



Shaping Tomorrow's Nephrology: Insight-Driven Kidney Care

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Clinical Relevance in Kidney Function, Diagnostics, Prognosis, Disease Severity, and Normative Studies of Imaging-Based Kidney Volume Measurement in Children: A Systematic Review

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Objectives : Kidney volume (KV) is correlated with nephron mass and renal structural development, but its association with normal reference values, renal function, and impact on disease severity in children remains unclear. This systematic review aims to comprehensively evaluate the clinical relevance of KV in children with kidney disease or healthy kidneys.

Methods : The database search was conducted using PubMed, Scopus, Science direct, and Cochrane library published from January 1, 2010, to February 28, 2026. Eligible studies included randomized controlled trials, cohort, cross-sectional, and case-control studies related to the clinical relevance of KV imaging in children aged 0-18 years. KV refers to the total volume of both kidneys or the individual kidney volume when the total volume is not reported. Quality assessment was performed using QUADAS-2 and Newcastle–Ottawa Scale.

Results : Out of 295 identified records, 27 studies met inclusion criteria with a low-to-moderate level of risk of bias. KV was measured using ultrasound, CT, MRI, and/or AI segmentation. The majority of studies showed that there was a relationship between large KV with disease severity and disease progression such as ADPKD in children. Smaller KV in LBW or premature infants was also associated with kidney function and blood pressure, but some cohort studies reported no significant relationship with term infants. KV also significantly increases with body surface area in children, which can indicate early detection, evaluation of kidney disease, and transplantation outcomes.

Conclusions : The results of this study show that KV has a major influence on clinical relevance, making it an important indicator in evaluating children's kidney health. The limitations of the study design suggest that more robust analytical studies, such as RCTs, are needed to clearly determine the causal relationship and long-term prognostic value.

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