

# **A Systematic Review of the Association between Borehole Fluoride Levels in the Rift Valley and Tubulointerstitial Nephritis in Nakuru County, Kenya**

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**K, a, m, a, u, O, c, h, i, e, n, g, ,, W, a, n, j, i, k, u, M, w, a, n, g, i, ,, K, i, p, k,  
o, r, i, r, R, o, t, i, c, h, ,, A, m, i, n, a, C, h, e, b, e, t**

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## | Abstract

Chronic kidney disease of uncertain aetiology, particularly tubulointerstitial nephritis, is a significant health concern in Nakuru County, Kenya. The region is within the Rift Valley, where groundwater is known to contain elevated fluoride levels. A link between fluoride exposure from borehole water and kidney damage has been hypothesised, but a comprehensive synthesis of the evidence is absent. This systematic review aimed to synthesise and critically appraise the available evidence on the association between fluoride levels in specific borehole water sources in the Rift Valley and the incidence or prevalence of tubulointerstitial nephritis among residents of Nakuru County. A systematic search of multiple electronic databases and grey literature sources was conducted. Studies reporting primary data on borehole fluoride concentrations and clinically diagnosed tubulointerstitial nephritis in Nakuru County were included. Two independent reviewers screened studies, extracted data, and assessed methodological quality using standardised tools. Of the 347 records initially identified, three studies met the inclusion criteria. All were ecological or cross-sectional in design. A consistent positive association was reported, with one study noting a two-fold higher prevalence of kidney function abnormalities in areas where borehole fluoride exceeded 4 mg/L. The evidence was limited by significant methodological heterogeneity and potential confounding. The existing evidence, though sparse and of low to

moderate quality, suggests a plausible association between high borehole fluoride levels and tubulointerstitial nephritis in this population. The current data are insufficient to establish causality. Further high-quality analytical epidemiological studies, particularly case-control or cohort designs with individual-level exposure assessment, are required. Public health measures should prioritise providing alternative low-fluoride water sources while research continues. Fluoride, groundwater, borehole, tubulointerstitial nephritis, chronic kidney disease, Rift Valley, Kenya. This review consolidates the limited primary evidence on a suspected environmental nephrotoxin in a specific geographical setting, highlighting critical evidence gaps and informing future research and public health strategy.

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