

Abstract Submission No.: A-0102**Carotid Intima-Media Thickness, Fibroblast Growth Factor 23, and Mineral Bone Disorder in Children with Chronic Kidney Disease**

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Objectives : Chronic kidney disease (CKD) poses challenges in pediatric patients, one of which is mineral and bone disorder (MBD), which leads to vascular calcification and accelerated atherosclerosis, compromising cardiovascular health. Carotid intima-media thickness (cIMT) is a measure of atherosclerotic vascular disease and a surrogate biomarker for cardiovascular risk in patients with CKD. Increased fibroblast growth factor 23 (FGF23)—the earliest detectable serum abnormality associated with CKD-MBD—has been linked with cardiovascular outcomes in patients with CKD. Our study aims to identify factors contributing to increased cIMT, FGF23, and suboptimal MBD control in pediatric CKD.

Methods : We recruited 43 children (ages 2–18) with CKD stages 2 to 5D at Dr. Sardjito General Hospital, Indonesia. cIMT was measured using Philips HD15 echocardiography by a blinded examiner, including left ventricular mass index (LVMI). Blood samples were collected for FGF23 analysis, with additional assessment of other parameters associated with CKD-MBD, including hemoglobin, creatinine, albumin, uric acid, calcium, phosphate, and PTH levels. Statistical analyses were applied to examine associations among cIMT, FGF23, and MBD.

Results : Higher FGF23 levels were significantly associated with the presence of MBD ($r=0.83$, $p<0.001$), lower eGFR ($r=-0.49$, $p<0.001$), advanced CKD ($r=0.33$, $p<0.05$), patients requiring dialysis ($r=0.69$, $p<0.05$), hypertension ($r=0.24$, $p=0.02$), and higher LVMI ($r=0.51$, $p<0.001$). No variable exhibited a significant correlation with cIMT measurements. Hemodialysis patients had poorer MBD parameters and higher FGF23 and cIMT than those on peritoneal dialysis, although the differences were insignificant.

Conclusions : FGF23 levels increased with CKD progression and the presence of CKD-MBD. Elevated FGF23 may be associated with increased MBD prevalence in late-stage CKD. The relationships between cIMT with FGF23, MBD, and cardiovascular outcomes in CKD have not been conclusively demonstrated in our study. A more extensive study is needed to validate the factors affecting cIMT in children with CKD.

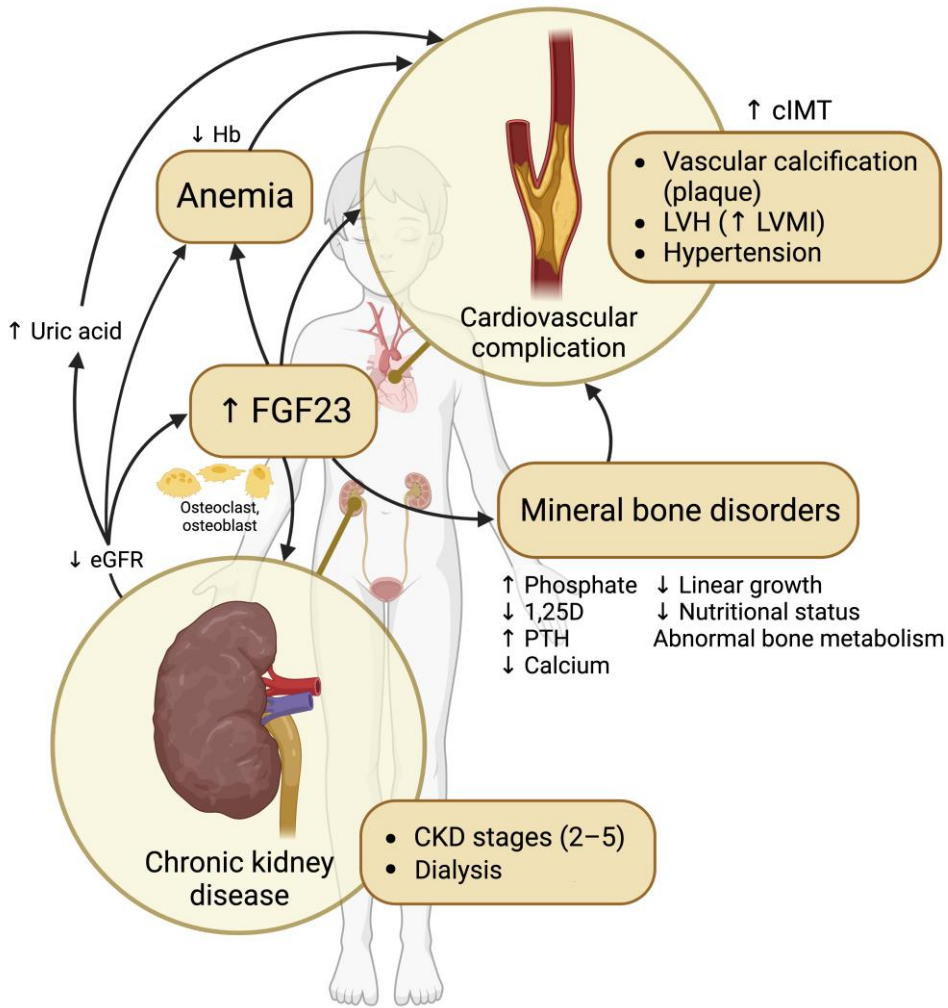


Figure 1 for APCN2024.png

Table 1. Statistical analysis of cIMT and FGF23 with MBD, cardiovascular parameters, and other variables in CKD

Variables	cIMT		FGF23	
	r	p-value	r	p-value
<i>Spearman correlation</i>				
Calcium (mg/dL)	0.07	NS	0.08	NS
Phosphate (mg/dL)	0.08	NS	0.11	NS
Ca x P product (mg ² /dL ²)	0.12	NS	0.19	NS
Albumin (g/dL)	-0.11	NS	-0.25	NS
Corrected calcium (mg/dL)	0.09	NS	0.14	NS
PTH (pg/mol)	0.05	NS	0.34	NS
Uric acid (mg/dL) [†]	0.24	NS	0.05	NS
FGF23 (RU/mL)	0.06	NS	NA	NS
LVMI (g/m ²)	-0.01	NS	0.51	< 0.001
Age (years)	0.24	NS	-0.09	NS
BMI (kg/m ²)	0.08	NS	-0.09	NS
eGFR (mL/min per 1.73 m ²)	-0.01	NS	-0.49	< 0.001
CKD duration (months)	0.003	NS	0.02	NS
Dialysis duration (months)	0.13	NS	0.26	NS
<i>Mann Whitney test</i>				
Gender	0.3	NS	0.13	NS
Anemia	0.27	NS	0.56	NS
Hypertension	0.05	NS	0.35	NS
Mineral bone disease	0.39	NS	0.83	< 0.001
Stunted	0.12	NS	0.12	NS
Receiving KRT [‡]	0.25	NS	0.69	< 0.05
PD/HD as KRT modality	0.49	NS	0.14	NS
<i>Kruskal Wallis test</i>				
Nutritional status [§]	0.15	NS	0.02	NS
CKD stage	0.04	NS	0.33	< 0.05
Hypertension [†]	0.01	NS	0.24	0.02
Primary disease (CAKUT, glomerular, and others)	0.01	NS	0.02	NS

BMI, body mass index; Ca, Calcium; CAKUT, congenital anomalies of kidney and urinary tract; cIMT, carotid intima-media thickness; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate (mL/min per 1.73 m²); FGF23, fibroblast growth factor 23; HD, hemodialysis; KRT, kidney replacement therapy; LVMI, left ventricular mass index; MBD, mineral bone disease; NS, not significant; P, phosphate; PD, peritoneal dialysis; PTH, parathyroid hormone

[†]PTH levels were tested in 9 subjects

[†]Uric acid levels were tested in 17 subjects.

[‡]KRT refers to HD and PD

[§]Nutritional status: underweight (BMI-for-age < 5th percentile), normal (BMI-for-age ≥ 5th and < 85th percentile), overweight (BMI-for-age ≥ 85th and < 95th percentile), obese (BMI-for-age ≥ 95th percentile) categorized based on American Academy of Pediatrics