Ground Water Quality Assessment of the Villages of Sirsa District with Respect to Fluoride

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ABSTRACT

Ground water is one of the major resources of the drinking water in rural area of the Sirsa city of Haryana. In the present study groundwater quality of the selected 20 villages of Sirsa city were taken for investigations, by collecting groundwater samples from all the villages. Local community utilized this water for drinking and irrigation purpose. Physico-chemical parameters were analyzed in November 2016 of different villages of Sirsa district of Haryana state for quality assessment. Various parameters like TDS, TH, TA, Ca, Mg, Chloride, Fluoride and nitrare were determined.

***Key words:** drinking water, fluoride, ground water, irrigation, TDS.*

I. INTRODUCTION

Ground water is the major source of water for drinking, agricultural and industrial purposes. The agriculture, chemical and organic waste adversely affects the physico-chemical properties of ground water. Water contamination is a serious process and may bring about a poor condition, water quality for monetary and recreational utilize, being risky to human wellbeing. Hints of metal particles have critical parts in a wide range of elements of life. Some of these lethal heavy metal levels are high, for example, harming by Fe, Pb, Ni influences the focal sensory system. Overwhelming metals nearness in nature as a rule is not risky for the earth since they are available just in little amounts [1,2,3,4]. Substantial metals are toxins in the earth just if it's available in vast amounts.

Fresh water is limited asset, fundamental for horticulture, industry and even human presence, without fresh water of sufficient amount, reasonable advancement won't possible[5]. Since water quality and human wellbeing are firmly related, water investigation before utilization is of prime significance. Certain physical, chemical and microbiological benchmarks which are projected to guarantee that the water is edible and fit to drink before it can be portrayed as potable[6].

Significance of groundwater water system in India has expanded in the current years, basically because of the way that groundwater offers dependability and adaptability in access to agriculture, drinking and for industrial purposes. Groundwater actually contains mineral particles broken down from soil particles, dregs and shakes as water goes along mineral surfaces of the aquifer[7]. Components like atmosphere, slant, weather conditions adds to the groundwater quality[8].

Physicochemical property like pH for water ought to be in the scope of 6.5 to 8.5 for drinking and residential purposes[9]. As an earth shattering part of DO sum in water nature of ground water, the normal convergence of DO was most astounding in post storm period and least in rainstorm thusly increment in BOD and COD[10].The parameters like pH, DO, biological oxygen demand(BOD),chemical oxygen demand(COD) add up to hardness(TH),calcium and magnesium were dissected utilizing standard procedures[11].

The variances in ideal pH extents may prompt an expansion or diminishing in the lethality of toxic substances in water bodies[12].The abnormal state of aggregate hardness is because of blending of sewage effluents into the waterways. The changeless hardness is mostly caused by chlorides and sulphates[13]. Fecal coli frames numbers/100 ml ought to be zero for water to be considered as no hazard to human wellbeing. All in all abnormal amounts of free CO_2 may be the purpose behind low pH esteems gotten in the stream water tests, which may thusly influence the bacterial count[14].

Ground water contains high measure of different particles, salts and so forth so on the off chance that we were utilizing such sort of water as consumable water then it prompts different water-borne diseases[15]. Dangerous drinking water added to various medical issues in creating nations, for example, the one billion or more episodes of carelessness of the intestines that happen annually[16]. The coli shape bacterium is the essential bacterial marker for fecal contamination in water[17,18].

Convergence of DO is a standout amongst the most essential parameters to show water virtue and to decide the passage and plenitude of different algal groups[19]. Abnormal state of TDS in water utilized for drinking purposes prompts numerous illnesses which are not water-borne but rather because of overabundance salts[20].

II. MATERIAL AND METHODS

The Water Samples were collected from four Different Stations in the Morning Hours between 9 to 11am, in Polythene Bottles. The Water samples were immediately brought in to Laboratory for the Estimation of various Physico-chemical Parameters like pH, TDS, TH, Ca, Mg, Total Alkalinity, Chloride, Fluoride and Nitrate using standard methods.

III. RESULTS AND DISCUSSION

The table shows the value of the quality parameters of the ground water of the study area.

Sample Station	Station Name	TDS (mg/l)	TH (mg/l)	Ca (mg/l)	Mg (mg/l)	Total Alkalinity (mg/l)	Chloride (mg/l)	Fluoride (ppm)	Nitrare (mg/l)	pH
1	Talwara Khurd	820	385	75	48	210	315	0.7	32	7.5
2	Talwara	1720	290	60	35	200	355	2.2	35	8.5

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	Khurd									
3	Talwara Khurd	1700	270	55	38	165	48	1.7	38	8.2
4	Nuhiyanwali	5100	2180	110	202	110	1980	1.6	42	8.5
5	Natar	227	115	22	17	160	165	0.8	38	7.0
6	Moju Khera	400	220	44	27	105	110	2.5	35	8.0
7	Kheowali	284	112	25	14	54	100	1.7	34	7.6
8	Majra	270	110	15	17	55	112	0.4	37	7.7
9	Keshupura	600	310	35	55	95	172	2.5	9.0	8.3
10	Ahmadpur	485	72	17	15	165	220	1.5	12	8.0
11	Kelnia	1400	42	60	235	174	325	2.2	10	8.2
12	Dhani 400	670	350	42	62	120	210	0.8	2.3	7.8
13	Chattargarh Patti	310	162	22	25	55	82	1.8	15	8.5
14	Ratta Khera	600	355	40	60	85	100	2.6	40	9.3
15	Moujdeen	352	150	20	24	70	120	0.9	8.2	8.4
16	Dhani Sohan Singh	505	210	32	35	90	80	1.0	6.2	8.2
17	Dhani Pratap Singh	602	280	32	48	50	200	0.4	8.2	8.0
18	Moujdeen	655	320	48	50	100	205	1.2	8.7	8.1
19	Kotli	870	500	250	98	250	190	1.2	9.8	8.5
20	Kharia	3500	1900	250	350	370	980	1.0	14	8.5

pH - WHO allowable cutoff for drinking water is 7 to 8.5. Without any substitute wellspring of water with pH 6.5 to 9.2 can be utilized. In the present investigations the pH estimation of tests fluctuates from 7.0 to 9.3. Maximum value is obtained at sample station 14 and minimum at station 1.

TDS - In the present study TDS ranged from 227 to 5100 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. Maximum value is obtained at sample station 4 and minimum at station 5.

Total hardness (TH), Calcium and Magnesium-Hardness is critical property of water from its residential perspective. Hard water causes issues in boilers in businesses. In the event that hard water is utilized for long stretch, it might be one of the reasons for stone development in body. At residential level if hard water is utilized for washing causes wastage of cleanser. Hardness is one of the essential properties of ground water from utility perspective for various purposes. The TH varies from 42 – 2180 mg/l. Maximum TH is obtained at sample

station 4 and minimum at station 11. Ca^{2+} and Mg^{2+} are essential parameter for total hardness. In our study Ca ranges from 15-250 mg/l and Mg ranges from 14-350 mg/l. Maximum Ca is obtained at sample station 19,20 and minimum at station 8 whereas maximum amount of Mg is present at station 20 and minimum at station 14.

Total alkalinity (T A)- Alkalinity is measure of the ability of water to neutralize acids the constituents of alkalinity in natural systems. The total alkalinity value ranges from 50-370 mg/l. Maximum alkalinity is obtained at sample station 20 and minimum at station 17. The WHO acceptable limit for alkalinity is 200 ppm in absence of alternate water source, alkalinity up to 600 ppm is acceptable for drinking purposes.

Chloride. Chloride occurs in all types of natural water. A high content of chloride gives salty taste to water. The chloride content in the ground quality of the study area is ranging from 80-1980 mg/l. Maximum chlorine is obtained at sample station 4 and minimum at station 3.

Fluoride- The ground water as a rule contain higher measure of fluoride particle broken up from topographical conditions while the surface water contain lesser measure of fluoride[21]. The danger of dental caries is decreased because of the take-up of fluoride by finish crystallites and arrangement of fluorhydroxyapatite which opposes corrosive solublization. Inordinate fluoride admission can prompt fluorosis of both teeth and bones. Kids between the ages of 2-3 year are at most danger of agony from corrective fluorosis. The fluoride satisfactory in ground water in various regions shifts as indicated by wellspring of water land arrangement of region, measure of precipitation and amount of water lost by dissipation. The different components that administer the arrival of fluoride particle in characteristic water by fluoride bearing minerals and rocks are fundamental substance piece of water, nearness and openness of fluoride particle and time of contact between source, minerals and water. The WHO allowable farthest point of fluoride in ground water is 1 ppm though in calm district, this assessable utmost is 1.5 ppm, where admission of water is low. In Indian conditions likewise, water which is having fluoride content up to 1.5 ppm is satisfactory. In the present examination the fluoride content in ground water shifts from 0.4-2.6 ppm. Maximum fluoride is present at sample station 14 and minimum at station 17.

Nitrate - Nitrate is a toxic part of ground water which is normal and in addition of anthropogenic in inception, Nitrate in ground water may have begun from agrarian exercises, modern effluents, septic tank squander, creature squander and so on. Nitrate is especially hazardous to babies, underneath the age of 6 months. The overabundance measure of nitrate in water causes a illness in kids, called blue child syndrome. The nitrate content in show think about reaches from 8.2-42 mg/l. Maximum nitrate is obtained at sample station 14 and minimum at station 1.

Table 2 – The table shows the stations which are fail according to the standards.

S. No.	Parameter	Range	Standards	Exceeding Samples
1	pH	6.5-8.5	WHO/BIS/USPH	Nil
2	TDS	500	WHO/BIS/USPH	12(1,2,3,4,9,11,12,14,17,18,19,20)

3	TH	300	WHO/BIS/USPH	15(1,2,3,4,6,9,12,13,14,15,16,17,18,19,20)
4	Ca	75-200	WHO/USPH	3(4,19,20)
5	Mg	30	WHO/BIS/USPH	7(1,2,3,4,9,11,12,14,17,18,19,20)
6	Total Alkalinity	200	WHO/USPH	2(19,20)
7	Chloride ions	250	WHO/BIS/USPH	5(1,2,4,11,20)
8	Nitrate ions	45	WHO/BIS	Nil
9	Fluoride ions	1-1.5	WHO/BIS	12(2,3,4,6,7,9,10,11,13,14,18,19)

IV. CONCLUSION

 In the present study water quality has been computed to assess suitability of groundwater quality for drinking purposes in Sirsa District, Haryana, India. Twenty groundwater samples were collected from different sites, to comprehensive physico-chemical analysis. For calculating the water quality nine parameters have been considered such as: pH, total hardness, calcium, magnesium, TA, fluoride, chloride, nitrate and total dissolved solids. The result shows that most of water samples exceeded the upper limit for drinking water. It represents that most of the studied samples laying in fourth class of WQI (very poor water). On the basis of above discussion, it may be concluded that the quality of ground water from some villages is not suitable for drinking purpose as directly from the sources. Hence in all sampling stations are required some degree of treatment before consumption and it also needs to be protecting from contamination.

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