7	745	230	125
Kartar colony (BW)	4.2	1020	3320	220	1.9	0.6	670	345	78
Stadium (HP)	4.6	879	1680	360	0.0	ND	1520	650	220

(ND= Not Detectable)

Table 3: Physical & Biological Parameters of South -East zone: Post- monsoon samples

Location / Source	pH	Color	Odour	Turbidity	Conductivity	Total Coliform
E.S.I Hospital(HP)	7.9	Colorless	Unobjectionable	2.6	456	< 4
Mundana (BW)	6.8	Clear	Unobjectionable	0.9	260	ND
Bila Heri(BW)	6.9	Clear	Unobjectionable	3.2	760	ND
Naya Gaon(BW)	7.1	Clear	Unobjectionable	0.5	187	ND
Harchandpur (HP)	7.2	Slightly brown	Unobjectionable	3.1	780	10
Sarpanch colony (HP)	8.5	Clear	Unobjectionable	2.1	580	ND

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Bidhuri colony (BW)	7.4	Reddish	Unobjectionable	6.8	960	12
Captain Harprasad colony (BW)	7.2	Clear	Unobjectionable	1.9	245	ND
Kartar colony (BW)	6.5	Blackish	Unobjectionable	5.7	610	ND
Stadium (HP)	7.9	Clear	Unobjectionable	3.8	290	ND

HP = Hand pump BW = Bore well

Total dissolve solid: The Table: 2 & 4 show the range of the total dissolved solids the pre monsoon samples which was found between 754 to 3320 mg/l. Harchandpur, Kartar colony & Capt. Harprasad colony area samples have higher values than the permissible limits. TDS values for the post monsoon samples ranged in 818 to 3680 mg/l and Harchandpur, Capt. Harprasad colony and kartar colony area samples have higher TDS value than the permissible limits. It may be conclude that all water sources have more TDS values than desirable limits

Table 4: Chemical Parameters of South- East zone: Post- monsoon samples

Location / Source	DO	Cl^-	TDS	SO_4^{-2}	F^-	Fe	Hardness	Ca- Hard Ness	Mg-Hard Ness
E.S.I Hospital(HP)	4.3	359	1776	299	1.3	0.9	359	170	88
Mundana (BW)	4.7	467	1560	208	1.1	1.0	480	189	79
Bila Heri(BW)	4.7	750	1456	210	4.2	0.4	577	219	105
Naya Gaon(BW)	4.3	590	818	70	0.8	ND	340	110	87
Harchandpur (HP)	3.5	1080	2309	890	6.3	7.3	780	299	195
Sarpanch colony (HP)	4.8	930	960	275	1.4	0.009	269	111	49
Bidhuri colony (BW)	4.9	438	1290	375	0.9	0.4	575	233	109

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Captain Harprasad colony (BW)	4.6	1045	2856	390	3.2	2.1	644	259	176
Kartar colony (BW)	4.1	1048	3680	888	6.8	15.9	987	345	209
Stadium (HP)	4.5	628	1870	400	1.1	1.0	591	259	100

(ND= Not Detectable)

CONCLUSIONS: - Considering all the investigated problematic chemical constituents collectively, suitability of water for drinking purpose has been decided by author as given below.

- Excellent to Good – All chemical constituents below desirable limit.
- Good to Permissible- All chemical constituents between desirable and permissible limit. 1 to 5 constituents may be below desirable limit.
- Doubtful to Unsuitable- If all constituents except any one of pH. Chloride, T.D.S. and T.H. are below permissible limit.
- Unsuitable- If any one of direct health affecting constituent (nitrate and fluoride) or 2 to 6 constituents are above permissible limit.

Drinking water quality status in South – East Zone

Location / Source	**Samples Collected**			
	Pre- Monsoon	**Remark**	**Post- Monsoon**	**Remark**
E.S.I Hospital(HP)	Good	Under limit	Good	Under limit
Mundana (BW)	Good	TH higher	Good	Under limit
Bila Heri(BW)	Good	TH , Total coliform higher	Good	Fluoride higher
Naya Gaon(BW)	Good	Sulphate higher	Good	
Harchandpur (HP)	Unsuitable	TDS, Sulphate, Fe, Fluoride,	Unsuitable	Not fit for

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		TH, Turbidity, Coliform higher		drinking
Sarpanch colony (HP)	Good	Under limit	Good	Under limit
Bidhuri colony (BW)	Unsuitable	Turbidity higher	Unsuitable	Total Coliform higher
Captain Harprasad colony (BW)	Unsuitable	Chloride, TDS, Sulphate, Fe, Fluoride, TH higher	Unsuitable	Chloride, TDS, , Fe, Fluoride, TH higher
Kartar colony (BW) Stadium (HP)	Unsuitable Doubtful	Chloride, TDS, Fluoride, TH higher TH higher	Unsuitable Doubtful	Chloride, TDS, Sulphate, Fe, Fluoride, TH higher

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