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Ground Water Quality Assessment Of Nagercoil Town (Hand Pumps)

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Abstract

Physico-chemical characteristics of water samples collected from 15 hand pumps from Vadasery, Chettikulam and Kottar of Nagercoil Town were analyzed for ground water quality assessments. The pH of the bore water from study area slightly acidic, where as total alkalinity, total hardness, Nitrate, Sodium, Pottasium, Iron and Phosphate showed above the permissible limit.

Key Words: Water contamination, Nitrate, Fluoride, Physico-chemical.

1. Introduction

Kanyakumari district, a part of the south Tamil Nadu. The study areas are coming under Agastheswaram Taluk of Kanyakumari District, Tamil Nadu, India. The district is located in between 8º-03' to 8º-35' ºN and 77º-15' to 77º-36, ºS. The district population is 16,76,034 (2001 census) which includes 8,32,269 males and 8,43,765 females spreading in an area of 1672 KM^2. Most of the inhabitants are using hand pumps water, and rest is using well water and municipality tap water for their domestic purpose. There are equal numbers of modern houses, old as well as small tiled houses, in the study area. Concern for water shortage for various used, especially, for domestic purposes has been gaining world wide attention (Anonymous 1994 and Serageldin 1995) and substitution to this problem utilization of ground water as alternate source for domestic purposes has been gaining world wide attention (Rahman 1996, Growd 2005, Ravinder et al.2005)

The problem of water shortage is most acute in the Mega cities of developing countries. Hand pumps are of immense use during water scarcity periods. The residents of this town under server water shortage resort to using whatever supply may be available. Besides the municipal water supply, the other sources include harvesting of ground water. This paper examines ground water quality available through hand pumps of Nagercoil Town.

2. Materials And Methods

The paper is a part of research work on water contamination in Nagercoil Town of Kanyakumari district. The information presented here is a result of field and laboratory analysis of water quality. The present work includes the ground water assessment of Nagercoil town of Vadasery, Chettikulam and kottar water sample was collected in clean disinfected polyethylene containers from 15 hand pumps.

Water Quality Analysis

Water quality parameters including physical and chemical characteristics are performed by using standard procedures.

2.1.1. Estimation of pH

pH measurements of the water samples are performed with the help of a pH meter and the values are expressed in pH scale.

2.1.2. Estimation of alkalinity

Alkalinity is determined by titration with 0.02 H_2SO_4 using methyl orange and phenolphthalein as indicators.

2.1.3. Estimation of total hardness

Total hardness of the water samples are estimated by titration with standard ethylene diamine tetra acetic acid (EDTA) using calmagite as indicator.

2.1.4. Estimation of Calcium

Calcium reacts with EDTA in the presence of a selective indicator at high pH (12 to 13) and magnesium is allowed to precipitate as its hydroxide.

2.1.5. Estimation of iron by Ammonium thiocyanide method

Ferric iron combines with thiocyanate ions to form red coloured ferric thiocyanate ions which is measured colorimetrically.

2.1.6. Estimation of manganese

The manganese salts are oxidized to permanganate by persulphate in acidic medium. The resulting colour of the permanganate is measured photometrically.

2.1.7. Estimation of Nitrite by photometric method

Acidification of the water samples containing NO_2-N leads to the formation of nitrous acid. By the addition of an aromatic amine (sulphanilamide), a diazonium salt is formed. This quantitatively couples with a second aromatic amine, N (1-naphthyl) – ethylenediamine dihydrochloride. This coupling yields a pink azodye with absorption maximum at 540nm.

2.1.8. Estimation of Nitrate (Brucine Sulphate Method)

Nitrate ions react with brucine in con.H_2SO_4 to form yellow colour which is measured photometriically. Measure the OD at 410 nm.

3. Results And Discussion

Ground water is a distinguished component of the hydrologic cycle. Water storage and groundwater with drawal are traditional engineering approaches which will continue to be followed in future. The chemical quality of ground water is related to the lithology of the area. Weathered Mantle, soils and atmosphere are the important factors responsible for contribution of dissolved solids to water. It is impossible to control the dissolution of undesirable constituents in

the waters after they enter the ground (Johnson 1979). The ground water was found to be colorless, its odour was unobjectionable and baste agreeable at the hand pumps surveyed.

The pH of hand pump samples was categorized with in the safe limits are per the standards of Tamil Nadu water supply & orgainse Board, with few exception falling in the acidic range pH of the bore well water samples in the study areas are with in the permissible limit ie. 6.5 – 8.5 of Indian standers (WHO 1996) (C/03, V/04) (Fig 1)

The hard water is not suitable for domestic uses such as washing, and laundering. In the present study the hardness values are ranging from 112-328 Mg/l. Total hardness of the water is defined as the presence of multivalent of hardness in water is dissolved polyvalent Metallic ions sedimentary rocks, and run off from soils (WHO 2002). The water samples had total hardness greater than 300 Mg/l May lead to heart and kidney problems (Satya Narayana and Guru Prasad 2006) and is not suitable for drinking purpose.

Total Dissolved solids (TDS) in water less than 1000 Mg/l has been classified as non-saline (Anony Mous 1989). So in the present study, few hand pumps found to be under non Saline category were as follows: C/01 to C/05. (Table 1)

Chloride in the form of chloride ion is one of the Major inorganic anion in water. All water samples had chloride falling under permissible limits (200-1000 Mg/l).

Excessive levels of fluoride ie above 1.5 Mg/l in the drinking water, may result in dental and skeletal fluorosis. In the study area all water sample had fluoride falling under desirable limit.

Apart from fluoride nitrate pollution is a major problem is some states in India. Sewage and other waste rich in nitrate cause blood disorders (Bowman 1994). But in the study area Nitrate falling above permissible limit. (C/01, C/04, V/04, V/05, K/01) (Table 1, 2, & 3).

As far as iron is concerned water samples from the bore wells are higher than the permissible limits. (C/01 to C/05, V/01 to V/05, K/01 to K/05). In the present study Sodium, Pottasium and Phosphate level are more than the permissible limit (Table 1, 2, &3) (C/01 to C/05, V/01 to V/05, K/01 to K/05).

4. Conclusion

The higher proportion of dissolved constituents are found in ground water, in some study area because of greater interaction of ground water with various materials in geologic strata.

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References

Anonymous,(1989),J.G, Management System To Reduce Nitrates. UK

Anonymous, (1994) "World Resources", (1994-95). Oxford University Press.

Gowd, S.S. (2005), "Assessment Of Ground Water Quality For Drinking And Irrigation Purpose". Environmental Geology 48, PP. 702-712.

Johnson, C.C. (1979), Land Application Of Water An Accident Waiting to Happen Ground Water 17(1), PP. 69-72.

Mamta Rawat and G.R. Jakher, (2008), Indian Journal Of Environmental Science, 12(2), PP. 119-124.

Rainman, A. (1996), "Water Science and Technology" 34 (7-8), PP. 285-292.

Ravinder, G. Ch Ravinder and R.K. Viyaya, (2005), "Ground Water Pollution Due To Dumping Of Municipal Solid Water at Warangal". Indian Journal of Environment Protection 25 (6), PP. 523-526.

Satya Narayana. T. and B.Guru Prasad, (2006), "Hydrogeological Study Of Sub-surface Waters Nature, Environment and Pollution Technology" 5(3), PP. 459-461.

Serageldin, I. (1995), "Towards Sustainable Management Of Water Resources. The World Bank", Washington DC.

Subramanian, A. (2010). "Epidemiological Studies on Dental Fluorosis In Rural Population of Kanyakumari District", PP. 53-60.

WHO, (1996), Guidelines For Drinking Water Quality. 2nd edition, Vol -2, Health Criteria And Other Supporting Information. WHO. Geneva.

WHO 2002. Environment Health criteria, 227,. Geneva; 14-20. PP.14-20.

Table .1 physical Chemical Characteristics of Water of hand pumps from Chettikulam

(Except pH, all values are in Mg/l

Sl. No	Id no. of Hand pumps	pH	T.D.S	otal Alkalini	Total hardness	Ca	Mg	Na	K	Fe	No_2	No_3	Cl	F	So_4	Po_4
1.	C/01	7.9	1115	320	320	96	29	194	38	1.16	0.03	69	295	0.6	33	0.75
2.	C/02	7.1	1148	276	276	68	104	104	44	1.02	0.03	19	335	0.6	39	0.73
3.	C/03	6.4	1216	290	290	61	162	162	33	1.09	0.01	7	410	0.7	30	0.69
4.	C/04	7.6	1164	309	309	73	128	128	35	1.04	0.30	61	361	0.4	32	0.57
5.	C/05	7.5	1139	328	328	92	146	146	43	1.14	0.17	8	390	0.9	38	0.74

Note: Ca - Calcium, Mg - Magnesium, Na - Sodium, Fe - Iron, Mn – Manganese, No_2 – Nitrite, No_3 –Nitrate, Cl –Chloride, F-Fluoride, SO_4 –Suphate, PO_4 –Phosphate.

Table .2 physical Chemical Characteristics of Water of hand pumps from Vadasery

(Except pH, all values are in Mg/l

Sl.	Id no. of	pH	T.D.S	otal Alkalini	Total	Ca	Mg	Na	K	Fe	No_2	No_3	Cl	F	So_4	Po_4

No	Hand pumps				hardness											
1.	V/01	7.3	415	148	112	34	7	94	21	1.21	0.03	10	82	0.4	23	1.75
2.	V/02	7.4	580	160	144	43	9	114	10	1.17	0.59	10	146	0.4	34	2.30
3.	V/03	7.2	634	181	139	41	6	126	13	1.26	0.62	10	138	0.6	27	2.19
4.	V/04	6.9	543	176	126	36	4	109	16	1.13	0.17	48	124	0.5	29	1.83
5.	V/05	7.8	586	144	127	39	5	97	13	1.19	0.23	57	110	0.6	32	1.72

Note: Ca - Calcium, Mg - Magnesium, Na - Sodium, Fe - Iron, Mn – Manganese, No_2 – Nitrite, No_3 –Nitrate, Cl –Chloride, F-Fluoride, SO_4 –Suphate, PO_4 –Phosphate.

Table .3 physical and Chemical Characteristics of Water of hand pumps from Kottar

(Except pH, all values are in Mg/l

Sl. No	Id no. of Hand pumps	pH	T.D.S	Total Alkalinit	Total hardness	Ca	Mg	Na	K	Fe	No_2	No_3	Cl	F	So_4	Po_4
1.	K/01	7.4	652	160	272	69	24	78	18	1.20	0.02	62	182	0.6	27	1.05
2.	K/02	7.3	726	152	320	80	29	1132	14	1.09	0.51	19	230	0.4	25	1.90
3.	K/03	7.7	818	118	291	71	23	86	19	1.08	0.49	18	190	0.4	25	1.12
4.	K/04	7.3	714	123	303	76	24	88	13	1.14	0.44	10	176	0.7	34	1.24
5.	K/05	7.2	693	149	319	70	30	106	18	1.23	0.40	12	209	0.6	26	1.07

Note: Ca - Calcium, Mg - Magnesium, Na - Sodium, Fe - Iron, Mn – Manganese, No_2 – Nitrite, No_3 –Nitrate, Cl –Chloride, F-Fluoride, SO_4 –Suphate, PO_4 –Phosphate.

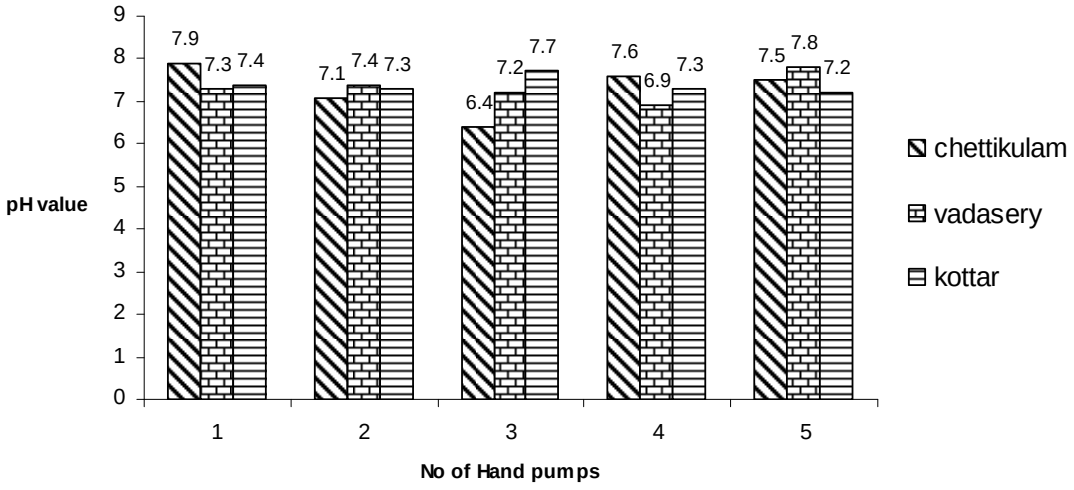

Figure.1. Reveals The Amount of pH In Bore Well Water From The Study Area (Chettikulam, Vadasery and Kottar)