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## Physico-Chemical Characteristics of Bore Well Water Quality in Rasipuram Region, Tamil Nadu, India



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### ABSTRACT

This study is based on the analysis of ground water, Municipal water and sewage water in Rasipuram area at Namakkal District, Tamil Nadu, India. Bore well water, Municipal water and sewage water were collected from five different area in Rasipuram within six months duration (from March 2016 to August 2016) and analyzed the physico-chemical parameters such as Colour, Odour, Turbidity, Total Dissolved Solids, Electrical Conductivity, pH, Total alkalinity, Total hardness, Calcium, Magnesium, Sodium, Potassium, Iron, Manganese, Ammonia, Nitrite, Nitrate, Chloride, Fluoride, Sulphate, Phosphate, Dissolved Oxygen, Biological Oxygen Demand and Chemical Oxygen Demand. These data were compared with the World Health Organization data.



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## 1. INTRODUCTION

Water plays an essential role in human life. Although statistics, the WHO reports that approximately 36% of urban and 65% of rural Indian were without access to safe drinking water [1]. Fresh water is one of the most important resources crucial for the survival of all the living beings. It is even more important for the human being as they depend upon it for food production, industrial and waste disposal, as well as cultural requirement [2]. Human and ecological use of ground water depends upon ambient water quality. Human alteration of the landscape has an extensive influence on watershed hydrology Gurunathan, 2006[3]. Ground water plays a vital role in human usage. The consequences of urbanization and industrialization leads to spoiling the ground water is explored in rural especially in those areas where other sources of water like dam and river or a canal is not considerable. During last decade, this is observed that ground water polluted drastically because of increased human activities. Frequently in many cases of water borne diseases has been seen which a cause of health hazards. An understanding of water chemistry is the fundamental knowledge of the multidimensional aspect of aquatic environmental chemistry which involves the source, composition, reactions and transportation of water. The quality of water is of vital concern for the mankind since it is directly linked with human welfare. It is a matter of history that facial pollution of drinking water caused water-borne diseases.

In the present study, to study the drinking water, Municipal water and sewage water collected from different locations in Rasipuram region, Namakkal District, Tamil Nadu, India and the data were compared with WHO standard data.

## 2. MATERIALS AND METHODS

### 2.1 Study Area:

Rasipuram area in Namakkal District in Tamil Nadu is geographically situated between the North latitudes 11°44' to 12°23' and East longitudes 78°18' to 79°92' covering an area about 24 Km. Rasipuram people used groundwater as drinking water collected from bore well. The water samples were collected from major areas in Rasipuram like Athanur, Andagalore Gate, Puduchatram, Rasipuram, Vaiyappamalai, Municipal water and sewage water.

## 2.2 Sampling:

Water samples were collected from five different areas in and around Rasipuram. The samples were collected through random selection level and tightly stoppered without introduction of air. Water quality parameters directly related to the safety of the drinking water to human use. These parameters provide important information about the health of a water body.

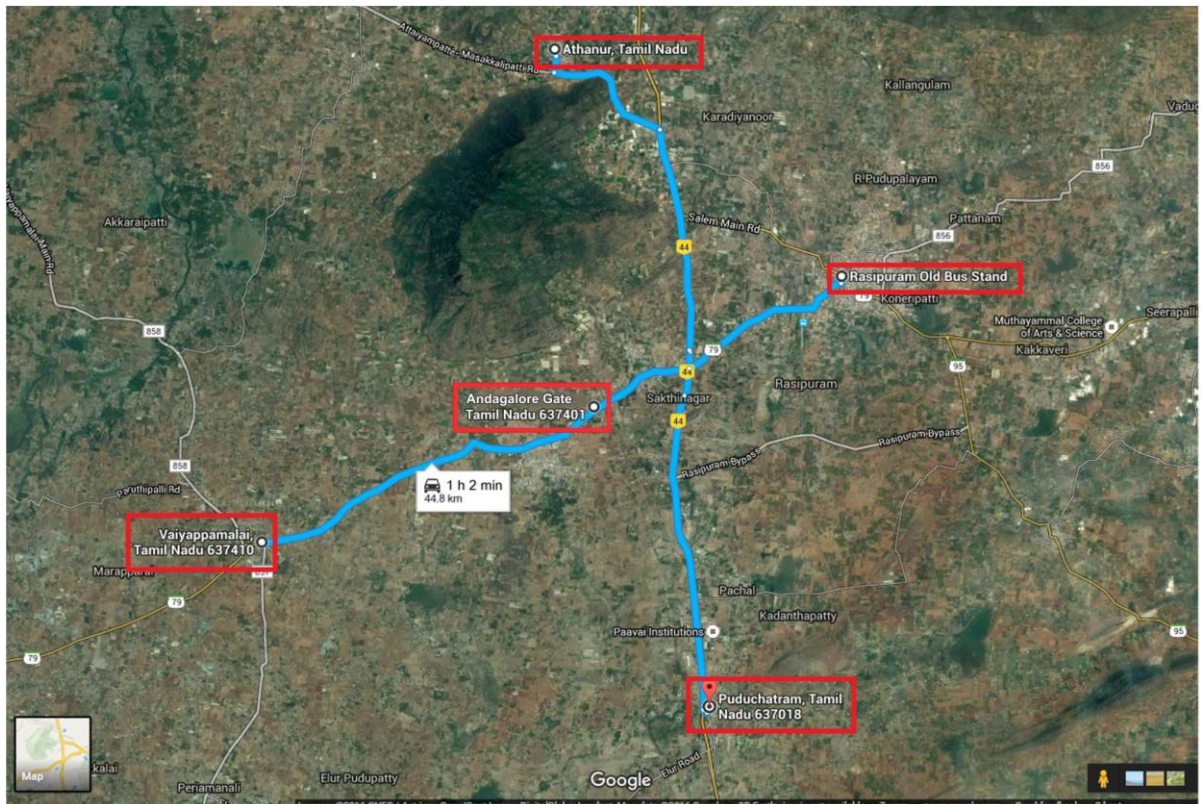


Fig.1 Rasipuram Region

### 3. RESULTS AND DISCUSSION

The result of the physico-chemical parameters for water sample are presented in Table-I

**Table – I Results of water analysis collected from Athanur, Andagalore Gate, Puduchatram, Rasipuram, Vaiyappamalai, Municipal water & sewage water with six months duration**

Parameters	Acceptable limit	Athanur		Andagalore Gate		Puduchatram		Rasipuram		Vaiyappamalai		Municipal water		Sewage water	
		Mar	Aug	Mar	Aug	Mar	Aug	Mar	Aug	Mar	Aug	Mar	Aug	Mar	Aug
Appearance	Clear	Clear		Clear		Clear		Clear		Clear		Clear		Unclear	
Colour	Colourless	Colourless		Colourless		Colourless		Colourless		Colourless		Colourless		Blackish	
Odour	Agreeable	Pleasant		Pleasant		Pleasant		Pleasant		Pleasant		Pleasant		Septic	
Turbidity	5.0NTU	0.3	0.1	0.2	0.2	0.3	0.2	0.4	0.2	0.2	0.1	0.3	0.4	146	158
TDS	500mg/l	2450	2250	2170	2050	2730	2225	1540	1320	2730	2150	501	516	1110	1795
EC	1400 $\mu$ mho/cm	1500	3500	1600	3100	1700	3900	1750	2200	1950	3900	702	716	1586	1800
pH	6.5 to 8.5	7.63	7.15	7.38	7.20	7.29	6.28	7.41	7.46	7.52	7.1	7.84	7.79	9.64	10.16
Alkalinity	200mg/l	444	215	312	220	536	300	424	275	424	215	226	242	680	710
Hardness	300mg/l	960	225	780	270	700	220	660	250	1000	500	216	208	320	460
Calcium	75mg/l	224	115	184	120	168	112	152	116	240	135	78	74	272	326
Magnesium	30mg/l	96	85	77	70	67	62	67	64	96	80	12	16	34	52
Sodium	200mg/l	292	180	288	185	270	210	188	189	272	199	106	102	208	310
Potassium	30mg/l	28	15	28	15	25	18	18	8	32	17	10	11	78	84
Iron	0.3mg/l	0.008	0.006	0.014	0.016	0.009	0.001	0.012	0.019	0.02	0.025	0.018	0.016	0	0.004
Ammonia	0.5mg/l	0.260	0.26	0.194	0.125	0.008	0.05	0.106	0.1	0.099	0.1	0.026	0.019	10.6	12.16
Nitrite	--mg/l	0.008	0.005	0.005	0.002	0.006	0.003	0.003	0.001	0.007	0.002	0.008	0.006	0.026	0.031
Nitrate	45mg/l	75	55	126	115	83	54	26	15	90	82	5	7	11	13
Chloride	250mg/l	560	223	520	242	580	249	424	215	680	239	84	86	280	304
Fluoride	1.5mg/l	2.4	1.5	1.0	0.9	4.2	3.8	0.5	0.3	1.8	1.2	0.5	0.4	0	0
Sulphate	200mg/l	320	180	284	193	380	199	46	23	376	185	8	9	43	54
Phosphate	0.1mg/l	0.164	0.298	0.102	0.10	0.084	0.09	0.093	0.08	0.068	0.03	0.036	0.039	0.184	0.21
DO	4.0mg/l	5.02	4.48	4.91	5.44	3.44	2.40	7.14	6.24	8.90	9.92	4.50	4.16	18	24
BOD	3.0mg/l	0.8	0.26	0.4	0.14	0.4	0.14	0.8	0.13	0.8	0.15	0.4	0.6	43	51
COD	250mg/l	1.8	0.39	1.0	0.08	1.1	0.07	1.8	0.009	1.8	0.007	1	1.2	99	92

#### 3.1 pH:

The pH value of drinking water samples varied between 6.28 to 7.84. These were falling within the permissible limit. In sewage water, it ranges from 9.64 to 10.16. It denotes that the sewage water is strongly alkaline in nature [4].

### 3.2 Turbidity:

The turbidity for all the drinking water samples are below the WHO standards, its ranges from 0.1 to 0.5 NTU. In sewage water, the value ranges from 146-158 NTU, due to presence of suspended impurities [5].

### 3.3 Total Dissolved Solids (TDS):

The total dissolved solids value ranges from 500 to 2730 mg/l. In drinking water, the value shows very high combined content of inorganic substances. The TDS of sewage water is low (1110 to 1795 mg/l) due to wide variety of dissolved and suspended impurities from the domestic use [6].

### 3.4 Electrical Conductivity (EC):

EC values were in the ranges from 702 to 3900  $\mu$  mho/cm. The high EC value of drinking water due to high amount of dissolved inorganic substances in ionized form [7].

### 3.5 Total Alkalinity:

The total alkalinity value ranges from 215 to 536 mg/l. These values were exceeded the permissible limit. It may leads to sour taste and salinity. In sewage water, 680 to 710 mg/l. It has high value due to mixing of wastewater from different sources [8].

### 3.6 Total Hardness:

The value ranges from 208 to 1000 mg/l. All the drinking water samples have high hardness due to water enters from direct pollution by human activities [9].

### 3.7 Calcium:

The calcium value ranges from 74 to 240 mg/l. It consists major role of hardness in water. The sewage water has high level of calcium 272 to 326 mg/l due to contaminants from household wastewater [10].

### 3.8 Magnesium:

The magnesium value ranges from 12 to 96 mg/l. The municipal water has low magnesium level 12 to 14 mg/l. It may leads to metabolic syndrome and hypertension [10, 11].

### 3.9 Sodium:

The sodium value ranges from 102 to 292 mg/l. All the samples have permissible limit of sodium (200mg/l). In sewage, the value ranges from 208 to 310 mg/l. The excess sodium may also be stored in old plants [11].

### 3.10 Potassium:

The potassium value ranges from 10 to 28 mg/l. All the samples have acceptable limit of potassium (30 mg/l). In sewage, it has 78 to 84 mg/l due to the presence of high contamination from domestic and commercial properties [8].

### 3.11 Iron:

The iron value ranges from 0.001 to 0.025 mg/l. All the samples are found below the permissible limit (0.3 mg/l). It can be acceptable. It is a biologically important element which is essential to all living organisms and also present in hemoglobin system [13].

### 3.12 Ammonia:

The ammonia value ranges from 0.019 to 0.194 mg/l. All the samples are within the permissible limit (0.5 mg/l). In sewage, it has 10.600 to 12.160 mg/l due to the presence of organic and inorganic waste matter from the domestic use. The higher amount of ammonia is highly toxic to our environment [14].

### 3.13 Nitrite:

The nitrite value ranges from 0.001 to 0.008 mg/l. In sewage, it has 0.026 to 0.031 mg/l. All the samples have the least amount of nitrite. It can be acceptable [14, 15].

### 3.14 Nitrate:

The nitrate value ranges from 5 to 115 mg/l. Athanur, Andalore Gate, Rasipuram, Vaiyappamalai water samples have above the permissible limit (45 mg/l). The high concentration of nitrate in drinking water is toxic [16].

### 3.15 Chloride:

The chloride value ranges from 84 to 680 mg/l. All the samples have highest amount of chloride. At concentration above 250 mg/l water acquires salty taste which is harmful for human body [17].

### 3.16 Fluoride:

The fluoride value ranges from 0.1 to 4.2 mg/l. Athanur, Puduchatram samples have exceeded the permissible limit (1.5 mg/l). The high level of fluoride is leading to bone, tooth decay and serious health problem [18].

### 3.17 Sulphate:

The sulphate value ranges from 8 to 380 mg/l. Athanur, Andagalore Gate, Puduchtram and Vaiyappamalai are exceeded the permissible limit (200 mg/l). High concentration of sulphate may cause gastric irritation [18].

### 3.18 Phosphate:

The phosphate value ranges from 0.03 to 0.298 mg/l. The permissible limit is 0.1 mg/l. The Athanur water sample has highest amount of phosphate (0.164 – 0.298 mg/l). So the phosphate content is high in Athanur soil [19].

### 3.19 DO (Dissolved Oxygen):

The DO value ranges from 2.40 to 9.92 mg/l. All the samples have permissible limit (4.0 mg/l) of DO. In sewage, the value ranges from (18-24 mg/l) due to algae and other aquatic plants release oxygen during photosynthesis [19].

### 3.20 BOD (Biological Oxygen Demand):

The BOD value ranges from 0.4 to 0.26 mg/l. All the drinking water samples have under the permissible limit (0.3 mg/l). In sewage, the value ranges from 43 to 51 mg/l. Because the highest amount of oxygen required to degradation of organic matter [19].

### **3.21 COD (Chemical Oxygen Demand):**

The COD value ranges from 0.007 to 1.8 mg/l. In sewage, the value ranges from 99 to 92 mg/l. All the samples contain the permissible limit of COD (250 mg/l). But sewage water has high COD value as compared to drinking water, due to the presence of organic waste matter from domestic use [19].

## **4. CONCLUSION**

The results of this study showed that the analysed data was compared with WHO standards. Rasipuram region generally affected by TDS problem. Puduchatram area water analysis showed that the area is a fluoride belt area. Vaiyappamalai water showed highly hard water and it contains large amount of calcium, nitrate and chloride salts. From this analysis, this area ground water is used for agriculture and domestic purpose only.





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