

Effect of pulse pressure, pulse pressure index and inflammation on the progression of chronic kidney disease in children from the CKiD study

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Objective: To understand the clinical significance of pulse pressure in terms of the progression of chronic kidney disease (CKD).

Pulse pressure (PP), systolic blood pressure (SBP), Left ventricular mass index (LVMI), pulse pressure index (PPI) and inflammatory biomarkers are proven predictors for cardiovascular (CV) disease and chronic kidney disease (CKD) progression in adults. Their viability in children, however, has not been established. This study aims to investigate how increased levels of these factors correlate with progression of CKD and other markers of CV disease including left ventricular mass index (LVMI). This is a retrospective analysis of 892 pediatric patients (1-16 years) with CKD from the NIDDK Chronic Kidney Disease in Children (CKiD) registry. Data including demographics, cause of CKD (inflammatory vs. non-inflammatory), estimated glomerular filtration rate (GFR), systolic and diastolic blood pressure (SBP and DBP), pulse pressure (PP) and angiotensin-converting enzyme inhibitors/angiotensin receptor blockers(ACEi/ARB) usage were included for analysis. A strong inverse relationship was found between increased SBP, DBP, and PP with loss of GFR and increases in LVMI. These results are similar to those seen in adult populations. In addition, our inflammatory CKD subgroup showed significantly higher serum creatinine (SCr), SBP, DBP, PP values with significantly lower serum albumin levels. A subgroup analysis demonstrated that SBP, DBP, and PP all correlated significantly with LVMI in inflammatory CKD patients, however, this was not seen in the non-inflammatory sub-group. In order to prevent future decline in renal function and reduced inflammation proper blood pressure control must be maintained.

This study is one of the first to assess children with CKD using non-invasive surrogate markers of arterial stiffness. We have demonstrated a strong inverse relationship between SBP, DBP, and PP with CKD outcomes such as loss of GFR and increases in LVMI in children similar to adults. In addition, we have demonstrated differences in these relationships by CKD etiology as inflammatory or non-inflammatory which is unique and hypothesis generating. Our inflammatory CKD subgroup children showed significantly higher SCr, SBP, DBP, PP and significantly lower serum albumin levels. Subgroup analysis of CKD patients demonstrated that SBP, DBP, and PP were all significantly correlated with LVMI in inflammatory CKD patients but not non-inflammatory. These findings suggest that effective blood pressure control is of paramount importance in children with CKD due to inflammatory causes to decrease their long-term CV morbidity and mortality, and to reduce their rate of decline in renal function.