Current World Environment Vol. **7**(1), 37-39 (2012)

Chemical Properties of Drinking Water of Renigunta Near Tirupati, Andhra Pradesh, India and its Impact on Human Health

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(Received: January 25, 2012; Accepted: March 12, 2012)

ABSTRACT

This paper is an attempt to assess the effect of drinking water quality on health of the people living in Renigunta, an industrial area near Tirupati, Andhra Pradesh, India. Drinking water samples were collected from 40 different locations of Renigunta and analyzed for physicochemical parameters such as pH, hard ness, alkalinity, calcium, magnesium, iron, nitrates, chlorides, sulphates, electrical conductivity, total solids (TS), total dissolved solids (TDS), total suspended solids (TSS), dissolved oxygen (DO), chemical oxygen demand (COD) and bio chemical oxygen demand (BOD). The found values of physicochemical parameters were compared with the World Health Organization water quality standards. Study of all these characteristics and correlation studies indicate that in some of the studied areas water was polluted and not suitable for drinking purpose. The drinking water of the area needs some degree of treatment before consumption and prevention steps to be taken from contamination.

Key words: Drinking water, Physicochemical parameters, Electrical conductivity, Total dissolved solids, Hardness.

INTRODUCTION

The quality of drinking water is vital concern for mankind since it is directly linked with human health. People of rural areas located around Tirupati are mainly dependent on ground water for drinking and other domestic needs. Thus, in this paper an attempt was made to assess the physico chemical analysis of drinking water in the view of health of human beings living in this area.

EXPERIMENTAL

Drinking water of different polluted locations at Renigunta area near Tirupati was studied during the period from March 2011 to August 2011. Electrical conductivity values were measured using Elico CM 180 conductivity bridge. Total alkalinity was evaluated by titration with standard 0.1M HCl using methyl orange and phenolphthalein as indicators[1]. Standard procedures[2-5] involving spectrophotometry, flame photometry and volumetry were used for the determination of water quality parameters. All the chemicals used were of AR grade.

RESULTS AND DISCUSSION

Most of the waters are slightly alkaline due to presence of carbonates and bicarbonates. pH below 6.5 starts corrosion in pipes, thereby releasing toxic metals such as Zn, Pb, Cd and Cu etc[3]. All the sampling points showed pH values within the limit prescribed by WHO.

Hardness of water depends upon the amount of calcium and magnesium salts. Hardness value in the studied area varied between 423-538 mg/L. 6 sampling points showed higher hardness values than the prescribed limit by WHO.

Alkalinity is due to the presence of bicarbonate, carbonate and hydroxide compounds of calcium, sodium and potassium. Alkalinity itself is not harmful to human beings[4]. Alkalinity value in the studied area varied between 218-580 mg/L. 8 sampling point showed alkalinity value within the

Table 1: Average results of chemical parameters

Sampling Point	pH	Hardness (mg/L)	Alkalinity (mg/L)	Ca^{2+} (mg/L)	Mg^{2+} (mg/L)	Fe^{2+} (mg/L)	NO_3^- (mg/L)	Cl^- (mg/L)	SO_4^{2-} (mg/L)
S1	6.7	445	304	118	71	0.39	8	231	146
S2	6.8	445	317	124	68	0.27	14	232	157
S3	6.9	445	329	126	87	0.45	4.2	232	161
S4	7.9	472	432	177	73	0.49	10.5	243	178
S5	8	472	437	179	62	0.16	4.8	246	154
S6	8.1	483	463	189	72	0.7	3.5	246	169
S7	8.1	483	490	192	74	0.71	13.6	249	137
S8	8.4	527	531	294	54	0.38	3.8	269	175
S9	7.8	467	427	169	66	0.52	6.9	242	174
S10	8.2	499	519	208	75	0.45	9.1	262	162
S11	8.3	462	520	219	77	0.5	12.5	263	136
S12	8.3	517	524	273	80	0.48	14.6	265	180
S13	8.4	494	543	306	83	0.61	11	269	175
S14	8.4	501	560	319	84	0.48	14.3	271	182
S15	8.5	483	580	320	87	0.5	20.1	310	214
S16	6.5	440	233	83	58	0.36	11.5	215	190
S17	6.6	430	234	84	60	0.44	23	218	208
S18	6.7	445	298	107	62	0.42	4.8	230	162
S19	6.7	453	304	118	62	0.39	8.5	231	146
S20	7	462	387	144	67	0.57	11.6	239	163
S21	7.1	445	392	144	68	0.21	6.3	239	171
S22	7.2	464	397	159	68	0.43	6.5	240	172
S23	7.4	471	406	162	69	0.57	11	240	182
S24	7.9	447	429	174	70	0.62	7.4	243	143
S25	7.7	483	416	164	69	0.51	10	240	224
S26	7.8	472	422	164	70	0.32	18.4	242	170
S27	7.8	527	427	169	70	0.52	16.4	242	174
S28	6.9	439	329	126	63	0.45	11.5	232	161
S29	7	453	378	137	66	0.43	20.8	237	159
S30	6.6	448	244	91	61	0.29	22.1	223	189
S31	6.7	431	245	92	61	0.38	22.5	227	168
S32	6.7	441	296	106	62	0.37	9.6	227	171
S33	7.9	524	432	177	71	0.49	10	243	178
S34	8	538	437	179	72	0.16	4.2	246	154
S35	6.8	454	317	124	63	0.27	14	232	157
S36	6.6	445	238	89	61	0.31	8.6	221	163
S37	6.5	445	231	81	57	0.25	21.5	214	209
S38	6.5	439	218	78	54	0.23	11	210	210
S39	6.5	441	229	80	55	0.31	16	211	171
S40	8.2	423	501	197	73	0.41	11	251	154
WHO	6.5-8.5	500	250	75	50	0.3	45	250	200

limit prescribed and 32 sampling points showed higher alkalinity values than the prescribed limit by WHO

Calcium value in the studied area varied between 78-320 mg/L. All the sampling points showed higher calcium values than the prescribed limit by WHO. If calcium is present beyond the maximum acceptable limit causes incrustation of pipes, poor lathering and deterioration of the quality of clothes.

Too high magnesium causes nausea, muscular weakness and paralysis in human body when it reaches a level of about 400mg/L[8]. Magnesium value in the studied area varied between 54-87 mg/L.

DO value in the studied area varied between 2.3-5.7 mg/L. 9 sampling points showed higher DO values than the prescribed limit by WHO. High amount of DO imparts good taste to water. BOD value in the studied area varied between 1.4-3.2 mg/L. All sampling points showed BOD values within the limit prescribed by WHO. Ground water with high value of BOD is due to microbial activities related to the dumpsites.

When electrical conductivity value exists at 3000 µ mho/cm, the generation of almost all the crops would be affected and it may result in much reduced yield[6]. It is considered to be an indication of the total dissolved salt content[10]. Conductivity value in the studied area varied between 1094-2400 µS/cm. 9 sampling points showed higher conductivity than the prescribed limit by WHO.

CONCLUSION

According to WHO, nearly 80% of all the diseases in human beings are caused by water[11,12]. The water quality parameters of the various areas of Renigunta, near Tirupati indicates that the drinking water samples are contaminated and the quality is poor for drinking purpose. After purification treatment only this water can be used for drinking. The values of correlation coefficients will help in selecting proper treatment to minimize pollution. Drinking water pollution in the studied area should be controlled by the proper environment management plan to maintain proper health conditions of people.

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