

Potential Sources of High Level of Ammonium Contamination in Deep Groundwater of Kathmandu Valley, Nepal

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The source of ammonium-nitrogen (NH₄-N) in Kathmandu Valley deep groundwater has not been widely researched, yet the elevated concentration continues to be a matter of concern. In this study, the potential sources of ammonium-nitrogen in deep groundwater of Kathmandu Valley were investigated by observing water quality and nitrogen isotope in the deep groundwater where contamination with high concentrations of ammonium was confirmed. Contamination of NH₄-N exceeding the drinking water guideline value of 1.1 mg-N/L was detected in 17 out of the 25 deep wells with the maximum value of 124.8 mg-N/L. The concentration was found to be increased gradually from the peripheral part to the central part of the basin and higher in the area overlain by a thick clay layer (aquitard). Meanwhile, nitrogen isotope from ammonia ($\delta^{15}\text{N-NH}_4$) was found to be ranged between 0.9‰ to 3.8‰. The origin of high ammonium concentration in the deep groundwater is nitrogen is found to be derived from soil deposited in the basin. Similarly, the geological analysis also suggested the natural origin of high ammonium concentration due to nitrogen loading from thick clay layers containing rich organic matter. From the preliminary analysis, the NH₄-N enrichment in the aquifer is anticipated from the percolation through thick clay. Thus, this study found a possible relationship between the thickness of the aquitard to the concentration of NH₄-N. However, in order to understand the source of ammonium contamination in the groundwater, there require a detailed study on hydrogeochemical processes within the aquifer and aquitards.

Keywords: Groundwater, Ammonium, Nitrogen isotope