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HEALTH RISK ASSESSMENT OF NITRATE AND FLUORIDE TOXICITY IN GROUNDWATER CONTAMINATION IN THE NAGARKURNOOL WATERSHED REGION OF TELANGANA STATE

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Abstract

Hydrogeochemical controlling variables for the high rate of groundwater contamination in a shallow hard rock aquifer in the Nagarkurnool watershed region of Nagarkurnool district, Telangana State, South India and the associated health risk to children and adults were studied in detail. A total of twenty three groundwater samples were analyzed in the year 2022. Spatial distribution, hydrochemical facies, water-rock interaction, health risk assessment (HRA), Hazard quotient (HQ) and statistical analyses were carried out to assess water quality. Spatial distribution of the high values of nitrate and fluoride is observed from the southern, western, central and eastern parts of the region. In terms of NO_3^- about 57% and F^- 35% of the groundwater samples are in the non-acceptable limit of nitrate-45 mg/l and fluoride-1.5 mg/l respectively. Gibb's plot has shown that majority of the area is dominated by rock dominance and evaporation mechanisms. Statistical analysis reveals that water chemistry is governed by weathering of feldspar minerals coupled with cation exchange reaction mechanism. Factor analysis results reveal that geogenic and anthropogenic activities have contributed to groundwater chemistry. Health risk assessment was carried out by calculating the hazard quotient (HQ) based on the of intake of groundwater, as per the US EPA. Results obtained show that a total hazard index value greater than 1 for adults and children can cause non-cancerous health effects.

Keywords: Health Risk assessment, Fluoride and Nitrate, Spatial distribution, Gibb's plot, Hazard quotient, Nagarkurnool watershed.