



A Systematic Review of the Association Between Mine Tailings Exposure and Chronic Kidney Disease of Unknown Aetiology in South Africa's North West Province: Evidence from 2009

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Abstract

Chronic kidney disease of unknown aetiology (CKDu) is a notable public health concern in South Africa's North West Province, a region characterised by extensive historical mining. Community concerns and initial research have proposed a potential link with environmental exposure to mine tailings, highlighting a need for a rigorous synthesis of the available evidence. This systematic review aimed to critically appraise and synthesise existing evidence on the correlation between exposure to mine tailings and the prevalence of CKDu in the North West Province. The objective was to determine the strength and nature of this association from the published literature. A systematic search was executed across multiple electronic databases for peer-reviewed studies. Pre-defined inclusion and exclusion criteria were applied. Two independent reviewers screened titles, abstracts, and full texts, extracted data, and assessed the methodological quality of included studies using standardised tools. A narrative synthesis was conducted due to heterogeneity in study designs and outcomes. The review identified a limited but consistent body of evidence indicating a positive association. A recurring finding was elevated levels of nephrotoxic heavy metals, such as cadmium and uranium, in environmental samples and biological matrices from affected communities. The evidence, however, remains largely observational, with significant methodological limitations identified across studies. The existing literature provides suggestive evidence of an association between mine tailings exposure and CKDu in the North West Province, but it is insufficient to establish causality. The observed correlations are biologically plausible given the known nephrotoxicity of tailings contaminants. There is a need for investment in robust, longitudinal epidemiological studies with individual-level exposure assessment. Public health authorities should consider enhanced environmental monitoring and community screening

programmes in high-risk areas as a precautionary measure. chronic kidney disease of unknown aetiology, CKDu, mine tailings, environmental exposure, nephrotoxicity, heavy metals, South Africa, North West Province, systematic review. This review consolidates and critically evaluates the available evidence on a hypothesised environmental driver of CKDu, providing a clear summary for researchers and policymakers and identifying crucial gaps for future investigation.

Keywords: *Chronic kidney disease of unknown aetiology, Environmental exposure, Mine tailings, South Africa, Systematic review, North West Province, Occupational health*

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