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Correspondence: Carotid intima-media thickness, fibroblast growth factor 23, and mineral bone disorder in children with chronic kidney disease

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Main text

We appreciate the opportunity to respond to Dr. Christian Saleh's letter and to clarify aspects of our study findings. We sincerely value the thoughtful comments and the chance to further reflect on our study's limitations. Our research aimed to identify factors influencing high carotid intima-media thickness (cIMT), elevated fibroblast growth factor 23 (FGF23), and poor mineral and bone disorder (MBD) control in children with chronic kidney disease (CKD) within our resource-constrained setting [1]. We anticipate that our findings will serve as a baseline for future studies involving a larger patient cohort and will help refine the limitations identified in the current study.

We recognize the importance of reproducibility, operator dependency, and methodological rigor in cIMT measurements. To minimize variability, we employed a single, blinded examiner with extensive training, ensuring adherence to a standardized protocol. Measurements were conducted individually at different time points rather than in batch readings, which are recommended for optimal consistency. To assess reliability, 10 of the 42 cIMT measurements were reassessed by a senior cardiologist. Agreement between the blinded examiner and the senior cardiologist was evaluated using the kappa (κ) statistic, yielding a κ value of 0.782, indicating moderate reliability [2].

We appreciate Dr. Saleh's suggestion that incorporating multiple measurements from different angles or artery views, along with a more extensive protocol, could further improve reliability [3]. Additionally, we acknowledge the role of cardiac synchronization in accounting for systolic and diastolic variability [4]. However, due to logistical and clinical constraints—particularly the limited

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cooperation of pediatric patients and restricted access to advanced facilities—this was not feasible [6–7]. Nonetheless, our standardized measurement protocol may have helped mitigate this limitation to some extent. We agree that future studies should integrate cardiac gating to enhance precision, and we acknowledge this as a limitation of our study.

Regarding methodological comparisons, we acknowledge that different techniques were employed by [8–10] specifically cardiac synchronization and edge-tracking devices, which limits direct comparisons with our manually performed measurements. We appreciate this important perspective and recognize these methodological discrepancies and their potential impacts on the interpretation of our results.

In summary, despite these acknowledged limitations, we hope our study provides meaningful insights into predictors of elevated cIMT in pediatric CKD. We are grateful for this constructive dialogue and the opportunity to refine our discussion, and we will consider these aspects in future research.

Abbreviations

cIMT	Carotid intima-media thickness
CKD	Chronic kidney disease
FGF23	Fibroblast growth factor 23
MBD	Mineral and bone disorder

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Not applicable.

Author contributions
RPB, KH, IKM, CK, and CGA reviewed the literature and this paper, and drafted and revised the manuscript. TN provided essential additional data. All authors read and approved the final manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
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Competing interests
The authors declare no competing interests.

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References

1. Palupi-Baroto R, Hermawan K, Murni IK, Nurlita T, Prihastuti Y, Puspitawati I, et al. Carotid intima-media thickness, fibroblast growth factor 23, and mineral bone disorder in children with chronic kidney disease. BMC Nephrol. 2024;25(1):369. https://doi.org/10.1186/s12882-024-03771-z.
2. McHugh ML. Interrater reliability: the kappa statistic. Biochem Med (Zagreb). 2012;22(3):276–82.
3. Bots ML, Evans GW, Riley WA, Grobbee DE. Carotid intima-media thickness measurements in intervention studies: design options, progression rates, and sample size considerations: A point of view. Stroke. 2003;34(12):2985–94. https://doi.org/10.1161/01.STR.0000102044.27905.B5.
4. Touboul P-J, Hennerici MG, Meairs S, Adams H, Amarenco P, Bornstein N et al. Mannheim carotid intima-media thickness and plaque consensus (2004-2006-2011). An update on behalf of the advisory board of the 3rd, 4th and 5th watching the risk symposia, at the 13th, 15th and 20th European Stroke Conferences, Mannheim, Germany, 2004, Brussels, Belgium, 2006, and Hamburg, Germany, 2011. Cerebrovasc Dis. 2012;34(4):290–6. https://doi.org/10.1159/000343145
5. Ambarsari CG, Hidayati EL, Trihono PP, Saraswati M, Rodjani A, Wahyudi I, Situmorang GR, Kim JJ, Mellyana O, Kadaristiana A. Experience of the first 6 years of pediatric kidney transplantation in Indonesia: A multicenter retrospective study. Pediatr Transpl. 2020;24(8):e13812. https://doi.org/10.1111/petr.13812.
6. Palupi-Baroto R, Hermawan K, Murni IK, Nurlitasari T, Prihastuti Y, Sekali DRK, et al. High fibroblast growth factor 23 as a biomarker for severe cardiac impairment in children with chronic kidney disease: a single tertiary center study. Int J Nephrol Renovasc Dis. 2021;14:165–71. https://doi.org/10.2147/IJNRD.S304143.
7. Ambarsari CG, Hidayati EL, Hasan I, Grace A, Oswari H. Successful treatment of hepatitis C virus infection using direct-acting antiviral agents (DAAs) in children with kidney transplantation: a case series. Int J Nephrol Renovasc Dis. 2020;13:139–46. https://doi.org/10.2147/IJNRD.S248632.
8. Schaefer F, Doyon A, Azukaitis K, Bayazit A, Canpolat N, Duzova A, et al. Cardiovascular phenotypes in children with CKD: the 4 C study. Clin J Am Soc Nephrol. 2017;12(1):19–28. https://doi.org/10.2215/CJN.01090216.
9. Brady TM, Schneider MF, Flynn JT, Cox C, Samuels J, Saland J, et al. Carotid intima-media thickness in children with CKD: results from the CKiD study. Clin J Am Soc Nephrol. 2012;7(12):1930–7. https://doi.org/10.2215/CJN.03130312.
10. Lopes R, Morais MB, Oliveira FLC, Brecheret AP, Abreu ALCS, Andrade MC. Evaluation of carotid intima-media thickness and factors associated with cardiovascular disease in children and adolescents with chronic kidney disease. J Pediatr (Rio J). 2019;95(6):696–704. https://doi.org/10.1016/j.jped.2018.06.010

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