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Some critical aspects to consider in recharge assessment in limestone (karst) aquifers

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Groundwater recharge by rainfall is the only source that replenishes the karstified Narji limestone aquifer of Kurnool district, India. The study was carried out to assess the recharge and different factors on which recharge is dependent. From the study, it was found that estimating recharge and managing water resources in this highly heterogeneous karst aquifer is not as simple because of complex karst hydrogeological peculiarities. Recharge occurs in many ways depending mainly on the degree of karst development. Two main recharge mechanisms are point and diffuse recharge in karst aquifers. Point recharge is the major contributor and enters the aquifer as allogenic inputs. In this method preferential solution pathways like, those developed by karstification are necessary to map and consider before choosing any method. Average annual point recharge of the aquifer is 15% of the annual rainfall. The high value of point recharge has a large effect on the hydrodynamics and hydrochemistry of the aquifer. Diffuse recharge enters the aquifer through the soil and epikarst zone and reaches the phreatic part very late. In case of diffuse recharge, soil properties, climatic conditions and frequency and intensity of rainfall are important factors to consider. Diffuse recharge of 13% of annual rainfall replenishes the aquifer. The results of the recharge estimation were calibrated with the water levels of the borewells and results from tritium injection method. The results showed that irrigation return flow also contributes to these limestone aquifers particularly from paddy fields. Annual recharge occurs only during 5-7 rainfall events in the year. This study is of great importance in groundwater resource management in karst aquifers of India which are still characterised and managed using non-specific methods.

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