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## **Alarming Nitrate contents in groundwater in semi-arid region in South India: Analyzing for its vulnerability**

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Groundwater is the major source for using as drinking and irrigation in the study area. Excessive nitrate ( $\text{NO}_3^-$ ) concentration in drinking water has been shown to cause significant effects on human health. In light of this, a study was conducted in a semi-arid rural area by measuring the physicochemical parameters in 72 groundwater samples were collected from bore wells during Pre and post monsoon seasons in the year 2015. The hydrochemical results indicates that the groundwater in the study area is near-neutral to weakly alkaline water. The order of major dominance of cations in the groundwater is  $\text{Na}^+ > \text{Ca}^{2+} > \text{Mg}^{2+} > \text{K}^+$  and anions is  $\text{HCO}_3^- > \text{Cl}^- > \text{CO}_3^{2-} > \text{NO}_3^- > \text{SO}_4^{2-}$  in the study area. Thereby four major hydrochemical facies were identified (1)  $\text{Na}^+ - \text{HCO}_3^-$  type,  $\text{Na}^+$  dominant  $\text{HCO}_3^-$  type waters. (2)  $\text{Ca}^{2+} - \text{Mg}^{2+} - \text{Cl}^-$  type,  $\text{Ca}^{2+} - \text{Mg}^{2+}$  dominant  $\text{Cl}^-$  type waters. (3)  $\text{Ca}^{2+} - \text{Mg}^{2+} - \text{HCO}_3^-$  type,  $\text{Ca}^{2+} - \text{Mg}^{2+}$  dominant  $\text{HCO}_3^-$  type waters and (4)  $\text{Na}^+ - \text{Cl}^-$  type,  $\text{Na}^+$  dominant  $\text{Cl}^-$  type waters.

The concentration of  $\text{NO}_3^-$  in groundwater ranges from 2 to 1418 mg/l with mean of 182 mg/l. The permissible limit of nitrate in drinking water is 45 mg/l. It is observed that 78% samples were exceeded the permissible limits prescribed by drinking water standard.  $\text{NO}_3^-$  has shown a significant negative correlation with pH and positive correlation with Eh, TDS,  $\text{K}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Cl}^-$  and  $\text{SO}_4^{2-}$ . The significant positive correlation between these ions indicates the anthropogenic pollution rather than naturally originated. The  $\text{NO}_3^-$  pollution in the studied groundwaters originates through anthropogenic processes. Results thus indicated that the groundwater of the study area is highly unsafe for drinking purposes in normal condition.

**Key words:** Groundwater quality, Fluoride, Nitrate, Impact on human health, Geochemical mechanism.

