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PHYSICO- CHEMICAL ANALYSIS OF DRINKING WATER OF ELLENABAD CITY OF SIRSA DISTRICT HARYANA

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ABSTRACT

Ground water quality of Ellenabad city was assessed for its suitability for drinking purposes. Samples collected from the Bore-wells (forms a part of municipal water supply) were analyzed for the various physico-chemical parameters including pH, total dissolved salts, total hardness, total alkalinity, calcium,magnesium, chloride and fluoride etc. The TDS and TH was found higher than the WHO standards for the drinking water. It may cause various health problems to the people of the city. The high TDS may cause Undesirable taste, gastro intestinal irritations and corrosion or incrustation.The concentrations of F− in groundwater of Ellenabad also raise the risk of fluorosis and hence the study concluded that the groundwater must be used with proper treatment for public health.

Keywords: **Bore-Wells, Ground Water, Hardness, Water Pollution, Water Treatment.**

I. INTRODUCTION

The quality of drinking-water is a powerful environmental determinant of health. Drinking-water quality management has been a key pillar of primary prevention for over one-and-a-half centuries and it continues to be the foundation for the prevention and control of waterborne diseases. Water is essential for life, but it can and does transmit disease in countries in all ncontinents – from the poorest to the wealthiest. Physico-chemical analysis of drinking water of Ellenabad town of Sirsa district of Haryana state has beeninvestigated intensively. Bore well water is generally used for drinking and other domesticpurposes in this area. The uses of fertilizers and pesticides, manure, lime, septic tank, refusedump, etc. Are the main sources of bore wells water pollution [1]. In the absence of fresh watersupply people residing in this area use bore wells water for their domestic and drinkingconsumption. In order to assess water quality index, the physico-chemicalanalysis of bore wells drinking water was carried out. Fluoride is found in all natural water at someconcentration. In ground water however low and high concentration of fluoride can occurdepending upon the nature of the rocks and the occurrence of the fluoride – bearing minerals.Fluorosis has been described as an endemic of tropical climate[2].The main sources of fluoride intake is water[3].In low concentration of fluoride prevent dental caries. However it has been observed that whenfluoride intake through water, food and air increases to a specific level (1.0-1.5 mg / l.) thebeneficial effect is lost and in fact harmful effect being to show with increasing

concentration (above 1.5 mg /l). Excess intake of fluoride beyond permissible limit brings out dental andskeleton fluorosis along with some neurological disorder. Higher concentration of fluoride also causes respiratory failure, fall of blood pressure and genera paralysis. Continuous investigationnonfatal dose of fluoride causes permanent inhibition of growth. Fluoride ions inhibit a variety ofenzymes often by forming complexes with magnesium ion and other metal ions[4]. In recent years, an increasing threat to ground water quality due to human activities has become of great importance. The adverse effects on ground water quality are the results of man's activity at ground surface, unintentionally by agriculture, domestic and industrial effluents, unexpectedly bysub-surface or surface disposal of sewage and industrial wastes[5-6].In India, where groundwater isused intensively for irrigation and industrial purposes, a variety of land and water-based human activitiesare causing pollution of this precious resource. Its over-exploitation is causing aquifer contamination incertain instances; while in certain others its unscientific development with insufficient knowledge ofgroundwater flow dynamic and geo-hydrochemical processes has led to its mineralization [7-8]. The qualityof ground water is of great importance in determining the suitability of particular ground waterfor a certain use (public water supply, irrigation, industrial applications, power generation etc.).The quality of water may be described according to their physico-chemical and micro-biologicalcharacteristics. Therefore, the quality of ground water varies from place to place, with the depth ofwater table, and from season to season and is primarily governed by the extent and composition ofdissolved solids present in it[9-10]. For effective maintenance of water quality through appropriatecontrol measures, continuous monitoring of large number of quality parameters is essential.However it is very difficult and laborious task for regular monitoring of all the parameters even ifadequate manpower and laboratory facilities are available. Therefore, in recent years an alternativeapproach based on statistical correlation, has been used to develop mathematical relationship for comparison of physico-chemical parameters.

II. MATERIALS AND METHODS

Water samples from six different areas located in Ellenabad city werecollected in brown glass bottles with necessary precautions. All the chemicals used were of ARgrade.Double distilled water was used for the preparation of reagents and solutions. The water qualityparameters considered for the examination in this study are Temperature, pH, TDS, Total alkalinity, Calcium and Magnesium hardness, Sulphate and Nitratecontents was measured by water analysis kit and manual methods. Calcium and Magnesium hardnessof water was estimated by complex metric titration methods. Chloride contents were determined volumetrically by $AgNO_3$ titrimetric method using K_2CrO_4 as an indicator and was calculated interms of mg/L. Sulphate contents were determined by volumetric method.

III. RESULTS AND DISCUSSION

The physico-chemical data of the bore wells water sample collected in April 2016 are recorded in table. The results of the samples vary with different collecting places because of the different nature of the soil contamination.

S. No.	Sample Station	NO_3^- mg/L	TDS mg/L	Total Hardness mg/L	Ca^{2+} mg/L	Mg^{2+} mg/L	Total Alkalinity mg/L	Fe mg/L	Cl^- mg/L	F^- mg/L	pH	Sulphate mg/L
1.	PremDassKutia	7.4	660	300	60	36	110	0.053	200	1.5	7.7	85
2.	Near Bus Stop	6.9	640	120	20	16.8	130	0.070	200	1.5	7.5	42
3.	Bilaspur colony	10.3	1950	450	100	48	130	0.074	540	1.5	8.5	213
4.	Old Chungi	9.7	1100	440	92	50.4	120	0.069	200	1.5	8.0	220
5.	Udham Singh Chowk	6.4	630	110	20	14.4	160	0.042	150	1.5	8.0	82
6.	Devi Lal Park	7.6	925	150	24	21.5	144	0.057	232	1.5	8.2	78
7.	Mandi Town	7.1	800	190	32	26.4	120	0.052	210	1.0	8.1	81

Temperature:I n the present study Temp. ranged from 27.30C to 33.00C.

pH: In the present study pH ranged from 7.5 to 8.5. The tolerance pH limit is 6.5 – 8.5. Low pH may cause corrosion and metallic taste where as high pH may cause bitter taste and deposits.

Iron: The iron ranged from 0.052 – 0.074 mg/L. The tolerance value for iron is 0.3 mg/L.

TDS: In the present study TDS ranged from 630 to 1950 mg/L. According to WHO and Indian standards, TDS value should be less than 500 mg/L for drinking water. The high value of TDS may cause hardness, scaly deposits, sediment, cloudy colored water, staining, salty or bitter taste, corrosion of pipes and fittings.

Chlorides: In the present study chloride ranged from 150 to 540 mg/L. Thetolerance range for chloride is 200 – 1000 mg/L. The main sources of Cl^- in water are fertilizers, industrial wastes.

Total Alkalinity: The total alkalinity content in the samples is in between 110 to 160 mg/L. Thesources of alkalinity are landfills hazardous waste landfills.

TotalHardness: The total hardness ranged from 110 to 450 mg/L. The tolerance range for total hardness is 75 – 200 mg/L. The hardness of water is due to the presence of dissolved calcium and magnesium from soil and aquifer minerals containing limestone or dolomite. The high value of hardness may cause scale in utensils and hot water system, soap scums.

Calcium: The Ca^{2+} ranged from 20-100 mg/L. The tolerance range for Ca^{2+} is 75-200 mg/L.

Magnesium: The Mg^{2+} ranged from 14.4-50.4 mg/L. The tolerance range for Mg^{2+} is 30-100 mg/L.

Fluoride: The F^- ranged from 1.0-1.5 mg/L. The tolerance range for F^- is 1.0-1.5 mg/L. The main sources of F^- in water are industrial waste and geological. The high value of F^- in water may cause brownish discoloration of teeth and bone damage.

Sulphate: The sulphate ranged from 42-220 mg/l. The tolerance range for SO_4^{2-} is 200-400 mg/l. The main sources of sulphate ions in water are animal sewage, septic system, sewage
industrial waste and natural deposits or salt.

Nitrate: The nitrate ions ranged from 6.4-10.3 mg/L in the present study. The tolerance value of NO_3^- is 45 mg/L. The main sources of nitrate in water are livestock facilities, septic systems, manure lagoons,household waste water, fertilizers and natural deposits.

The hard water has no known adverse health effect, WHO says at its Geneva Conference. The health effects of hard water are mainly due to the effects of salts dissolved in it, primarily calcium and magnesium.It may cause cardiovascular disease, growth retardation and reproductive failure.

TDS in all the samples is above the standard limits. It may cause learning disorders in later years among the children and stiffness in joints,hardening of arteries, kidney stone, gall stone, blockage of arteries and microscopic capillaries and other passage in which liquids flow through entire body. The high TDS of water may cause the adverse effect on roots of plants, the root system of the plants will have trouble taking up many nutrients that have applied. The high TDS may cause Undesirable taste, gastro intestinal irritations and corrosion or incrustation.

Fluorine is a naturally occurring element present in the earth, air, water, animals and plants. It quickly bonds with other elements particularly metals to become fluoride. The high concentration of fluoride may inhibit the process of photosynthesis and cause damage to plant tissues. It moves through plants with water, coming to rest along the outer edges of the leaves or the tips of needles. The effects of high concentration of fluoride in water are Brownish discoloration of teeth, bone damage.

IV. CONCLUSIONS

In the present study the ground water samples were collected from the different areas of Ellenabad city of Sirsa district to access the quality parameters. We found that the hardness and TDS in some areas are above the standard limits of WHO for drinking water. We all know that our daily life depends upon water and most of the community depends upon ground water.

From the results of the present study, we can say that the TDS and hardness in some areas is overreaching. The uptake of such water can cause various health problems. Therefore, we suggest that the people and government should be acquiring some technology for controlling the hardness and TDS for public health.

REFERENCES

[1] I. Vogel, Text Book of Inorganic Quantitative Analysis, 4 th Ed., ELBS, London(1978).

[2] Guidelines for drinking water quality, World Health organization, Geneva, Vol.1,(1993).

[3] Guidelines for drinking water quality, World Health organization, Geneva, Vol.2,(1999).

[4] Fluoride in drinking water, WHO / IWA,(2001).

[5] R Kavitha, K Elangovan, Int J Environ Sci,1(2), 145(2010).

[6] N.S. Bhujangaiah, and P. VasudevaNayak, J. Ind. Coun. Chem., 22 (1), 42,(2005).

[7] Y. Sun Alexander, 'CONSID: A Toolbox for Contaminant Source Identification'Ground Water, 46, 638(2008).

[8] Abdul Jamal, Poll. Res.,17(2), 111 (1998).

[9] B.K. Borah, H.P. Sarmah and R. Roy, Nat. Envi. Poll.Tech.10(1), 73,(2011).

[10] D.K Sinha, ShilpiSaxena and RiteshSaxena, Poll. Res.23(3), 527(2004).