Data in brief 24 (2019) 103846

Contents lists available at ScienceDirect

Data in brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Data on water quality index development for groundwater quality assessment from Obulavaripalli Mandal, YSR district, A.P India

M. Prasad [a], V. Sunitha [b, *], Y. Sudharshan Reddy [b], B. Suvarna [b], B. Muralidhara Reddy [a], M. Ramakrishna Reddy [a]

[a] Department of Earth Sciences, Yogi Ve mana University, Kadapa – 516005, India
[b] Department of Geology, Yogi Vemana University, Kadapa – 516005, India

ARTICLE INFO

Article history:
Received 19 November 2018
Received in revised form 5 March 2019
Accepted 8 March 2019
Available online 26 March 2019

Keywords:
Water quality index
Water quality assessment
Obulavaripalli
Y.S.R district

ABSTRACT

Groundwater is a vital resource for most developmental activities. Demand for groundwater is increasing due to paucity of surface water and recurrent failures of monsoons. Increasing demand for groundwater causes water level to decline and water quality to deteriorate. This data article is aimed to investigate the quality of drinking water of Obulavaripalli Mandal YSR district based on water quality Index (WQI). To evaluate WQI in the study area, twenty groundwater samples were collected and different physico-chemical parameters viz., pH, EC, TDS, TH, total alkalinity (TA), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), sulphate (SO_4^{2-}) and fluoride (F^{-}) were analyzed. WQI data for groundwater samples indicated that 30% of the samples fall under excellent rating, 40% of the samples fall under good category and another 30% of the groundwater is under poor category. Overall groundwater quality is not suitable for drinking purpose.

* Corresponding author.
E-mail address: vangalasunitha@gmail.com (V. Sunitha).

https://doi.org/10.1016/j.dib.2019.103846

Specifications table

Subject area	Chemistry
More specified Subject area	Environmental Geochemistry
Type of Data	Tables and figures
How data was acquired	Groundwater sampling was carried out from 20 representative bore wells in Obulavaripalli, Y.S.R District, A.P using study area and sample locations maps. Groundwater samples were analyzed for pH, EC, TDS, TH, TA, Ca^{2+}, Mg^{2+}, Cl^{-}, SO_4^{2-}, and F^{-}. Subsequently, WQI was calculated using the standards of water quality standards recommended by the World Health Organization [1] and Indian Standard Institute [2].
Data format	Raw and analyzed
Experimental factors	All the physico-chemical parameters have been analyzed in accordance with the standard procedures described in standard groundwater test methods [3].
Experimental features	The levels of physical and chemical parameters in drinking water have been determined (Table:1) and compared with WHO and BIS drinking water standards using WQI.
Data Source Location	Obulavariipalli mandal of Y.S.R District, A.P India (Figure:1)
Data accessibility	Data is available in the article.
Related research article	Sunitha. V, Muralidhara Reddy.B Sumithra. S. 2016. Assessment of Groundwater Quality Index in the Kadapa Municipal City, Y.S.R. District, Andhra Pradesh. International Journal of Advanced Research 6(2): 545–548 [4]

Value of the data

- The data introduced can be used to evaluate water quality index in addition to accentuating the significance of water quality parameters for drinking purposes.
- The study contributes a clear view of quality of groundwater and the variations in it. It will help in deciding the end use of the each groundwater sample for the human population residing in the present study area.
- From the data, it is evident that the water sources can be used for drinking purpose only after prior treatment.
- Based on the finding of the study the concerned institutions of the government can look forward to adoption of suitable remedial measures.
- Due to limited published study in the area of interest discussed here, the data provided will be one of the pioneer reportings.

1. Data

1.1. Study area

The study area Obulavaripalli Mandal is located in YSR District in the state of Andhra Pradesh, India and lies in the Survey of India topographic maps # 57 N/4, N/8, O/1 & O/5 between latitudes N 14° 09 '13″- 14° 48'50″ and longitudes E 79° 06'09″- 79° 22'16″. Location map of the study area is shown in the Fig. 1 and sample locations in the Fig. 2. Lithologically, the Cuddapah basin rocks in particular, Nallamalai sub-basin formations are mainly argillaceous with calcarious sediments subordinated. Major lithotypes are quartzite, shale/phyllite, dolomite and limestones. The average annual precipitation is 600–650 mm and the average temperature varies from 20.4 °C in the month of December to 43.2 °C in the month of April [5].

1.2. Data

Physico-chemical analysis data of twenty groundwater samples is shown in Table 1 and its statistical summary shown in Fig. 3. Table 2 shows each parameter's relative weight. Table 3 presents WQI value based water quality classification. WQI at individual sampling stations is shown in Table 4 and represented by Fig. 4. The summative WQI data reveal that 30% of the samples are of Excellent WQI

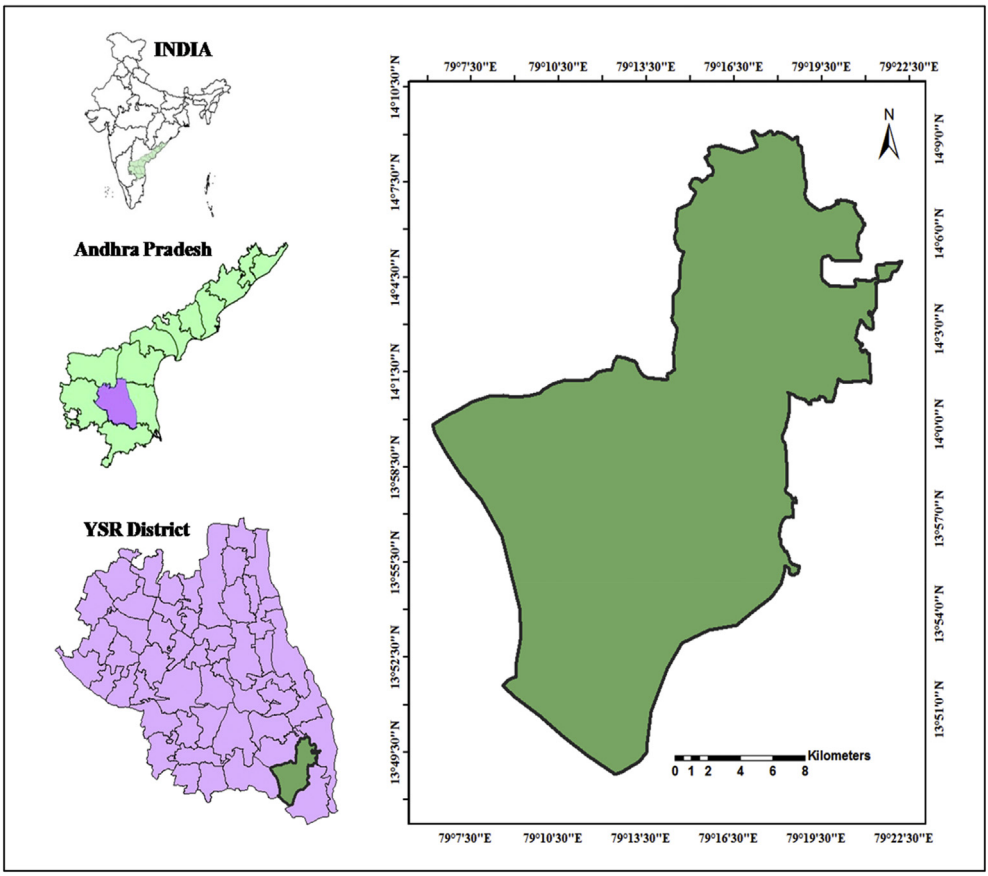

Fig. 1. Location map of the study area.

rating, 40% of the samples are classified as Good water and another 30% of the groundwater is classified as poor water.

2. Experimental design, materials and methods

2.1. Materials and methods

Twenty Groundwater samples were collected in and around Obulavaripalli mandal, Y.S.R District, Andhra Pradesh during September 2017. All the groundwater smaples were collected in 2 L of polyethylene bottles pre cleansed and well dried. The methods used include titrimetry, colorimetry and gravimetry as per the standard methodology proposed by the American Public Health Association, 2007 [3]. The water samples collected in the field were analyzed for pH, EC, TDS, TH, TA, Ca^{2+}, Mg^{2+}, Cl^-, SO_4^{2-} and F^- according the usual procedures [3,6–8] and recommended precautionary measure were adopted to avoid the contamination. pH and EC were determined by pH and conductivity meter, TDS by TDS meter, TH, Ca^{2+}, Mg^{2+}, CO_3^{2-}, HCO_3^- and Cl^- were determined through titrimetry, F^- was assessed in ion selective electrode (Orion 4 star ion meter, Model: pH/ISE). Table 1 gives the result of analyses for these parameters in the different water samples for the

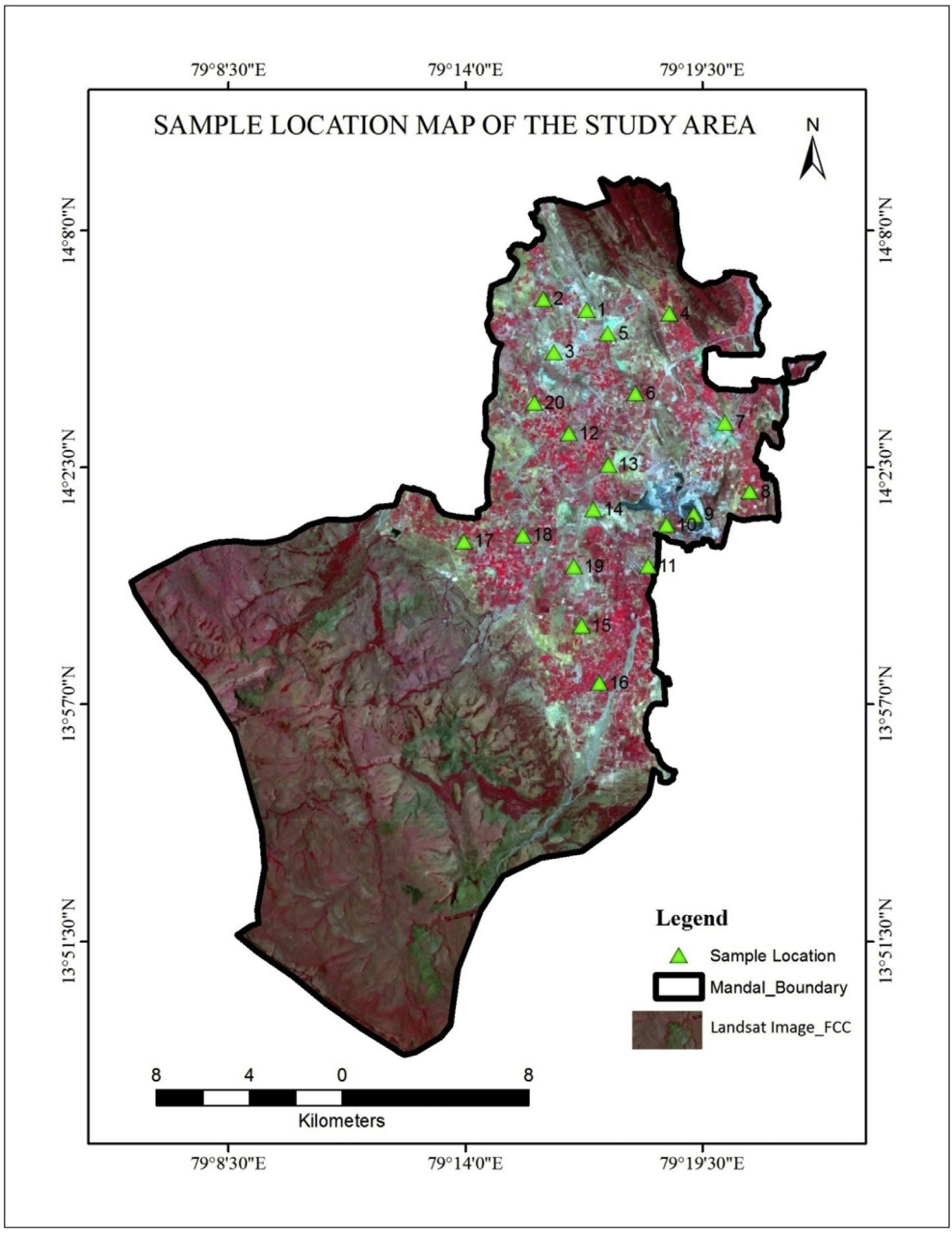

Fig. 2. Sample locations map of the study area.

20 boreholes analyzed. The analyzed data were compared to the WHO recommended standards and a correlation coefficient was also calculated to evaluate the relationship between different parameters.

Table 1
Analytical results of physico-chemical parameters of the study area.

S. No	pH	EC (μS/cm)	TDS (mg/L)	TH (mg/L)	Ca^{2+} (mg/L)	Mg^{2+} (mg/L)	CO_3^{2-} (mg/L)	TA (mg/L)	Cl^- (mg/L)	SO_4 (mg/L)	F^- (mg/L)
1	8	1100	704	400	70	70	53	109	160	220	0.6
2	8.1	1130	723.2	220	140	20	80	80	170	180	1.8
3	8.2	1700	1088	270	80	50	40	210	210	190	2
4	8.3	1100	704	290	50	55	36	183	180	160	1.8
5	7.8	1800	1152	270	200	19	50	183	400	70	1.9
6	7.8	1800	1152	240	180	40	30	200	240	80	1
7	8.2	1750	1120	300	190	52	36	91	410	140	0.9
8	8	1930	1235.2	320	100	20	58	90	180	220	2.82
9	8.2	1600	1024	380	60	60	34	92	190	240	1.42
10	8.3	1400	896	290	200	40	50	110	160	280	1.2
11	7.8	1800	1152	180	190	24	42	40	150	260	0.6
12	8.2	1400	896	510	310	20	48	38	220	240	0.8
13	7.8	1550	992	410	190	72	70	40	230	320	0.9
14	8.3	1600	1024	530	200	64	46	45	280	380	1
15	8.2	740	473.6	290	190	70	48	90	460	430	0.5
16	8	1500	960	310	200	52	50	85	430	280	0.4
17	7.9	1400	896	340	180	20	40	80	540	290	0.7
18	8	1600	1024	410	110	54	80	92	620	410	0.3
19	8.3	1800	1152	450	160	70	30	90	410	320	0.4
20	8.2	1930	1235.2	410	120	65	30	92	400	300	0.7
Min	7.8	740	473.6	180	50	19	30	38	150	70	0.3
Max	8.3	1930	1235.2	530	310	72	80	210	620	430	2.82
Mean	8.077273	1513.636	968.7273	342.273	158.182	46.7273	48.2273	104	309.545	250.4545	1.13

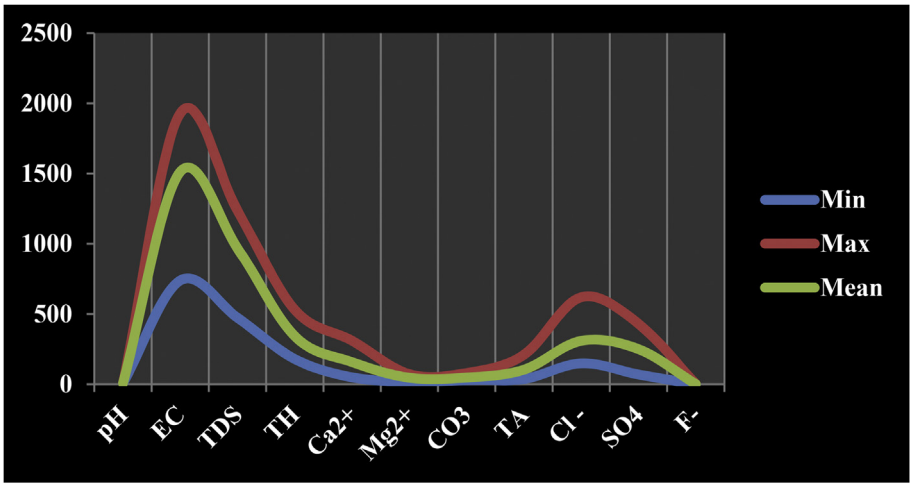

Fig. 3. Statistical summary of physico-chemical parameters in the study area.

2.2. Analytical procedures

WQI was calculated using the World Health Organization standards [1] and Indian Standards [2] in the following steps. The WQI calculation was carried out using a weighted arithmetic index as shown below [9].

Table 2
Relative weight for each parameter.

Chemical parameters	Sn	1/Sn	K	Wn = K/Sn	Ideal value (Vi)	Observed value (Vn)	Quality rating (Qn)	Wn Qn	WQI
pH	8.5	0.117647	1.234598	0.145247	7	8	66.67	9.68	44.3289
EC	1500	0.000667		0.000823	0	1100	73.33	0.06	
TDS	1500	0.000667		0.000823	0	704	46.93	0.04	
TH as CaCO3	500	0.002		0.002469	0	400	80.00	0.20	
Ca2+	200	0.005		0.006173	0	70	35.00	0.22	
Mg 2+	150	0.006667		0.008231	0	70	46.67	0.38	
Total Alkalinity	200	0.005		0.006173	0	109.2	54.60	0.34	
Cl^-	600	0.001667		0.002058	0	160	26.67	0.05	
Sulphate	250	0.004		0.004938	0	220	88.00	0.43	
F^-	1.5	0.666667		0.823065	0	0.6	40.00	32.92	
		0.80998		1				44.33	

Table 3
Water quality classification based on WQI value.

Class	WQI value	Water quality status
A	<50	Excellent
B	51–100	Good
C	101–200	Poor Water
D	201–300	Very Poor Water
E	>300	Water Un Suitable For Drinking

Table 4
WQI at individual sampling stations.

Sample no	WQI	Water quality status
1	44.3289	Excellent
2	110.8317	Poor Water
3	123.1174	Poor Water
4	125.7373	Poor Water
5	112.9962	Poor Water
6	113.858	Poor Water
7	63.16242	Good Water
8	166.223	Poor Water
9	91.48609	Good Water
10	80.71651	Good Water
11	42.32659	Excellent
12	57.63394	Good Water
13	53.76893	Good Water
14	69.80338	Good Water
15	68.7878	Good Water
16	33.64625	Excellent
17	48.965	Excellent
18	28.2726	Excellent
19	36.694	Excellent
20	51.985	Good Water

Calculation for water quality rating:

$$q_n = 100\,[(V_n - V_i)/(S_n - V_i)]$$

Where

q_n = Water quality rating for the nth parameter,
V_n = Observed value of the nth parameter,
S_n = Standard permissible value of n^{th} parameter,

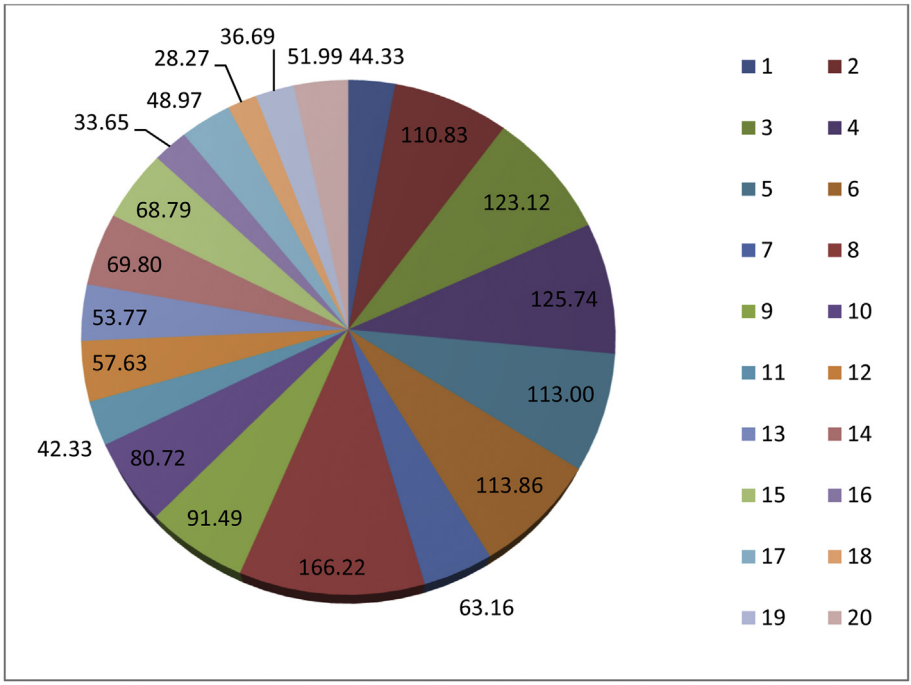

Fig. 4. Pie chart of WQI at Individual sampling stations.

V_i = Ideal value of nth parameter.

Calculation of Unit weight (Wn):

The Unit weight of the corresponding parameter was an inverse proportional value to the recommended standard value of Sn

$$W_n = K/S_n$$

Where,

Wn = unit weight for the n^{th} parameter,

Sn = standard value of the n^{th} parameter,

K = constant for proportionality,

Constant for proportionality constant by using the following equation was calculated:

$$K = 1/\sum (1/S_n)$$

The total water quality index was calculated linearly by adding the quality rating to the unit weight.

$$WQI = \sum q_n W_n / \sum W_n$$

Acknowledgements

Authors are grateful to the anonymous reviewers for the valuable suggestions in improving the script. First author is grateful to Dept of Science and Technology for financial assistance (INSPIRE Fellowship: IF120393).

Transparency document

Transparency document associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2019.103846.

References

[1] WHO, Guidelines for Drinking Water Quality, fourth ed., WHO press, 2011, p. 564.
[2] IS, Indian Standard Specification for Drinking Water, IS, 2012, p. 10500.
[3] American Public Health Association (APHA), Standard Methods for the Examination of Water and Wastewater, nineteenth ed., American Public Health Association, Washington, 1995.
[4] V. Sunitha, B. Muralidhara Reddy, S. Sumithra, Assessment of groundwater quality index in the kadapa municipal city, Y.S.R. District, Andhra Pradesh, Int. J. Adv. Res. 6 (2) (2016) 545–548.
[5] Central Ground Water Board (CGWB), Ground Water Brochure, 2013, p. 22. YSR District (Kadapa), Andhra Pradesh.
[6] Shakir Ali, et al., Elevated Fluoride in Groundwater of Siwani Block, Western Haryana, India: A Potential Concern for Sustainable Water Supplies for Drinking and Irrigation, Groundwater for Sustainable Development, 2018 in press.
[7] J.D. Hem, The Study and Interpretation of the Chemical Characteristics of Natural Water, third ed., U.S. Geological Survey Water-Supply, 1985. Paper. 2254.
[8] H.M. Raghunath, Groundwater, New Age International (P) Ltd., New Delhi, 2003, pp. 344–369.
[9] R.M. Brown, N.I. Mc Clelland, R.A. Deininger, R.G. Tozer, A water quality index: do we dare? Water and sewage work 117 (1970) 339–343.