



Congress Abstract

Community Detection of CKD Markers and Evaluation of Point-of-Care Creatinine Testing in Kazakhstan

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ABSTRACT

Background: Evidence on chronic kidney disease (CKD) in Central Asia remains limited, particularly for community-based detection using both kidney function and albuminuria. This study assessed the frequency of CKD markers among adults in three cities of Kazakhstan and examined whether point-of-care (POC) creatinine testing could support community screening.

Methods: Adults were recruited through community screening events in Astana, Ust-Kamenogorsk, and Turkestan. Laboratory serum creatinine was used to calculate eGFR with the CKD-EPI 2021 equation, and urine albumin-to-creatinine ratio (ACR) was measured to identify albuminuria. Participants were classified as having screening-detected CKD markers if eGFR was <60 mL/min/1.73 m² and/or ACR was ≥ 30 mg/g on a single assessment. Multivariable logistic regression was used to examine associated factors. Capillary POC creatinine was compared with laboratory creatinine, and its diagnostic performance for identifying eGFR <60 mL/min/1.73 m² was evaluated.

Results: Of 1,022 participants with complete laboratory kidney measurements, 100 (9.8%; 95% CI 8.1–11.8) had screening-detected CKD markers. Albuminuria was identified in 7.7%, while reduced eGFR was present in 3.4%. Among participants with CKD markers, 52.0% reported no previous awareness of abnormal kidney findings. Hypertension was associated with approximately twice the adjusted odds of CKD markers (aOR 2.05, 95% CI 1.24–3.41). POC and laboratory creatinine were available for 987 participants. POC creatinine exceeded laboratory values by an average of 18.5 μ mol/L, with wide limits of agreement. For identifying laboratory-defined reduced eGFR, POC-derived eGFR had 84.4% sensitivity, 83.4% specificity, 14.5% positive predictive value, 99.4% negative predictive value, and an AUC of 0.919.

Conclusions: CKD markers were detected in roughly one in ten screened adults, and albuminuria accounted for a substantial proportion of identified abnormalities. The high proportion of previously unrecognized findings supports greater use of combined eGFR and ACR assessment in CKD case-finding. POC creatinine may be useful for triage because of its strong rule-out performance, but positive findings should be confirmed with standardized laboratory testing.

Keywords: Albuminuria; Chronic Kidney Disease; Community Screening; Noncommunicable Diseases; Point-of-Care Test

Table 1. Participant characteristics and kidney outcomes overall and by city

Characteristic	Overall (N=1,039)	Astana (n=461)	Ust-Kamenogorsk (n=352)	Turkestan (n=226)	p-value
Age, years (median (IQR))	49 (34–61)	49 (33–62)	51 (39–61)	46 (32–57)	0.002
Female, n (%)	783 (75.4)	365 (79.2)	258 (73.3)	160 (70.8)	0.031
Rural, n (%)	50 (4.8)	18 (3.9)	10 (2.8)	22 (9.7)	<0.001
Higher education, n (%)	808 (77.8)	356 (77.2)	287 (81.5)	165 (73.0)	0.052
Hypertension, n (%)	380 (36.6)	164 (35.6)	133 (37.8)	83 (36.7)	0.809
Self-reported diabetes, n (%)	60 (5.8)	24 (5.2)	23 (6.5)	13 (5.8)	0.724
Self-reported CVD, n (%)	49 (4.7)	26 (5.6)	14 (4.0)	9 (4.0)	0.455
Prior awareness of abnormal kidney findings, n (%)	310 (29.8)	113 (24.5)	115 (32.7)	82 (36.3)	0.002
Family history of CKD, n (%)	215 (20.7)	115 (25.0)	59 (16.8)	41 (18.1)	0.010
BMI, kg/m ² (median (IQR))	26.0 (22.8 – 28.9)	25.9 (22.7–28.7)	26.0 (23.1–29.8)	26.2 (22.3 – 29.1)	0.476
Waist circumference, cm (median (IQR))	86 (77–96)	86 (77–96)	87 (77–97.5)	87 (77–96)	0.779
Albuminuria, n/N (%)	79/1,022 (7.7)	29/454 (6.4)	23/345 (6.6)	27/223 (12.1)	0.021
eGFR <60 mL/min/1.73 m ² , n/N (%)	35/1,022 (3.4)	24/454 (5.3)	7/345 (2.0)	4/223 (1.8)	0.014
CKD, n/N (%)	100/1,022 (9.8)	47/454 (10.4)	26/345 (7.5)	27/223 (12.1)	0.173

Abbreviations: BMI, body mass index; CKD, chronic kidney disease; CVD, cardiovascular disease; IQR, interquartile range.

Note: Higher education was defined as completion of college, university, or postgraduate education; secondary education or below was classified as no higher education. Hypertension was defined as either self-reported hypertension or a measured systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg. Kidney outcomes were analyzed among participants with both laboratory eGFR and urine ACR available. p-values were calculated using the Kruskal–Wallis test for continuous variables and Pearson's chi-square test for categorical variables.

Table 2. Distribution of eGFR categories and prevalence of albuminuria and chronic kidney disease

Stage	Renal indicator					CKD (n = 1,022)	
	eGFR (mL/min/1.73 m²)			Albuminuria			
	Range	n	% (95% CI)	n	% (95% CI) ^a	n	% (95% CI)
1	≥90	705	69.0 (66.1 – 71.7)	44	6.2 (4.7 – 8.3)	44	4.3 (3.2-5.7)
2	60-89	282	27.6 (24.9 – 30.4)	21	7.4 (4.9 – 11.2)	21	2.1 (1.3-3.1)
3	30-59	30	2.9 (2.1 – 4.1)	10	33.3 (19.0 – 51.7)	30	2.9 (2.1-4.2)
4	15-29	3	0.3 (0.1 – 0.9)	2	66.7 (9.4 – 99.2) ^b	3	0.3 (0.1-0.9)
5	<15	2	0.2 (0.05 – 0.8)	2	100 (15.8 – 100.0) ^b	2	0.2 (0.05-0.8)
Total		1,022	100	79	7.7 (6.2 – 9.5)	100	9.8 (8.1-11.8)

Abbreviations: eGFR, estimated glomerular filtration rate; CKD, chronic kidney disease.

Note: Analyses were restricted to participants with both laboratory eGFR and urine ACR available (n=1,022). Albuminuria was defined as ACR ≥ 30 mg/g.

^a. Albuminuria prevalence in each row was calculated within the corresponding eGFR category. The total row represents the overall albuminuria prevalence in the complete-case sample.

^b. Exact binomial confidence intervals were used for categories with small cell counts or observed proportions of 0% or 100%.

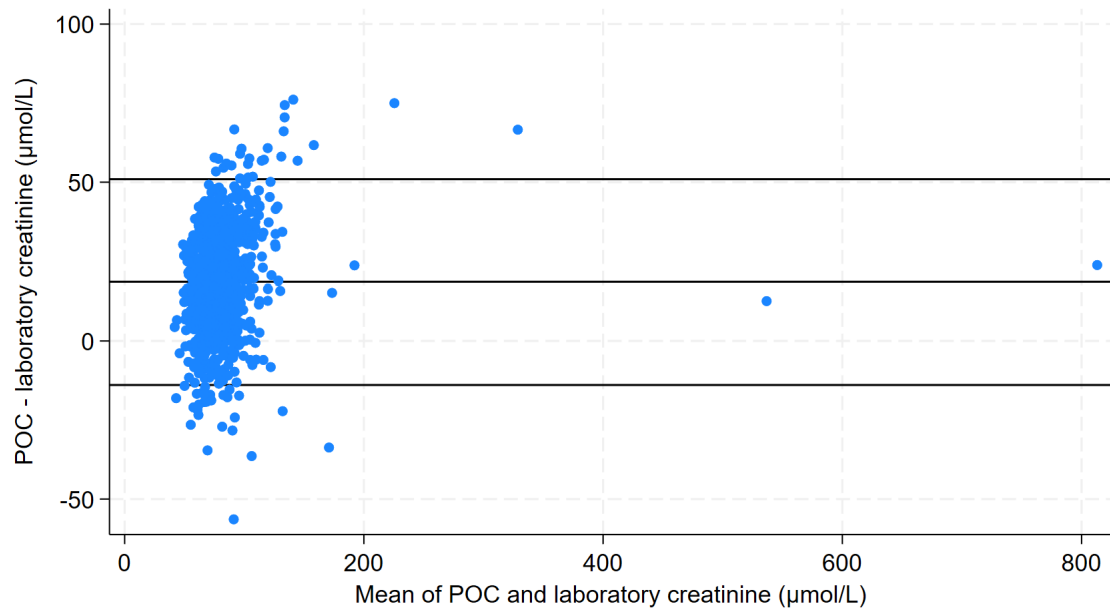


Figure 1. Bland–Altman plot comparing point-of-care and laboratory creatinine measurements. The mean difference was 18.5 $\mu\text{mol/L}$, and the 95% limits of agreement ranged from -13.9 to 51.0 $\mu\text{mol/L}$. Differences were calculated as POC minus laboratory creatinine.

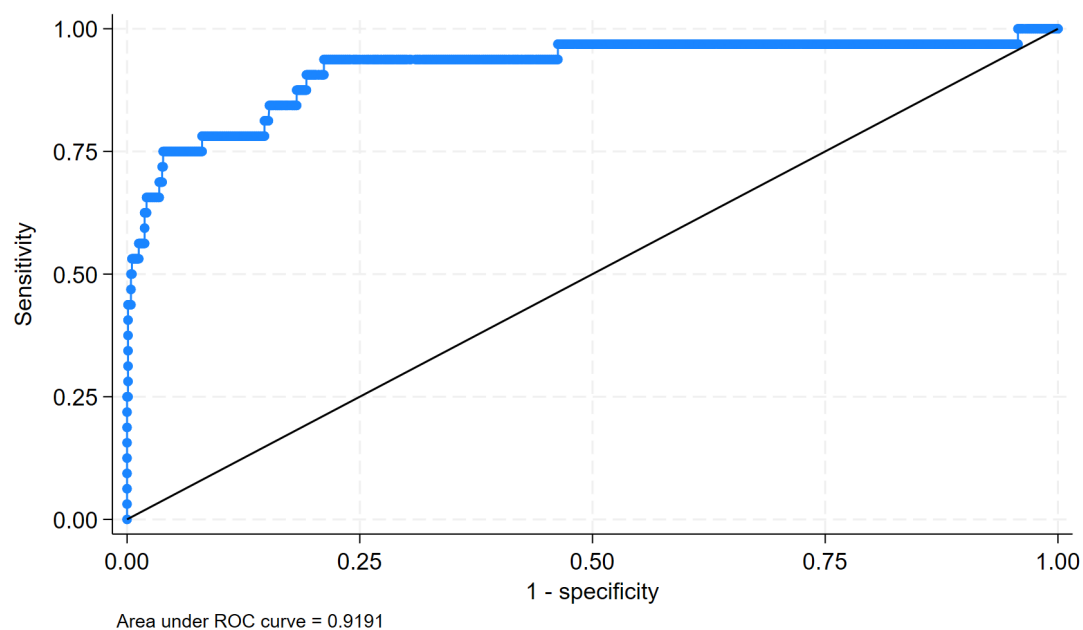


Figure 2. Receiver operating characteristic curve of POC-derived eGFR for identifying laboratory-defined eGFR $<60 \text{ mL/min/1.73 m}^2$. The area under the curve was 0.919 (95% CI 0.854–0.984).