

Children's Mercy Kansas City

SHARE @ Children's Mercy

Posters

4-2022

Potassium Status in Pediatric Chronic Kidney Disease: A Preliminary Report from the Chronic Kidney Disease in Children (CKiD) Study

Katherine L. Kurzinski
Children's Mercy Hospital

Yunwen Xu

Derek NG

Susan Furth

George Schwartz

See next page for additional authors

Let us know how access to this publication benefits you

Follow this and additional works at: <https://scholarlyexchange.childrensmercy.org/posters>



Part of the [Nephrology Commons](#), and the [Pediatrics Commons](#)

Recommended Citation

Kurzinski, Katherine L.; Xu, Yunwen; NG, Derek; Furth, Susan; Schwartz, George; and Warady, Bradley A., "Potassium Status in Pediatric Chronic Kidney Disease: A Preliminary Report from the Chronic Kidney Disease in Children (CKiD) Study" (2022). *Posters*. 269.

<https://scholarlyexchange.childrensmercy.org/posters/269>

This Poster is brought to you for free and open access by SHARE @ Children's Mercy. It has been accepted for inclusion in Posters by an authorized administrator of SHARE @ Children's Mercy. For more information, please contact hlsteel@cmh.edu.

Authors

Katherine L. Kurzinski, Yunwen Xu, Derek NG, Susan Furth, George Schwartz, and Bradley A. Warady

Potassium Status in Pediatric Chronic Kidney Disease: A Report from the Chronic Kidney Disease in Children (CKiD) Study

Katherine Kurzinski¹; Yunwen Xu²; Derek Ng²; Susan Furth³; George Schwartz⁴; Bradley A. Warady¹

¹Division of Pediatric Nephrology, Children's Mercy Kansas City, Kansas City, MO; ²Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD; ³Division of Nephrology, Children's Hospital of Philadelphia, Philadelphia, PA; ⁴Department of Pediatric Nephrology, University of Rochester Medical Center, Rochester, NY

Background

- Hyperkalemia is associated with increased disease progression, cardiovascular events, morbidity, and mortality in patients with chronic kidney disease (CKD).
- There are few large-scale studies evaluating potassium levels and the prevalence of hyperkalemia in pediatric CKD.

Objectives

- Characterize median serum potassium levels and prevalence of hyperkalemia in subjects with CKD Stage (1-5)
- Evaluate the relationship of serum potassium and hyperkalemia with respect to CKD etiology, CO₂ level, and degree of proteinuria
- Evaluate the prevalence of hyperkalemia with respect to medication use when controlling for subject factors

Methods

- 5183 study visits with laboratory data from 1050 subjects from the CKiD Study
- Evaluated median serum potassium level (mmol/L) and percentage of patients with hyperkalemia (K > 5.5 mmol/L) with respect to the following features:
 - CKD Stage (CKiD U25 eGFR)
 - CKD Etiology (glomerular v. nonglomerular)
 - Acid-Base Status (CO₂ level: low, medium, high)
 - Level of proteinuria (none, non-nephrotic, nephrotic)
 - Self-Reported Therapy Use

Statistical Analysis

Kruskal-Wallis tests: compare median potassium levels across groups

Repeated Measures Logistic Regression, Generalized Estimating Equations: estimate/compare proportion of hyperkalemia (K > 5.5 mmol/L) within groups

Univariate/Multivariate Logistic Regression: assess association between presence of hyperkalemia (K > 5.5 mmol/L) and concurrent use of the following:

- ACEi/ARB, Beta Blocker, Diuretic, Potassium Binder

Models adjusted for the following covariates:

- Age, sex, race, ethnicity, low socioeconomic status (public insurance, annual household income < \$36k, or maternal education < college), eGFR, log₂ based proteinuria, CKD etiology, CO₂ category, concurrent alkali therapy

Results

Table 1. Median serum potassium levels and percentage of assessments with hyperkalemia by CKD stage.

Stage (eGFR, mL/min/1.73m ²)	1/2 (60+)	3a (45-59)	3b (30-44)	4/5 (<30)	p-value
Overall, N (# of visits)	1492	1353	1368	970	
Potassium, mmol/L	4.2	4.3	4.4	4.5	<0.001
[IQR]	[4.0, 4.5]	[4.1, 4.6]	[4.1, 4.7]	[4.1, 5.0]	
Hyperkalemia, % (n)	0.6 (9)	0.8 (11)	2.3 (32)	6.6 (64)	<0.001
[95% CI]	[0.3, 1.2]	[0.5, 1.5]	[1.6, 3.4]	[4.8, 8.2]	
Glomerular, n*	538	290	227	154	
Potassium, mmol/L	4.3	4.4	4.5	4.9	<0.001
[IQR]	[4.0, 4.5]	[4.1, 4.8]	[4.2, 4.9]	[4.3, 5.3]	
Hyperkalemia, % (n)	1.1 (6)	1.0 (3)	2.2 (5)	14.3 (22)	0.002
[95% CI]	[0.5, 2.5]	[0.3, 3.1]	[0.9, 5.1]	[9.4, 21.1]	
Non-glomerular, n*	954	1063	1141	816	
Potassium, mmol/L	4.2	4.3	4.4	4.5	<0.001
[IQR]	[4.0, 4.5]	[4.1, 4.6]	[4.1, 4.7]	[4.1, 4.9]	
Hyperkalemia, % (n)	0.3 (3)	0.8 (8)	2.4 (27)	5.1 (42)	<0.001
[95% CI]	[0.1, 1.0]	[0.4, 1.5]	[1.6, 3.5]	[3.5, 6.8]	

* Glomerular or nonglomerular etiology of CKD, # of study visits

Table 2. Median serum potassium levels and percentage of assessments with hyperkalemia by CO₂ level and level of proteinuria.

CO ₂ mmol/L	High >26	Normal 22-26	Low <22	p-value
N (# of visits)	1407	2333	1304	
Potassium, mmol/L	4.3 [4.0, 4.5]	4.3 [4.1, 4.6]	4.5 [4.1, 4.9]	<0.001
Hyperkalemia*, % (n)	0.4 (5)	1.9 (45)	4.8 (63)	<0.001
Level of proteinuria UPCR, g/g	None <0.2	Non-nephrotic 0.2-2.0	Nephrotic >2.0	p-value
N (# of visits)	1825	2611	608	
Potassium, mmol/L [IQR]	4.3 [4.1, 4.6]	4.4 [4.1, 4.7]	4.4 [4.0, 4.8]	<0.001
Hyperkalemia*, % (n)	1.3 (24)	2.6 (69)	3.3 (20)	0.002

Results con't

Table 3. Self-reported medication use in the study population.

Medication	Overall n (%)
ACEi/ARB	2809 (54.2)
Beta Blocker	292 (5.6)
Diuretic	300 (5.8)
Potassium Binder	67 (1.3)

Table 4. Association between self-reported medication use and the presence of hyperkalemia.

Medication Used	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
At Concurrent Study Visit		
ACEi/ARB	5.36 (2.09, 13.73)	3.16 (1.33, 7.53)
Beta Blocker	2.29 (1.18, 4.46)	1.34 (0.71, 2.52)
Diuretic	1.97 (1.04, 3.73)	1.15 (0.60, 2.20)
Potassium Binder	2.26 (1.45, 3.51)	2.40 (1.49, 3.89)
At Previous Study Visit*		
ACEi/ARB	3.07 (1.79, 5.27)	3.06 (1.69, 5.54)
Beta Blocker	0.83 (0.31, 2.27)	0.45 (0.16, 1.26)
Diuretic	2.29 (1.20, 4.38)	1.65 (0.86, 3.17)
Potassium Binder	2.84 (0.83, 9.75)	2.16 (0.68, 6.84)

* Subjects medication use at 2 or more study visits

Conclusions

- Subjects with advanced CKD stage, low CO₂ level, and nephrotic-range proteinuria had significantly higher median serum potassium levels and a greater percentage of laboratory assessments with hyperkalemia irrespective of CKD etiology
- The odds of hyperkalemia is 3.16 times higher with concurrent ACEi/ARB use
- This information can help identify patients at greatest risk for substantial elevations in potassium who may benefit from dietary modification and/or potassium-lowering medication.

Funding

The CKiD Study is funded by the National Institute of Diabetes and Digestive and Kidney Diseases, with additional funding from the National Institute of Child Health and Human Development, and the National Heart, Lung, and Blood Institute (U01-DK-66143, U01-DK-66174, U01DK-082194, U01-DK-66116).