Data Article

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

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A B S T R A C T

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 (Ca2+), magnesium (Mg2+), chloride (Cl−), sulphate (SO42−) 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.

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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 Obulavariipalli, 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 Obulavariipalli 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 calcareous 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
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 samples 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. 1. Location 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.

Fig. 2. Sample locations map of 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 1

| S. No | pH | EC (µS/cm) | TDS (mg/L) | TH (mg/L) | Ca²⁺ (mg/L) | Mg²⁺ (mg/L) | CO₃²⁻/CO₂ (mg/L) | TA (mg/L) | Cl⁻ (mg/L) | SO₄ (mg/L) | F⁻ (mg/L) |
|-------|----|------------|------------|-----------|-------------|-------------|-------------------|-----------|------------|------------|----------|
| 1     | 8  | 1100       | 704        | 400       | 70          | 70          | 53                | 109       | 160        | 220        | 0.6      |
| 2     | 8.1| 1150       | 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.
Calculation for water quality rating:

\[ q_n = 100 \left[ \frac{(V_n - V_i)}{(S_n - V_i)} \right] \]

Where

- \( q_n \) = Water quality rating for the \( n \)th parameter,
- \( V_n \) = Observed value of the \( n \)th parameter,
- \( S_n \) = Standard permissible value of \( n \)th parameter,
\[ V_i = \text{Ideal value of nth parameter.} \]

Calculation of Unit weight (Wn):

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

\[ W_n = \frac{K}{S_n} \]

Where,

\( W_n \) = unit weight for the \( n^{th} \) parameter,
\( S_n \) = standard value of the \( n^{th} \) parameter,
\( K \) = constant for proportionality,

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

\[ K = \frac{1}{\sum (1/S_n)} \]

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

\[ WQI = \sum q_n W_n / \sum W_n \]

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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.