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Cardiovascular Phenotypes in Children with CKD: The 4C Study

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Abstract

Background and objectives Cardiovascular disease is the most important comorbidity affecting long-term survival in children with CKD.

Design, setting, participants, & measurements The Cardiovascular Comorbidity in Children with CKD Study is a multicenter, prospective, observational study in children ages 6–17 years old with initial GFR of 10–60 mL/min per 1.73 m². The cardiovascular status is monitored annually, and subclinical cardiovascular disease is assessed by noninvasive measurements of surrogate markers, including the left ventricular mass index, carotid intima-media thickness, and central pulse wave velocity. We here report baseline data at study entry and an explorative analysis of variables associated with surrogate markers.

Results A total of 737 patients were screened from October of 2009 to August of 2011 in 55 centers in 12 European countries, and baseline data were analyzed in 688 patients. Sixty-four percent had congenital anomalies of the kidney and urinary tract; 26.1% of children had uncontrolled hypertension (24-hour ambulatory BP monitoring; $n=545$), and the prevalence increased from 24.4% in CKD stage 3 to 47.4% in CKD stage 5. The prevalence of left ventricular hypertrophy was higher with each CKD stage, from 10.6% in CKD stage 3a to 48% in CKD stage 5. Carotid intima-media thickness was elevated in 41.6%, with only 10.8% of patients displaying measurements below the 50th percentile. Pulse wave velocity was increased in 20.1%. The office systolic BP SD score was the single independent factor significantly associated with all surrogate markers of cardiovascular disease. The intermediate end point score (derived from the number of surrogate marker measurements >95th percentile) was independently associated with a diagnosis of congenital anomalies of the kidney and urinary tract, time since diagnosis of CKD, body mass index, office systolic BP, serum phosphorus, and the hemoglobin level.

Conclusions The baseline data of this large pediatric cohort show that surrogate markers for cardiovascular disease are closely associated with systolic hypertension and stage of CKD.

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Published online before
print November 2016,
doi: 10.2215/
CJN.01090216
CJASN January 06, 2017
vol. 12 no. 1 19–28

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Received February 1, 2016.
Accepted September 26, 2016.

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Print ISSN: 1555-9041
Online ISSN: 1555-905X