

Determination of Trace elements in the groundwater in Thittakudi Taluk, Cuddalore distric, Tamilnadu.

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Abstract:

A study on groundwater chemistry in occurrence of trace elements was measured at 15 different villages in and Thittakudi taluk, Cuddalore district. The samples are collected from tube wells during the month of February 2014. In the groundwater samples analysed in nine elements such as Cu, Fe, Mn, Zn, Ni, Cr, Co, Cd and Pb were measured using Atomic Absorption Spectrophotometer. The elements concentrations varied from one place to another place, all the elements noted in Mg/l. The trace elements maximum and minimum values are 0.102 to 0.216, 0.001 to 0.788, 0.043 to 0.081, 0.002 to 0.427, 0.102 to 0.216, 0.939 to 1.091, 0.034 to 0.21, 0.019 to 0.048 and 0.042 to 0.308 respectively. All the samples compared with permissible limit for drinking water in WHO (2004) standard. In this case Mn, Fe, Co and Zn elements are observed in within the permissible limit and remaining elements

such as Ni, Cr, Pb and Cd observed in above the permissible limit. In this study find out the study area dumped in some where plant animal wastages and anthropogenic activities are impact in the groundwater.

Key Words: Groundwater; Trace Elements

Introduction

Water is very important requirement of everywhere, without which neither the life impossible to any other developments in the earth. Peoples are used groundwater as drinking purpose, nowadays more than seventy percent of the populations depends on groundwater for survival his life (Dagar, 2009). The agricultural activities particularly in relation to excessive application. The groundwater is polluted in several reasons, the effective implementation of the many of the causes by the human body. In recent years, considerable interest has been focused

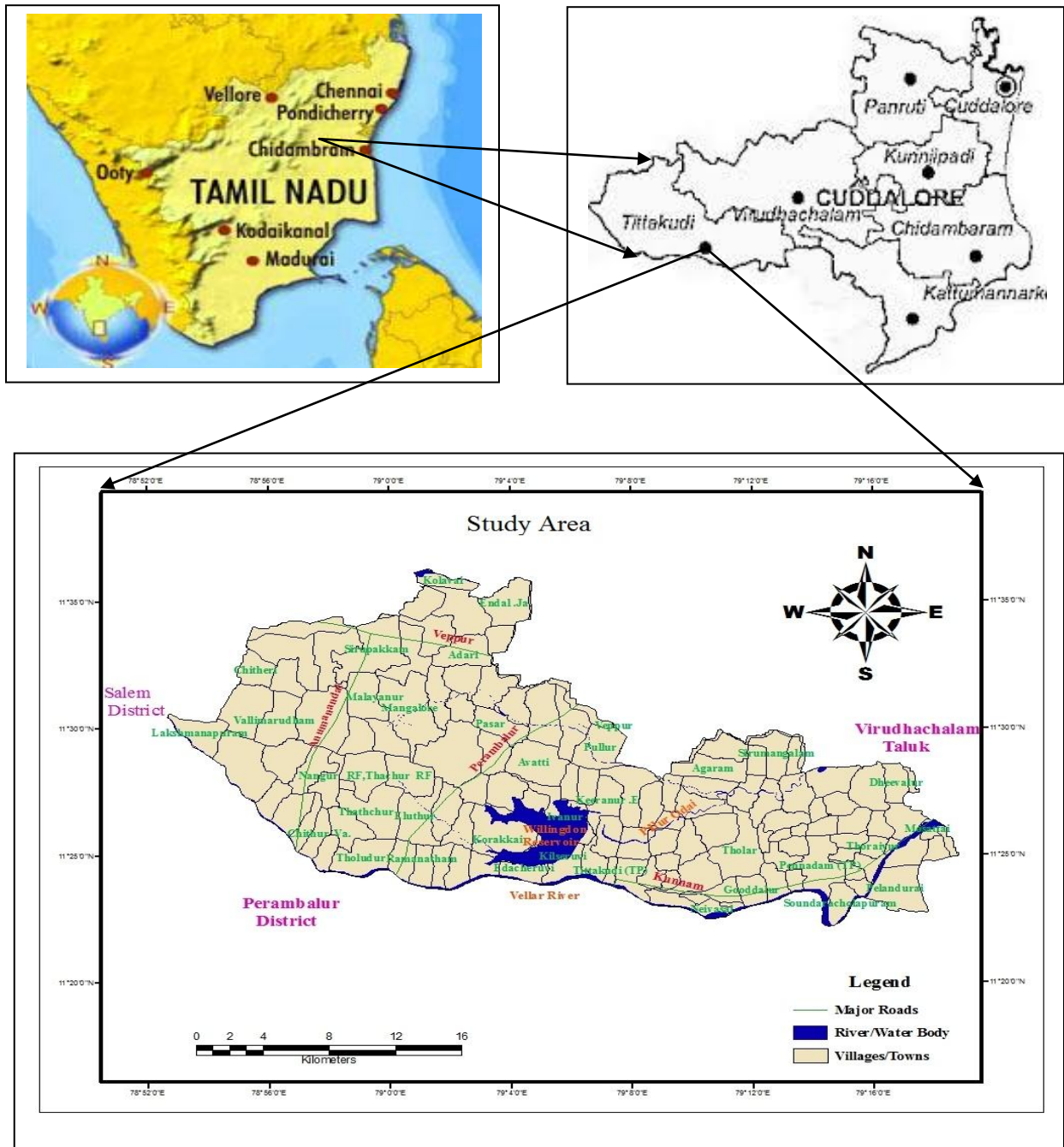
on assessing the human health risk posed by metals, metalloids, and trace elements in the environment. The elements have become of particular interest in recent decades and within the framework of environmental investigations. Trace elements are among the most persistent of pollutants in the aquatic ecosystem because of their resistance to decomposition in natural conditions. High concentrations of the elements can be released into the aquatic environment as a result of leaching from bedrocks, atmospheric deposition, drainages and discharge of industrial wastewaters. The trace elements in groundwater behave in a typical manner. There is no single mechanism is sufficient to explain the process that are undergoing in the water. Trace metals like Fe, Mn, Cu, Zn, Co, Ni, etc., are very important for the proper functionary of the biological system and their deficiency or excess in the human system can lead number of disorders (Bowen, 1972), (Underwood, 1971). Some other trace metals such as Pb, As, Hg, etc., are not only biologically non essential but definitely toxic (Satyanarayana, 1983). The

potential toxic metal elements, such as Cr, Pb, Cu, Zn, etc., are identified to cause health hazards in animal (Bryan, 1976, Adelekan, 2011, Lowe, 1970).

Study area

The present investigation aimed at determining the trace elements in the Thittakudi taluk, Cuddalore district. The study area geographical extent is around 59687 hectares and located between north latitude 11°20' to 11°50' and east longitude 78°50' to 79°20'. The study area falls in southeast part of Cuddalore district, Tamilnadu. The region is covered by Survey of India toposheet No.58 M/2, 3, 7 and 58 I/14, 16. The administrative purpose of the taluk has been bifurcated into two blocks named as Nallur and Mangalore. The study area geologically comprises with the Charnockite and Granitic gneiss are the major rocks are found in the taluk. The Wellington reservoir is the major tank, which is the major irrigation source of the taluk. The reservoir located in Vellar Basin across a tributary stream Periya Odai of Vellar River. The study area base map shows fig.1.

Figure.1. Study Map



MATERIALS AND METHODS

Totally 15 groundwater samples were collected during the post monsoon from Thittakudi taluk, Cuddalore district in

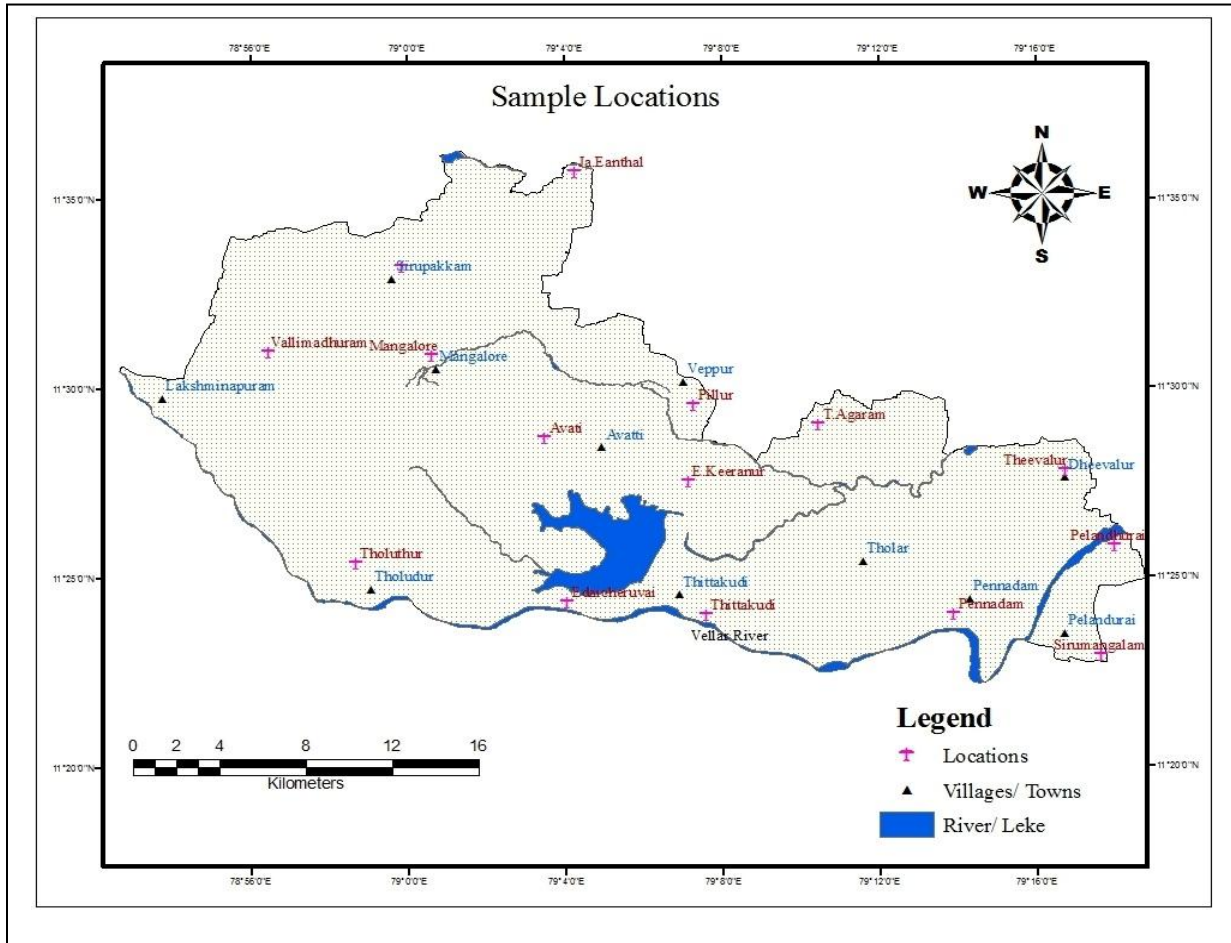
different villages in one liter well cleaned polyethylene containers. The samples were examine for the Fe, Mn, Cr, Cu, Ni, Co, Zn, Pb and Cd with help of standard literature

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methods using AAnalyst 700 model Atomic Absorption Spectrometer. The analysed groundwater samples are compare with

permissible limit for drinking water in WHO (2004) standard.

Figure.2.Sample Location map



RESULTS AND DISCUSSION

The occurrence of trace elements in ground water is affected both by hydro chemical factors, like mineral composition of the rocks, soil characteristics, etc., as well as by anthropogenic activities and likely to

show both temporal and spatial variation. The distribution of trace elements in Thittakudi taluk groundwater samples analysed data are show in table 1.

Table 1: Concentration of trace metals in Thittakudi taluk. (all elements unit in Mg/l)

Sl.No	Sample ID	Locations	Fe	Mn	Cr	Cu	Ni	Co	Zn	Pb	Cd
1	S1	Theevalur	0.012	0.067	1.091	0.037	0.162	0.081	0.048	0.108	0.025
2	S2	Pennadam	0.06	0.044	1.055	0.022	0.102	0.114	0.023	0.042	0.022
3	S3	T.Agaram	0.109	0.045	1.067	0.006	0.187	0.043	0.034	0.21	0.019
4	S4	Thittakudi	0.018	0.081	1.046	0.026	0.146	0.046	0.026	0.27	0.029
5	S5	E.Keeranur	0.189	0.067	1.018	0.019	0.212	0.078	0.265	0.135	0.028
6	S6	Ja.Eanthal	0.121	0.059	1.03	0.013	0.147	0.115	0.277	0.177	0.021
7	S7	Edaicheruvai	0.043	0.043	1.009	0.004	0.176	0.135	0.014	0.164	0.022
8	S8	Siruppakkam	0.036	0.045	0.995	0.009	0.198	0.175	0.027	0.154	0.03
9	S9	Vallimadhuram	0.001	0.07	0.977	0.026	0.216	0.122	0.031	0.241	0.032
10	S10	Mangalore	0.207	0.074	0.996	0.016	0.162	0.076	0.427	0.12	0.025
11	S11	Pillur	0.024	0.06	0.985	0.011	0.177	0.068	0.002	0.179	0.029
12	S12	Tholuthur	0.788	0.053	0.979	0.012	0.12	0.21	0.009	0.235	0.031
13	S13	Avati	0.135	0.067	0.973	0.023	0.193	0.153	0.028	0.226	0.044
14	S14	Pelandhurai	0.075	0.078	0.939	0.019	0.141	0.034	0.02	0.308	0.042
15	S15	Sirumangalam	0.135	0.052	1.015	0.003	0.154	0.203	0.19	0.187	0.048
		WHO (2004) Permissible Limit (Mg/l)	0.3	0.05	0.05	0.005	0.02	0.0002	3.0	0.01	0.01
		Minimum	0.001	0.043	0.939	0.003	0.102	0.034	0.002	0.042	0.019
		Maximum	0.788	0.081	1.091	0.037	0.216	0.21	0.427	0.308	0.048

Manganese

Manganese is occurs naturally in soils, rocks and minerals. In the aquifer, groundwater comes in contact with these solid materials dissolving them. The values of Mn concentration in the study area range from 0.043 to 0.081 Mg/lit. The WHO standard drinking water permissible limit is 0.05 Mg/l, and compare to the standard Mn concentration was observed samples S2, S3, S7, S8 are observed in within the permissible limit remaining samples are occurred in above the permissible limit.

Iron

The Iron is most commonly found in nature in the form of its oxides (Elinder, 1986., Knepper, 1981). The iron concentration in the study area values varied from 0.001 to 0.788 Mg/l in during the sampling period. The WHO standard drinking water permissible limit is 0.3 Mg/l, Similarly compare with Fe concentration of the samples S12 sample only observed within the limit remaining 14 samples are occurred above the permissible limit.

Zinc

Zinc is an essential for plants and human nutrient and it is an undesirable astringent taste to water. Zinc values varied from the study area as 0.002 to 0.427 Mg/l. The WHO standard drinking water permissible limit is 3.0 Mg/l, compare with Zn concentration of the samples in all fifteen samples occurring within the WHO drinking water permissible limit.

Chromium

Chromium is a metallic element found in rocks, soils, plants, and animals. Chromium values varied from 0.939 to 1.091 mg/ l in water samples during the sampling period. The WHO standard drinking water permissible limit is 0.05 Mg/l, in compare from the WHO standard all sample occurred in high values to permissible limit.

Copper

Copper is an unpleasant metallic, bitter taste to drinking water. Copper ranges varied from 0.003 to 0.037 mg/ l in the samples. According to the WHO permissible limit of drinking water is 0.005 Mg/l. in the study area sample ID S7 and S15 was observed within the permissible and other samples are occurred in beyond the limit.

Nickel

The primary source of nickel in drinking water is leaching from metals in contact with drinking-water, such as pipes and fittings. Nickel ranges from 0.102 to 0.216 mg/ l in water samples. In the study area nickel concentration was observed in over the drinking water permissible limit of WHO standard as 0.02 Mg/l.

Lead

The major sources of lead in drinking water are corrosion of household plumbing systems, and erosion of natural deposits. Lead ranges of the study area varied from 0.042 to 0.308 mg/ l. According to the WHO drinking water permissible limit of lead is noted in 0.01 Mg/l, but the samples are observed in over ranges of the permissible limit.

Cadmium

The solubility of cadmium in water is influenced to a large degree by its acidity, suspended or sediment-bound cadmium may dissolve when there is an increase in acidity (Ros & Slooff, 1987). The values of Cadmium varied from 0.019 to 0.048 mg/lit. The drinking water permissible limit as per WHO standard noted as 0.01 Mg/l. in the area compare with the standard all the samples occurred in high range of permissible limit. The Cd occurs due to the

natural and anthropogenic sources in the environment.

Cobalt

Cobalt occurs naturally in the earth's crust and in soil. Groundwater containing cobalt metal can have an erythropoietic effect such as increased incidence of goitre among most mammals, including humans. Cobalt ranges from 0.034 to 0.21 mg/ l in groundwater samples. According to the WHO standard for drinking water permissible is 0.0002 Mg/l, the collected samples are occurred in over the permissible limit.

CONCLUSION

The present study aimed to determined trace element concentrations in groundwater samples from Thittakudi taluk, cuddalore district. In the study area At least 70% of the population is still dependent on ground water sources for drinking purpose, especially there is very interior villages. According to the investigations of some water samples of Thittakudi taluk the element zinc found all the samples within the limit and manganese, Iron and Copper, are mostly found in within the limit, as well as these are found towards little higher sides, and nickel, chromium, lead, Cobalt and cadmium is found higher only in the study area, but these metals are essentials for our body metabolism. In this area growing lot of

agricultural activities and continuous disposal of municipal wastes are dumped in without proper treatments. It is recommended to control and restrict the fertilizer for agricultural activities in the taluk in order to prevent the leachate from reaching the groundwater.

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