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Assessment of Ground Water Quality at Different Locations in Kotturu and Hiramandalam Mandals, Srikakulam Dist, Ap, India

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Abstract:
Background*: Over exploration of water resources with increasing population may causes scarcity and contamination of resources. Base line status of present growing rural to sub urban area is due to increasing of usage of ground water.*
Materials and Methods*: Study focused on status of water quality in eight sampling locations collected in and around the mandals of Kotturu and Hiramdalam. Water quality parameters i.e., pH, electrical conductivity, turbidity and total dissolved solids, total hardness, total alkalinity, sulphate, chloride, dissolved oxygen and fluoride were analysed by using standard operating procedures.*
Results*: In the present stud some of the sampling locations, Turbidity, TDS, hardness, alkalinity parameter concentrations were observed above the water quality standards while pH, electrical conductivity, DO, sulphate and fluoride concentrations were below the water quality standards.*
Conclusion:*present shows that the quality of some of the sampling locations were suitable for drinking and other sampling locations also used for domestic purpose only.*
Key Word*:assessment, contamination and water quality*

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I. Introduction

Water plays a vital role in the proper functioning of the earth ecosystem[1]. The quality of ground water is of great importance in determining the suitability of particular ground water for a certain use (public water supply, irrigation, industrial applications, power generation etc.)[2]. The quality of water for drinking deteriorates due to inadequacy of treatment plants, direct discharge of untreated sewage into rivers[3,4]. In recent years, the increasing threat to groundwater quality due to human activities has become a matter of great concern[5]. This depends on a large number of individual hydrological, physical, chemical and biological factors that have acted on the water from the moment it condensed in the atmosphere to the time it is discharged by a well[6, 7, 8].

It is important to know the geochemistry of the chemical-soil groundwater interactions in order to assess the fate and impact of pollutant discharged on to the ground[9,10,11,12]. Ground water is about 20% of the world resources of fresh water and used in large amount for industry, irrigation and domestic activity[13]. As there is a gradual decline in availability of fresh water for irrigation in India, the use of sewage and other industrial effluents for irrigating agricultural lands is on the rise[14].

II. Material and Methods

Study area: Present study area in Srikakulam District, formerly known as Chicacole, is the extreme North-eastern district of Andhra Pradesh, situated within the geographic co-ordinates of 18°-20’ and 19°-10’ N and 83°-50’ and 84°-50’E. A portion of Srikakulam district is plain terrain with intense agriculture and another portion of the district is rocky and hilly terrain covered with forests. Kotthuru, Hiramandalam, Pathapatnam, Kalingadal reservoir and some other areas are still covered with dense forests.

In the present study, eight water samples were collected in month of March during the year of 2019. The water samples were analyzed for physico-chemical parameters by using standard methods[39] determined based on pH, Electrical conductivity, turbidity, Total Dissolved Solids (TDS), total hardness, total alkalinity, chlorides, sulphate, dissolved oxygen and fluoride.

Table. 1: Water sampling points with latitude and longitude

S. No.	Location	Latitude Longitude	S. No.	Location	Latitude Longitude
1	Nivagam	18^0 49' 40.31"N 83^0 52' 55.41"E	5	Bhagiradhipuram	18^0 43 '33.37" N 83^0 58'55.62" E
2	Kosali	18^0 47' 02 .41"N 83^0 55' 54.36" E	6	Padali	18^0 39 '25.11"N 83^0 52'07.26" E
3	Gulumuru	18^0 41 '48.10" N 83^0 57' 46.08" E	7	Kadumu	18^0 48' 42.75"N 83^0 54'28.21"E
4	Gotta	18^0 41' 16.51"N 83^0 57'52.28" E	8	Madanapuram	18^0 46' 04.65"N 83^0 56' 14.25"E

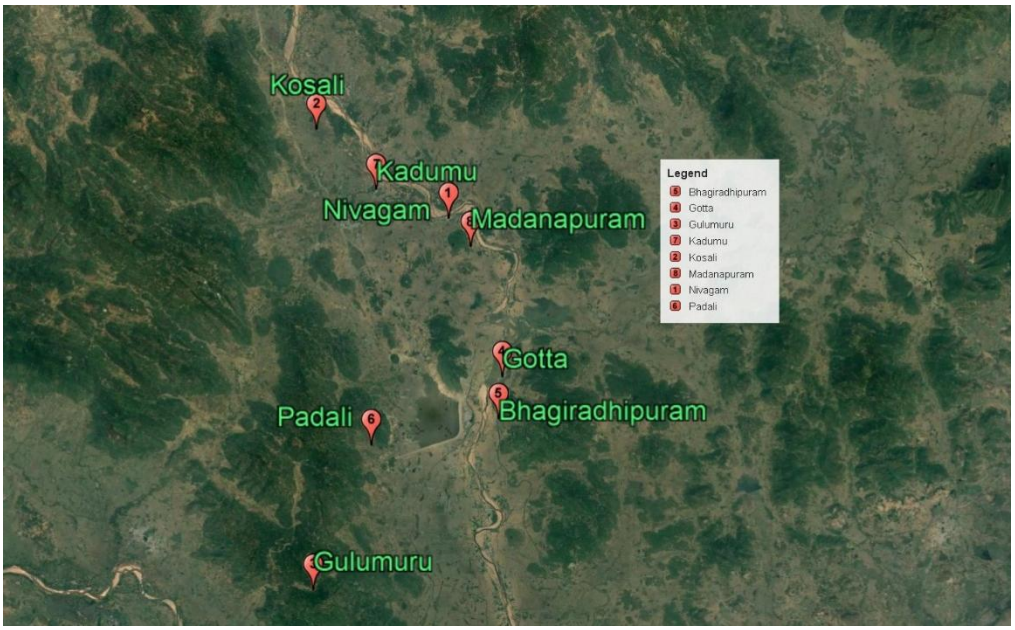


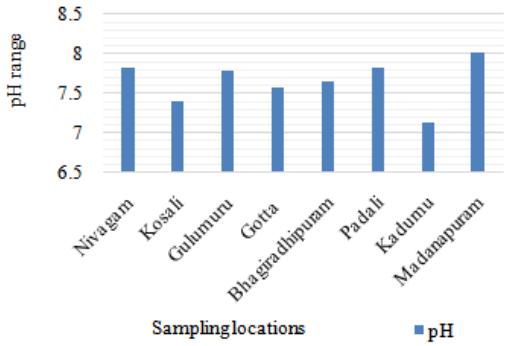
Fig.1: Map showing sampling points of the study

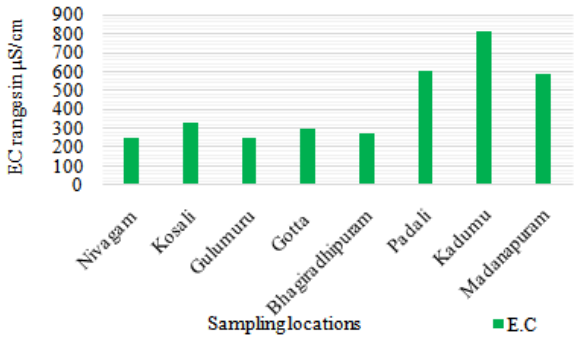
III. Result& Discussion

Table. 2: Physico-chemical analysis of ground water report

	pH	EC	Turbidity	TDS	Hardness (TH)	Total alkalinity	Chloride	Sulphates	DO	Fluoride
Nivagam	7.82	248.8	4.29	200	204	44	44	10	3.6	0.27
Kosali	7.39	333.4	0.4	280	206	82	50	10	3.2	0.25
Gulumuru	7.78	246.5	1.52	230	156	144	30	8	3.4	0.24
Gotta	7.56	295.2	1.92	200	168	130	46	10	2.8	0.29
Bhagiradhipuram	7.64	271.1	3.05	200	198	104	30	12	2.7	0.24
Padali	7.83	602	14.62	540	214	186	72	18	2.1	0.27
Kadumu	7.12	810.5	8.22	640	280	240	102	12	2.2	0.24
Madanapuram	8.01	585	4.48	380	238	340	70	20	3.5	0.31
Min	7.12	246.5	0.4	200	156	44	30	8	2.1	0.24
Max	8.01	810.5	14.62	640	280	340	102	20	3.6	0.31
Mean	7.64	424.1	4.81	333.7	208	158.7	55.5	12.5	2.9	0.26
Standards	6.5-8.5	1500	5	500	300	200	250	200	> 2	1.0

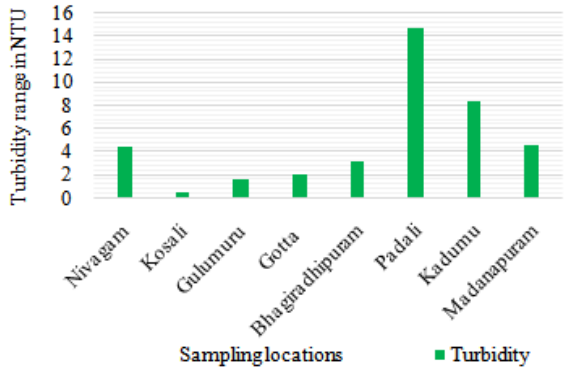
The pH range (6.0 – 8.3) of all water sources were within the acceptable range for fresh waters, which usually ranges between pH 6.5 and 8.2[15,16]. In the present study, pH values range from 7.12 to 8.01 with mean of 7.64 and maximum value recorded at Madanapuram (8.01) while minimum value at Kadumu (7.12) and all the sampling locations were indicating alkaline range and low range. The water tends to be more alkaline when it possesses carbonates[17,18]and greater than 7.0 is vital for growth and reproduction for the majority of mesophilic pathogenic bacteria involved in the biodegradation of organic matter dissolved in water[19].

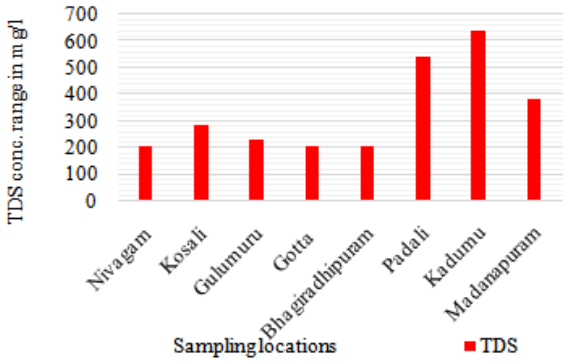




Electrical conductivity is a decisive parameter in determining suitability of water for a particular purpose[20] and its gives clue of ion concentrations or total dissolved solids (TDS) in water[16]. The Electrical conductivity values were ranges from 246.5 to 810.5 µS/cm with mean of 424.6 µS/cm and high value recorded at Kadumu (810.5 µS/cm). In most of the sampling locations investigated, all the sampling locations were within the acceptable limits proposed of BIS (1991)[40] and while minimum values observed at Nivagam location (248.8 µS/cm).

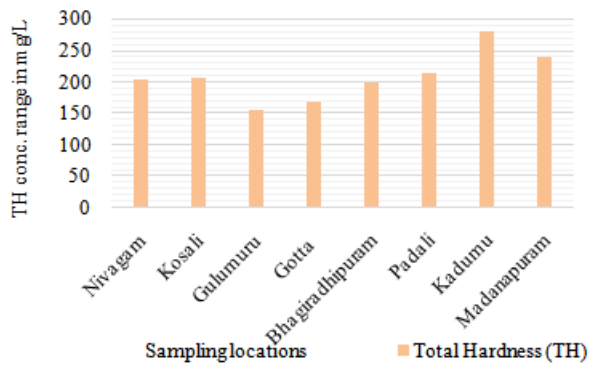
Turbidity of the samples were ranges from 0.4 to 14.62NTU with mean of 4.81NTU and maximum values were recorded at Padali (14.62 NTU) >Kadumu (8.22 NTU) >Madanapuram (4.48 NTU) >Nivagam (4.29 NTU) >Baghiradhipuram (3.05 NTU) while lowest at Kosali, Gulumuru and Gotta. In case of high turbidity in water is normally indicates that the high chance of pathogenic microbial contaminants, since elevated turbidity levels may make the water difficult to be disinfected appropriatel[21].

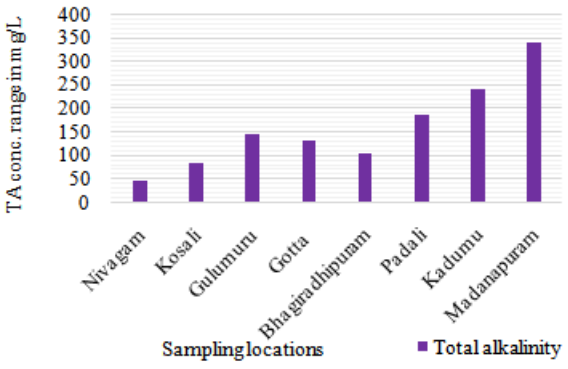




Total dissolved solid denote in terms of various kinds of mineral present in the water[22]. Total Dissolved Solids values were ranges from 200 to 640mg/l with a mean of 333.75mg/l and maximum values were recorded at Kadumu (640mg/l) >Padali (540mg/l) >Madanapuram (380mg/l) and no health-based guideline values have been proposed for TDS by the WHO[23] while minimum concentrations were observed at Nivagam, Gotta and Bhagiradhipuram (below 200mg/l). Two sampling locations i. e., Kadumu and Padali were observed above the BIS water quality acceptable limit is 500mg/L. However, less than about 600 mg/l is generally considered as good, it becomes significantly and gradually undrinkable when this content exceeds 1,000.00 mg/l[24].

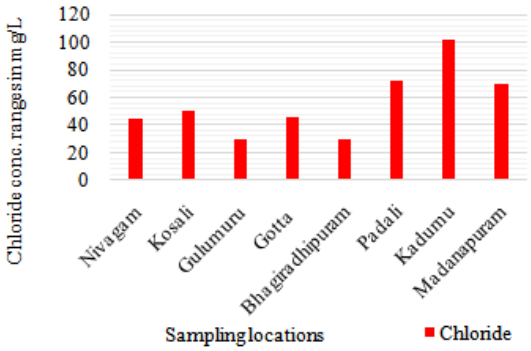
The concentration of total hardness is ranges from156 to 280mg/l with mean of 208mg/l and highest concentration recorded at Kadumu (280mg/l) >Madanapuram (238mg/l) >Padali (214mg/l) >Kosali (206mg/l) >Nivagam (204mg/l) were exceeded the water quality standard level is 200mg/l and below concentrations were observed at Gulumuru (156mg/l). All the sampling locations were observed below the water quality standard level is 300mg/L.

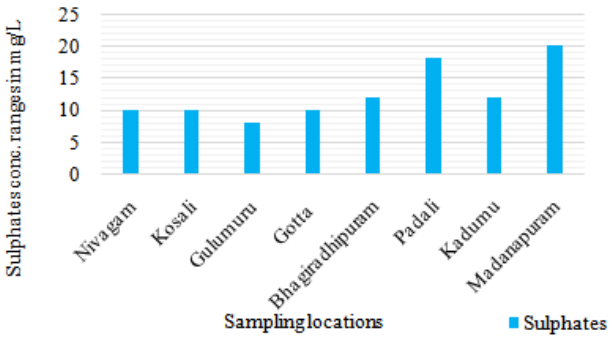




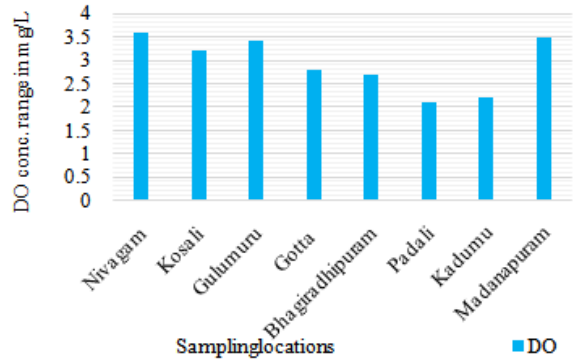
Alkalinity of water is a measure of weak acid present in it and of the cations balanced against them[26]. The Alkalinity concentrations were varying from 44 to 340mg/l with mean of 158.75mg/l. The highest concentration observed at Madanapuram (340mg/l) and Kadumu (240mg/l) and exceeded the water quality standard level is 200mg/L and due to presence of mineral salt present in it[27,28,29] while lowest at Nivagam (44mg/l).

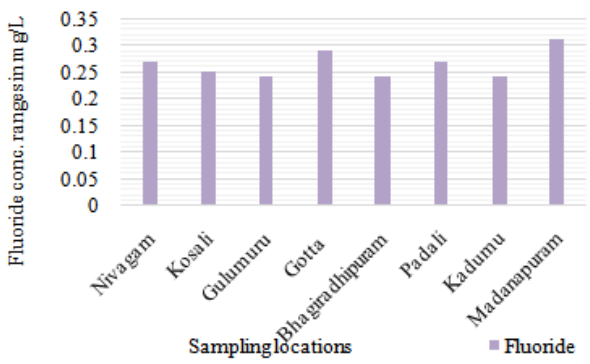
In general, chlorides occur in all types of waters and the contribution of chloride in the groundwater is due to minerals like apatite, mica, and hornblende and also from the liquid inclusions of igneous rocks. Leachate from landfills[30,31,32], septic tanks and pit latrines[33,34,35,36,37,31,38]also contribute considerable amount of chlorides to groundwater. Chlorides concentrations were ranges from 30 to 102mg/l with a mean of 55.5mg/l and highest at Kadumu (102mg/l) whereas lowest at Gulumuru village (30mg/l).





Sulphates concentrations were varies from 8 to 20mg/l with a mean of 12.5mg/l and all the sampling locations were below the standard limits. Fluorides levels were ranges from 0.24 to 0.31mg/l with mean of 0.26 and all the sampling locations were below the fluoride contamination levels. Dissolved Oxygen (DO) content, plays a vital role in supporting aquatic life and is susceptible to slight environment changes[27].The concentration of dissolved oxygen were ranges from 2.1 to 3.6mg/l with a mean of 3.6mg/l and highest values recorded at Madanapuram (3.6mg/l) while lowest recorded at Gotta (2.1mg/l) and all the sampling points have good oxygen solubility and prior to for domestic purpose.





IV. Conclusion

In order to address the issue, the physiochemical characteristics water in different villages of Kothuru and Hiramandalam mandals have been analysed. In the present stud some of the sampling locations, Turbidity, TDS, hardness, alkalinity parameter concentrations were observed above the water quality standards while pH, electrical conductivity, DO, sulphate and fluoride concentrations were below the water quality standards.The results have shown that some of the physicochemical properties of the water sources investigated do not meet the adopted national guideline values for potable water qualities.Intake of poor quality of drinking water leads to wide spread. In future, take to preventive measure for control of pollutants that have damaged land and soil may enter surface or ground water affecting our ability to meet, water quality standards.

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