

Evaluation of Groundwater Quality and Contamination of Fluoride, Medak Region, Telangana, South India

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Hydrogeochemical investigation of fluoride contaminated groundwater samples from Medak district in Telangana are undertaken to understand the quality and portability of groundwater from the study area, the level of fluoride contamination, the origin and geochemical mechanisms driving the fluoride enrichment. The groundwater is the main source of water for their living. The groundwater in villages and its surrounding are affected by fluoride contamination and consequently the majority of the people living in these villages has health hazards and is facing fluorosis. The purpose of this study is to identify geochemical processes and using characterization of the major physico-chemical parameters of groundwater from study area. For this purpose, 194 groundwater samples have collected and analyzed for different water quality parameters, such as pH, EC, TDS, TH, calcium, magnesium, sodium, potassium, carbonate, bicarbonate, chloride, nitrate, sulfate and fluoride with the help of standard methods recommended by American Public Health Association. The results of the analyzed parameters formed the attribute database for geographical information system (GIS) analysis and final output maps. Fluoride ion concentrations ranged between 0.4 and 7.1 mg/L with mean values of 1.69 mg/L in the groundwater suggest that favourable conditions exist for the dissolution of fluoride bearing minerals present in the granite and gneissic rocks in the study area, whereas, distribution pattern showed high concentrations in the vicinity of Siddipet, Chinnakodur and Nangnoor. Due to the higher fluoride level in drinking water, several cases of dental and skeletal fluorosis have appeared at alarming rate in this region. The highly alkaline conditions indicated fluorite dissolution as major process responsible for high concentration of fluoride in eastern part of the Medak. Fluoride has a very weak correlation with pH which may be due to the increase of alkalinity resulting from the increase of bicarbonate ions. While the deficiency of calcium ion concentration in the groundwater from calcite precipitation favours fluorite dissolution leading to excess fluoride concentration. The comparison of TDS versus Na/(Na+Ca) and Cl/(Cl+HCO₃) points to the dominance of rock weathering as the main process, which promotes the availability of fluoride in the groundwater. The presence of high fluoride in groundwater poses a serious health threat to the rural populace in the region.