Fluorosis is one of the most prevailing groundwater related disease in developing countries like India and China. In India, 20 out of 29 states have some extent of groundwater fluoride contamination. In especially, Telangana State all (10 out of 10) districts are fluoride affected (Adimalla and Venkatayogi, 2017). However, this article describes about fluoride contamination and correlation between fluoride and other hydrochemical parameters, in the Munneru river basin (MRB) groundwater, Telangana State, South India. The fluoride concentration in groundwater of Munneru river basin ranged from 0.3 to 8.0 mg/L, with a mean of 1.607 mg/L. About 35% of the groundwater samples have fluoride concentration above 1.5 mg/L which are unsuitable for drinking purposes. However, 53% of groundwater locations are within the acceptable limits (0.5–1.5 mg/L) and these are very suitable for drinking purposes and remaining 22% of collected groundwater samples were having less than the required limit of 0.5 mg/L.

© 2018 Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).
### Value of the data

- The data which were presented here can be a pave path to design a sustainable planning and management of the groundwater resource to protect and supply potable water to dependent population.
- In most of the arid and semi-arid regions, groundwater is the upper most source of water supply. Therefore, water quality is the most important in such regions and it brings health problems. Hence, continuous monitoring of the quality of water is very essential.
- Identification of groundwater vulnerability zones is the primary and taking necessary precautions is foremost vital, in order to protect future generations.
- This data will be useful to develop effective strategies for improving rural drinking water supply and provide scientific evidence for decision and management of the groundwater.

### 1. Data

The MRB is one of the tributes of Krishna River, which is under arid and semi-arid condition and also MRB occupied by the Granitic rocks of Archaean age. The groundwater samples and its locations were shown in Fig. 1. The most of the MRB surrounding villagers depend on groundwater for their drinking and other household applications and to know the groundwater quality is the foremost vital and especially fluoride concentration, because it effects human health. The fluoride contents found in the groundwater samples range between 0.3 and 8.0 mg/L with a mean of 1.607 mg/L (Tables 1 and 2). The high fluoride content in the groundwater of MRB, which exceeds the maximum limit for drinking waters (1.5 mg/L) and east and south part of the MRB is shown elevated fluoride levels (Fig. 2). The fluoride ion (F\(^-\)) is the most common form in which fluorine occurs in the environment, although its behavior in groundwater is strongly dependent on the pH, since it has a lower solubility at pH 6.0–6.5 [1–12]. Binary diagrams of fluoride versus pH, nitrate, calcium, total dissolved solids (TDS), bicarbonate and chloride were performed to identify the groundwater influence factors, positive or negative correlations (Fig. 3).
## Table 1

Results of the chemical analysis of groundwater samples collected from Munneru river basin (MRB), Telangana State, South India.

| Sample ID | pH  | EC  | TDS  | TH  | Ca²⁺ | Mg²⁺ | Na⁺ | K⁺ | Cl⁻ | HCO₃⁻ | NO₃⁻ | SO₄²⁻ | F⁻ |
|-----------|-----|-----|------|-----|-------|-------|-----|----|-----|-------|------|-------|----|
| MRBT-1 | 7.7 | 1400| 896  | 125 | 4  | 28 | 52 | 2 | 152.6 | 98 | 39 | 30 | 2 |
| MRBT-2 | 7.61 | 2380| 362 | 195 | 10 | 41 | 79 | 3 | 337.2 | 98 | 39 | 34 | 2 |
| MRBT-3 | 8.42 | 92.3 | 59 | 20 | 4 | 2.4 | 8 | 1 | 24.8 | 18 | 8 | 14 | 0.2 |
| MRBT-4 | 7.85 | 1190 | 762 | 125 | 4 | 28 | 52 | 4 | 99.4 | 128 | 38 | 23 | 1 |
| MRBT-5 | 7.99 | 1970 | 1260 | 195 | 4 | 45 | 68 | 5 | 255.6 | 98 | 35 | 56 | 0.5 |
| MRBT-6 | 7.88 | 1360 | 870 | 190 | 10 | 40 | 26 | 3 | 102.9 | 79 | 39 | 53 | 0.4 |
| MRBT-7 | 7.88 | 1830 | 1171 | 165 | 2 | 39 | 68 | 4 | 181.1 | 195 | 39 | 41 | 1 |
| MRBT-8 | 8.38 | 1180 | 755 | 40 | 4 | 7.3 | 74 | 3 | 85.2 | 220 | 34 | 31 | 6 |
| MRBT-9 | 7.93 | 1220 | 780 | 70 | 6 | 13 | 55 | 3 | 110.1 | 128 | 38 | 19 | 3 |
| MRBT-10 | 8.07 | 67.5 | 432 | 100 | 18 | 13 | 30 | 7 | 74.6 | 79 | 33 | 8 | 0.7 |
| MRBT-11 | 8.14 | 328 | 209 | 55 | 6 | 4.8 | 17 | 4 | 28.4 | 55 | 24 | 0 | 0.6 |
| MRBT-12 | 7.62 | 2440 | 1561 | 315 | 26.1 | 61 | 56 | 4 | 429.5 | 92 | 35 | 56 | 0.5 |
| MRBT-13 | 7.58 | 4490 | 2873 | 555 | 54.1 | 102 | 100 | 5 | 812.9 | 67 | 39 | 37 | 2 |
| MRBT-14 | 7.95 | 1060 | 678 | 110 | 14 | 17 | 38 | 13 | 145.5 | 79 | 32 | 15 | 0.8 |
| MRBT-15 | 7.45 | 865 | 553 | 58 | 8 | 8.5 | 44 | 6 | 92.3 | 73 | 2 | 26 | 1 |
| MRBT-16 | 7.88 | 1140 | 729 | 80 | 4 | 17 | 35 | 35 | 53.3 | 73 | 23 | 35 | 0.7 |
| MRBT-17 | 7.75 | 2970 | 1900 | 350 | 48 | 17 | 32 | 4 | 259.1 | 153 | 39 | 45 | 4 |
| MRBT-18 | 7.26 | 2440 | 1561 | 315 | 26.1 | 61 | 56 | 4 | 429.5 | 92 | 35 | 56 | 0.5 |
| MRBT-19 | 7.88 | 1360 | 870 | 190 | 10 | 40 | 26 | 3 | 102.9 | 79 | 39 | 53 | 0.4 |
| MRBT-20 | 7.88 | 1830 | 1171 | 165 | 2 | 39 | 68 | 4 | 181.1 | 195 | 39 | 41 | 1 |
| MRBT-21 | 8.38 | 1180 | 755 | 40 | 4 | 7.3 | 74 | 3 | 85.2 | 220 | 34 | 31 | 6 |
| MRBT-22 | 7.93 | 1220 | 780 | 70 | 6 | 13 | 55 | 3 | 110.1 | 128 | 38 | 19 | 3 |
| MRBT-23 | 8.07 | 67.5 | 432 | 100 | 18 | 13 | 30 | 7 | 74.6 | 79 | 33 | 8 | 0.7 |
| MRBT-24 | 7.99 | 1970 | 1260 | 195 | 4 | 45 | 68 | 5 | 255.6 | 98 | 35 | 56 | 0.5 |
| MRBT-25 | 7.88 | 1360 | 870 | 190 | 10 | 40 | 26 | 3 | 102.9 | 79 | 39 | 53 | 0.4 |
| MRBT-26 | 7.88 | 1830 | 1171 | 165 | 2 | 39 | 68 | 4 | 181.1 | 195 | 39 | 41 | 1 |
| MRBT-27 | 7.75 | 1710 | 1094 | 215 | 36.1 | 30 | 41 | 7 | 557.4 | 73 | 24 | 0 | 0.6 |
| MRBT-28 | 7.75 | 1710 | 1094 | 215 | 36.1 | 30 | 41 | 7 | 557.4 | 73 | 24 | 0 | 0.6 |
| MRBT-29 | 7.75 | 1710 | 1094 | 215 | 36.1 | 30 | 41 | 7 | 557.4 | 73 | 24 | 0 | 0.6 |
| MRBT-30 | 7.75 | 1710 | 1094 | 215 | 36.1 | 30 | 41 | 7 | 557.4 | 73 | 24 | 0 | 0.6 |
| MRBT-31 | 7.75 | 1710 | 1094 | 215 | 36.1 | 30 | 41 | 7 | 557.4 | 73 | 24 | 0 | 0.6 |
| MRBT-32 | 7.75 | 1710 | 1094 | 215 | 36.1 | 30 | 41 | 7 | 557.4 | 73 | 24 | 0 | 0.6 |

*MRBT: Munneru river basin groundwater, Telangana State*
### Table 2
Statistical summary of the chemical composition of groundwater from Munneru river basin (MRB), Telangana State, South India.

| Water quality parameters | Minimum | Maximum | Mean   | Median | Standard deviation | Coefficient of variation | Acceptable limit | Permissible limit | Undesirable effect                |
|--------------------------|---------|---------|--------|--------|--------------------|--------------------------|-----------------|-----------------|-----------------------------------|
| pH                       | 7.33    | 8.55    | 7.882  | 7.88   | 0.292              | 0.037                    | 6.5–8.5         | No relaxation | Taste                             |
| EC (µS/cm)               | 92.3    | 5220    | 2118.345 | 1735 | 1209.651            | 0.571                    | –               | 1500            | Gastrointestinal irritation       |
| TDS (mg/L)              | 59      | 3341    | 1319.123 | 1094 | 787.263             | 0.597                    | 500             | 2000            | Gastrointestinal irritation       |
| TH                        | 20      | 815     | 214.912 | 165   | 169.475             | 0.789                    | 200             | 600             | –                                 |
| Ca²⁺                     | 2       | 208.4   | 22.807 | 10    | 38.660              | 1.695                    | 75              | 200             | Scale formation                   |
| Mg²⁺                     | 2.4     | 111     | 38.474 | 34    | 24.903              | 0.647                    | 30              | 100             | –                                 |
| Na⁺                      | 8       | 125     | 61.895 | 60    | 27.232              | 0.440                    | –               | 200             | High blood pressure               |
| K⁺                       | 1       | 35      | 4.965  | 4     | 5.318               | 1.071                    | –               | 12              | Bitter taste                      |
| Cl⁻                      | 24.8    | 1118.2  | 311.712 | 220  | 281.365             | 0.903                    | 250             | 1000            | Salty taste                      |
| HCO₃⁻                     | 18.3    | 427     | 111.512 | 91.5  | 70.779              | 0.635                    | –               | –               | –                                 |
| NO₃⁻                     | 1.5     | 40.7    | 33.970 | 38.7  | 9.327               | 0.275                    | 45              | –               | No relaxation methemoglobinemia  |
| SO₄²⁻                     | 0       | 101.2   | 36.556 | 33.5  | 20.395              | 0.558                    | 200             | 400             | Laxative effect                   |
| F⁻                       | 0.2     | 8       | 1.607  | 1     | 1.595               | 0.993                    | 1               | 1.5             | Fluorosis                         |
Fig. 1. Location map of the groundwater samples from the Munneru river basin (MRB), Telangana State, South India.

Fig. 2. Three-dimensional distribution and correlation with pH and Fluoride concentration in Munneru river Basin (MRB), Telangana State, South India.
2. Experimental design, materials, and methods

2.1. The study area description

Munneru river basin (MRB) stretches geo-graphically from 79.82798633 to 79.93446207 E longitude and 17.87285336 to 17.9557804 N latitude, positioned in the Warangal rural district, in the eastern part of Telangana (Fig. 1) and the mean monthly rainfall distribution is in shown in Fig. 4.

2.2. Sample collection and analysis procedure

Fifty seven groundwater samples were collected in pre-cleaned and sterilized polyethylene bottles of 1 L capacity with necessary precautions [13]. The groundwater samples were analyzed for various hydro chemical parameters such as pH, electrical conductivity (EC), total hardness (TH) as CaCO₃,
calcium (Ca\(^{2+}\)), magnesium (Mg\(^{2+}\)), sodium (Na\(^{+}\)), potassium (K\(^{+}\)), chloride (Cl\(^{-}\)), sulphate (SO\(_4^{2-}\)), nitrate (NO\(_3^{-}\)) and fluoride (F\(^{-}\)) [13] and detailed analysis procedure is depicted in Table 3. The fluoride concentration in water was determined electrochemically, using fluoride in selective electrode [13]. This method is applicable to the measurement of fluoride in drinking water in the concentration range of 0.01–1000 mg/L. The electrode used was an Orion fluoride electrode, coupled to an Orion electrometer. Standards fluoride solutions (0.1–10 mg/L) were prepared from a stock solution (100 mg/L) of sodium fluoride. As per experimental requirement, 1 ml of Total Ionic strength Adjusting Buffer Grade III (TISAB III) was added in 10 ml of sample. The ion meter was calibrated for a slope of – 59.2 ± 2 [12]. The composition of TISAB solution was as 385.4 g ammonium acetate, 17.3 g of cyclohexylene diamine tetraacetic acid (CDTA) and 234 ml of concentrate hydrochloric acid per liter.

**Acknowledgments**

Authors thank the DST-PURSE Program for providing financial assistance in the form of research project and Head, Department of Applied Geochemistry, Osmania University, Hyderabad for providing laboratory facilities. The first author special thanks to Department of Science and Technology

![Figure 4](image-url)
DST - Science and Engineering Research Board (SERB) Government of India, has sponsored Young Scientists Project (SR/FTP/ES-13/2013), under Start-Up Research Grant.

Transparency document. Supplementary material

Transparency document associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2018.01.059.

References

[1] Adimalla Narsimha, Elevated fluoride concentration levels in rural villages of Siddipet, Telangana State, South India Data Brief 16 (2018) 693–699. http://dx.doi.org/10.1016/j.dib.2017.11.088.

[2] N. Adimalla, S. Venkatayogi, Mechanism of fluoride enrichment in groundwater of hard rock aquifers in Medak, Telangana State, South India, Environ. Earth Sci. 76 (2017) 45. http://dx.doi.org/10.1007/s12665-016-6362-2.

[3] A. Narsimha, V. Sudarshan, Hydrogeochemistry of groundwater in Basara area, Adilabad District, Andhra Pradesh, India, J. Appl. Geochem. 15 (2) (2013) 224–237.

[4] A. Narsimha, V. Sudarshan, Assessment of fluoride contamination in groundwater from Basara, Adilabad District, Telangana State, India, Appl. Water Sci. 7 (2017) 2717–2725. http://dx.doi.org/10.1007/s13201-016-0489-x.

[5] A. Narsimha, V. Sudarshan, Contamination of fluoride in groundwater and its effect on human health: a case study in hard rock aquifers of Siddipet, Telangana State, India, Appl. Water Sci. 7 (2017) 2501–2512. http://dx.doi.org/10.1007/s13201-016-0441-0.

[6] A. Sudhakar, A. Narsimha, Suitability and assessment of groundwater for irrigation purpose: a case study of Kushaiguda Area, Ranga Reddy District, Andhra Pradesh, India, Adv. Appl. Sci. Res. 4 (2013) 75–81.

[7] A. Narsimha, S. Geetha, V. Sudarshan, P. Swathi, P. Srinivasulu, Physico-chemical analysis of drinking water quality in Hanamkonda area, Warangal District, Andhra Pradesh, India, JOCPR 4 (9) (2012) 4255–4259.

[8] A. Narsimha, V. Sudarshan, P. Swathi, Groundwater and its assessment for irrigation purpose in Hanmakonda area, Warangal district, Andhra Pradesh, India, Int. J. Res. Chem. Environ. 3 (2) (2013) 196–200.

[9] Adimalla Narsimha, Venkatayogi Sudarshan, Drinking water pollution with respective of fluoride in the semi-arid region of Basara, Nirmal district, Telangana State, India, Data Brief 16 (2018) 752–757. http://dx.doi.org/10.1016/j.dib.2017.11.087.

[10] Adimalla Narsimha, Venkatayogi Sudarshan, Data on fluoride concentration levels in semi-arid region of Medak, Telangana, South India, Data Brief 16 (2018) 717–723. http://dx.doi.org/10.1016/j.dib.2017.11.089.

[11] A. Narsimha, A. Sudhakar, Monitoring the quality of groundwater in Kushaiguda area Ranga Reddy District, Andhra Pradesh, Int. J. Adv. Sci. Technol. Res. 3 (1) (2013) 455–465.

[12] A. Narsimha, V. Sudarshan, P. Srinivasulu, B. Vishnu, M. Ramana Kumar, S. Niranjan Kumar, Groundwater quality and its suitability for drinking and agricultural purpose around Chityal Area, Nalgonda District, Andhra Pradesh, India, Water Res. Dev. 2 (3) (2012) 68–75.

[13] APHA, Standard Methods for Estimation of Water and Waste Water, 19th ed., American Public Health Association, Washington, DC, 1995.