ASSESSMENT OF GROUND WATER QUALITY (HAND PUMP) FOR SOME SELECTED PRIMARY SCHOOL IN TEHSIL ATARRA, DIST. BANDA U.P.

Sadhana Chaurasia [*]

Raj Karan [**]

Nandini [***]

ABSTRACT

Much of ill health that affects humanity, especially in the developing countries can be traced to lack of safe and wholesome water therefore groundwater samples were collected from six hand pumps of primary school of Atarra tehsil and analysed for its drinking water quality. Laboratory tests were performed for the analysis of pH, Hardness, Chloride, Alkalinity, TDS etc. On comparing the results against drinking water quality standards laid by World Health Organization (WHO), it was found that some of the water samples are non-potable for human.

In the present study, EC was found higher than permissible limit at all station, Total hardness, Calcium & Magnesium were also higher than permissible limit except S2 (Awashthi Ashram) and S6 (Nijaminagar), turbidity at S3 (Nagwara) was higher than permissible limit. Fluoride value was found high at S6 (Nijaminagar) and nitrate value was very high than the limit at S5 (Badausa area) .There cannot be state of positive health and well being without water. Thus an attempt has been made to find the quality of ground water in and around Atarra tehsil.

Key words: Quality, physico-chemical, standard, ground water

[*] Head.Dept. of Energy & Environment, MGCGV, Chitrakoot, Satna MP.485331,

[**] Research Scholar, Dept. of Energy & Environment, MGCGV, Chitrakoot, Satna M.P. 485331,

[***] Student, M.Sc. (Environment), Dept. of Energy & Environment, MGCGV, Chitrakoot, Satna M.P. 485331

INTRODUCTION

Water is not only a vital environmental factor to all forms of life, but it has also a great role to play in socio-economic development of human population. The extent of ground water pollution depends on rainfall pattern, depth of water table distance from the source of contamination, soil properties, such as permeability [3]. Water pollution is a growing hazard in many developing countries owing to human activity.

Groundwater is a vital natural resource. Depending on its usage and consumption it can be a renewable or a non renewable resource. It is estimated that approximately one third of the world's population use groundwater for drinking [2]. Groundwater is the major source of water supply for domestic purposes in urban as well as rural parts of India. The WHO [5] has clearly stated that the quality of drinking water is a powerful environmental determinant of health. Drinking-water quality management has been a key pillar in the prevention and control of waterborne diseases. Water is essential for life, but it can and does transmit disease in all countries of the world from the poorest to the wealthiest. Safe drinking water therefore is a basic need and hence, an internationally accepted human right [9], and reducing the number of people without access to sustainable safe drinking water supply has been enlisted as one of the ten targets of the millennium development goals. The importance of water quality in human health has also recently attracted a great deal of interest [6]. The evaluation and management of groundwater resources require an understanding of hydro-chemical investigation and the same was carried out to identify groundwater geochemistry and its suitability for drinking purpose.

Atarra is a region of intensive agriculture. Over the few decades, competition for economic development, associated with rapid growth in population and urbanization, has brought insignificant changes in land use, resulting in more demand of water for agriculture and domestic activities. Due to inadequate availability of surface water, to meet the requirement of human activities, groundwater remains the only option to supplement the ever-increasing demand of water.

Atarra is a medium-size town located at 25.28°N 80.57°E.It has an average elevation of 124 metres.Atarra is a rapidly growing city due to constantly increasing population. The present study was carried out in some selected government schools. The studies have been conducted in 6 schools. Many residential colonies in most developing countries where public water and

sanitation networks are not trusted or are altogether absent. Water pollution is a growing hazard owing to human activity. By keeping in view about cited information the present work has been undertaken to assess the quality of drinking water in few government schools. For the present study ten government schools are selected and ground water sample collected from them.

Objective-

1. To analyze water samples from different hand pumps from Govt. Primary School, Atarra.
2. To know the drinking water quality status of ground water.
3. To determine the ground water quality index.

MATERIALS & METHODS:

Collection of water Samples:

Ground water samples were collected for a period of three months from March to May 2012. Total eighteen Physico-chemical parameters of the water samples that were analyzed were obtained from 6 sampling sites. All water samples were collected in well cleaned sterilized (sun –Dried) wide mouthed bottles. The physical and chemical analysis was done within six hours. The dissolved oxygen was fixed in well sterilized 300 ml BOD bottles by using Manganous sulphate and Alkali-Iodide–azide. The physico-chemical were carried out in the laboratory were as follows (APHA AWWA WPCF 2005).

The physico–chemical attributes:

Temperature (^{0}C), Turbidity (NTU), Total Suspended Solids (mg/l), Total Dissolved Solids (mg/l), Total Solids (mg/l), pH, Conductivity (µmho/cm), Total Hardness (mg/l) , Calcium (mg/l), Calcium Hardness (mg/l), Magnesium(mg/l), Chloride (mg/l), Fluorides(mg/l), Iron (mg/l), Nitrates (mg/l), Sodium (mg/l), Potassium (mg/l).

The detail of ten sampling station are given below.

Table: 1 Showing sampling code and its detail

S.No.	Station Code	Detail of Stations
1.	S-1	Kanya primary school Atarra dist. (Banda)
2.	S-2	Primary school Awasthi ashram,Naraini

3.	S-3	Primary school Nagwara , Naraini, Atarra
4.	S-4	Primary school Turra, Area Naraini ,Atarra
5.	S-5	Primary school Badausa, area, Naraini,atarra
6.	S-6	Primary school Nijaminagar , Naraini, Atarra

RESULTS & DISCUSSION:

The physico-chemical quality of drinking water varied drastically among different sites of Atarra Tehsil. With reference to the standard ranges for different chemicals in drinking water as prescribed by WHO/IS the groundwater quality is important as it is the main factor determining its suitability for drinking, domestic, agricultural, purposes. Table 1 illustrates the physico-chemical parameters of groundwater in the Atarra Tehsil, showing the minimum, maximum and mean values. The values were compared with WHO and IS standard (Table 2)
The physico-chemical quality like pH, total alkalinity, iron, sodium and potassium were found within the permissible limit at all stations and turbidity was also found within the permissible limit except S3 (9.67 NTU). Higher turbidity increases water temperatures because suspended particles absorb more heat.

The mean value of electrical conductivity was ranged from 606.00-1689.33 µmho/cm.The EC values were found always beyond the permissible limit at all station. Conductance can help locate potential pollution sources because polluted water usually has a higher conductance than unpolluted waters. High conductance values often indicate pollution.The mean values of total hardness were range from 222.33-508.00 mg/l. Hardness is one of the very important parameter of ground water from utility point of view for different purposes. In the present study water was hard and crossed the permissible limits except S2 & S6. The total hardness is relatively high due to the presence of calcium, magnesium, chloride and sulphate ions. High amount of hardness in drinking water leads to heart diseases and kidney stone formation. The mean values of calcium were range from 25.22-134.40 mg/l. The calcium values were beyond the permissible limit at all station except S2 & S6.The Magnesium were range from 2.19-476.17. The magnesium values were also found beyond the limit except S2 and S6. The mean value of fluoride was ranged from 0.43-2.00 mg/l. Fluoride value was found

higher only at S6 2.00 mg/l. Health studies have shown that the addition of fluoride to water above 0.6 mg/l F leads to tooth decay in growing children.

The mean value of nitrate was ranged from 5.33-100.33 mg/l. Nitrate value at all station was found within the limit only S5 had very higher value minimum 100.00 mg/l and maximum 101.00 mg/l. High level of nitrate in ground water may be due to excessive use of agriculture fertilizers, decayed vegetable water, domestic effluent, sewage disposal industrial discharges, leachable from refuse dumps [7]. If the nitrates concentrations will increases than the permissible level water may get poisonous to pregnant woman or nursing woman. It has also been known to cause infant cyanosis (blue-baby) in children under the age of six months.

Table.2: Physico-chemical characteristics of ground water at various sampling station (2014).

Parameters		Sampling Station					
		S-1	S-2	S-3	S-4	S-5	S-6
Temp. (^{0}C)	Min.	28.00	29.00	31.00	31.00	30.20	31.00
	Max.	30.00	30.00	32.00	32.00	32.00	32.00
	Mean	29.00	29.67	31.67	31.67	31.07	31.33
	±SD	1.00	0.58	0.58	0.58	0.90	0.58
Turbidity (NTU)	Min.	2.00	2.00	9.00	4.00	4.00	3.00
	Max.	3.00	4.00	10.00	5.00	5.00	4.00
	Mean	2.33	3.00	9.67	4.33	4.33	3.33
	±SD	0.58	1.00	0.58	0.58	0.58	0.58
TDS (mg/l)	Min.	1836.00	516.00	456.00	544.00	1644.00	768.00
	Max.	1853.00	650.00	600.00	650.00	1900.00	900.00
	Mean	1843.00	592.67	541.33	598.00	1793.33	829.33
	±SD	8.89	69.06	75.61	53.03	133.23	66.49
TSS (mg/l)	Min.	3.60	14.04	28.00	0.80	5.20	0.80
	Max.	5.20	20.10	40.00	2.10	9.50	1.50
	Mean	4.37	17.91	33.33	1.63	7.57	1.10
	±SD	0.80	3.36	6.11	0.72	2.18	0.36
TS (mg/l)	Min.	1839.60	590.04	484.00	544.80	1649.20	768.80
	Max.	1858.20	670.10	640.00	652.10	1909.50	901.50
	Mean	1847.37	630.58	574.67	599.63	1800.90	830.43
	±SD	9.67	40.04	81.03	53.69	135.40	66.85

pH	**Min.**	6.11	6.58	6.10	6.10	6.40	6.12
	Max.	6.69	7.31	7.19	7.07	6.86	7.67
	Mean	6.33	6.92	6.74	6.54	6.60	7.03
	±SD	0.31	0.37	0.57	0.49	0.24	0.81
EC (µmho/cm)	**Min.**	929.00	588.00	491.00	600.00	1682.00	820.00
	Max.	1020.00	670.00	720.00	663.00	1700.00	888.00
	Mean	976.33	640.67	606.00	631.00	1689.33	859.33
	±SD	45.61	45.71	114.50	31.51	9.45	35.23
TH (mg/l)	**Min.**	507.00	220.00	384.00	364.00	424.00	71.00
	Max.	509.00	224.00	386.00	365.00	426.00	72.00
	Mean	508.00	222.33	385.33	364.67	425.00	71.67
	±SD	1.00	2.08	1.15	0.58	1.00	0.58
Ca (mg/l)	**Min.**	91.30	38.59	134.20	99.10	75.68	25.21
	Max.	92.51	39.23	134.60	99.24	75.70	25.23
	Mean	92.10	38.83	134.40	99.18	75.69	25.22
	±SD	0.69	0.35	0.20	0.07	0.01	0.01
Ca Hard (mg/l)	**Min.**	231.00	96.20	53.81	247.20	187.00	63.00
	Max.	232.00	96.80	53.92	247.80	189.00	64.00
	Mean	231.33	96.53	53.85	247.53	188.00	63.33
	±SD	0.58	0.31	0.06	0.31	1.00	0.58
Mg (mg/l)	**Min.**	67.56	30.10	60.90	476.10	57.33	2.18
	Max.	67.58	30.90	60.92	476.20	57.35	2.19
	Mean	67.57	30.37	60.91	476.17	57.34	2.19
	±SD	0.01	0.46	0.01	0.06	0.01	0.01
T.Alkalinity (mg/l)	**Min.**	297.00	305.00	262.00	302.00	198.00	298.00
	Max.	300.00	308.00	264.00	304.00	200.00	300.00
	Mean	298.67	306.67	263.00	303.00	199.00	299.00
	±SD	1.53	1.53	1.00	1.00	1.00	1.00
Chloride (mg/l)	**Min.**	113.40	56.70	28.32	56.72	312.00	70.89
	Max.	113.46	56.73	28.36	56.73	312.02	70.91
	Mean	113.43	56.71	28.34	56.73	312.01	70.90
	±SD	0.03	0.02	0.02	0.01	0.01	0.01
Nitrate (mg/l)	**Min.**	45.00	5.00	5.00	10.00	100.00	25.00
	Max.	46.00	10.00	6.00	11.00	101.00	27.00
	Mean	45.33	7.67	5.33	10.33	100.33	26.00
	±SD	0.58	2.52	0.58	0.58	0.58	1.00
Iron (mg/l)	**Min.**	0.10	0.20	0.30	0.10	0.10	0.10
	Max.	0.20	0.30	1.00	0.30	0.30	0.20

	Mean	0.17	0.23	0.77	0.20	0.20	0.17
	±SD	0.06	0.06	0.40	0.10	0.10	0.06
Fluoride (mg/l)	**Min.**	0.40	1.00	0.40	0.90	1.00	2.00
	Max.	0.50	2.00	0.50	1.00	2.00	2.00
	Mean	0.43	1.33	0.47	0.97	1.33	2.00
	±SD	0.06	0.58	0.06	0.06	0.58	0.00
Sodium (mg/l)	**Min.**	23.40	61.20	17.60	19.80	113.90	82.20
	Max.	23.90	62.00	17.70	20.00	114.30	83.20
	Mean	23.70	61.67	17.67	19.90	114.13	82.80
	±SD	0.26	0.42	0.06	0.10	0.21	0.53
Potassium (mg/l)	**Min.**	18.70	0.00	0.50	13.00	11.10	11.80
	Max.	18.90	0.00	0.60	13.40	12.20	12.00
	Mean	18.80	-------	0.53	13.20	11.80	11.90
	±SD	0.10	--------	0.06	0.20	0.61	0.10

Table:3. Showing standards for drinking water

S.N.	**Parameters**	**USPH Standard**	**ISI Standard**	**IS standard**	**World Health Organization (WHO,1994)**	**Bureau of Indian Standard (BIS,1990)**	**Indian Council of Medical Research (ICMR, 1975)**
1.	pH	7.0-8.5	6.0-9.0-	6.5-8.5	7.0-8.5	6.5-8.5	7.0-8.5
2.	Turbidity	25 JTU	25 JTU	10 NTU	10	5	10
3.	TDS	500	-		500	500	-
4.	Conductivity	300 mho cm^{-1}	-		500	-	500
5.	Alkalinity	-	-	-	200	-	200
6.	Fluoride	1.5	3.0	0.6-1.2			
7.	Chloride	250	600	250	200	-	200
8.	Mg	30	-	30	30	30	30
9.	Iron	<0.3	-	0.3			
10.	Calcium	100	-	75	75	75	75
11.	TH	-	-	300	300	300	300
12.	Nitrate	-	-	45		-	-
13.	Sodium	-	-	-	200	-	-
14.	Potasium	-	-	-	20	-	-

Fig.1: Showing TDS and EC at various stations.

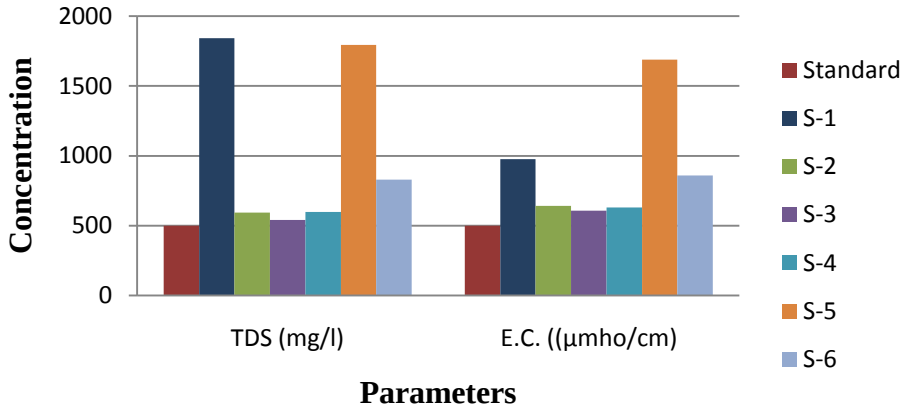
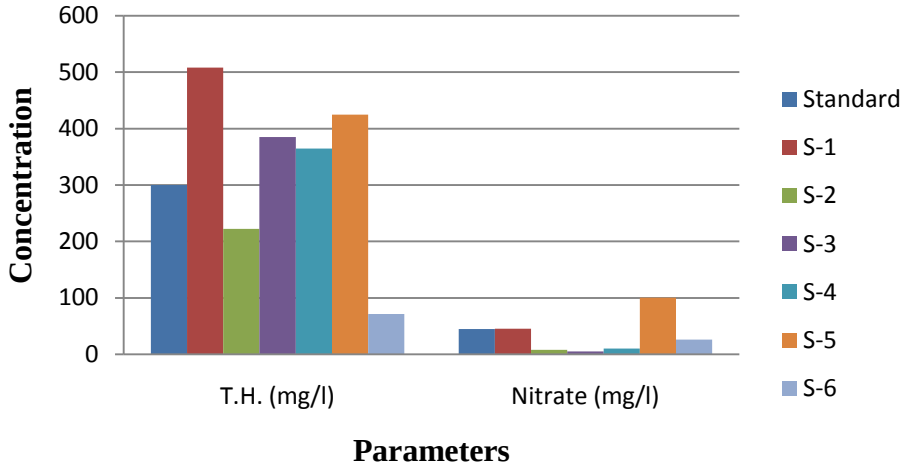


Fig.2: Showing Total hardness and Nitrate at various stations



CONCLUSION

In the current study, the groundwater samples showed deviations from drinking water quality standards indicating groundwater contamination. This study shows that ground water is the only source of water for school children in the study area, and the results of the chemical analyses indicate considerable variation. Most of the water samples do not comply with WHO/IS standard. The water quality in the investigated area was found to be suitable for drinking only in

few locations, while as with prior treatments. It must be noted that a regular chemical analsysis must be done to insure that the quality of water in this area is suitable for drinking purpose.

BIBLIOGRAPHY-

1. A.Narsimha, S. Geetha, V .Sudarshan, P.Swathi and P.Srinivasulu. (2012) Physico-chemical analysis of drinking water quality in Hanamkondaarea,Warangal District, Andhra Pradesh,India.Journal of chemical and pharmaceutical Research,4(9):4255-4259.
2. Ahmad.S and Mishra.A (2014) A study on physico-chemical properties of ground water quality of various locations of Kanpur city.International Journal of science and Research (IJSR).3(3):177-179
3. Chaurasia.S and Gupta. A.D (2012) Assessment of groundwater quality and its suitability for Drinking and Agriculture purpose used in District Banda, Utter Pradesh, India.World Journal of Environmental Biosciences 2(1):49-57.
4. Dhakad .N.K, Shinde.D and Choudhary.P.(2008) Water quality index of ground water(GWQI) OF Jhabuatown,M.P.(India). Journal of Environmental Research and development. 2(3):443-446.
5. Longe.E.O. and Balogun.M.R.(2010) Groundwater quality Assessment near a Municipal Landfill, Lagos, Nigeria. Research journal of Applied Science, Engineering and Technology,2(1):39-44.
6. Mahesha, Naik.N and Prasad N.R.R (2004) Physico-chemical characteristics of bore well water in Arsikere Taluk, Hassan. IJEP, 24(12):897-904.
7. Makhijani SD, Manoharan A. (1999). Nitrate pollution problem in drinking water sources: Monitoring and surveillance. Paper presented in the workshop water quality field test kits for Arsenic, Fluoride and Nitrate held from 8-9 Sept. at ITRC, Lucknow.
8. Manjare S.A, Vhanalakar S.A and Muley D.V.(2010) Analysis of water quality using physico-chemical parameters Tamdalge Tank in Kolhapur District, Maharashtra.International Journal of Advanced Biotechnology and Research.1(2):115-119.

9. MaruthiY.A , Hossain K , and Goswami A. (2012) Assessment of drinking water quality in some selected primary school in Visakhapatnam. Pelagia Research Library 3(5): 1071-1074.
10. Mulla.J.G, Asif.S, Abed.S, Pardhan.V (2012) Ground water quality Assessment of Babalgaon, District Latur. Journal of chemical, Biological and physical science. 2(1):501-504.
11. Nath.V.R.A, and Helen, H.M (2013) Evaluation of ground water quality in Neyyattinkara Taluk, Kerala. Journal of chemical and Pharmaceutical Research, 5(4):201-207.
12. Reddy.N.B.Y and Prasad.K.S.S (2005) Hydrochemistry of groundwater in and around Tadpatri area, Anantapur District, andhara Pradesh. Journal IAEM, 32(2):64-73.
13. Sivasankaran M.A, Reddy S.S and Ramesh R. (2005) Geochemical characteristics of groundwater in Pondicherry Region, India. Journal IAEM, 32(2):96-114.