

Supplementary Material

Supplemental Table 1. Cause-specific hazard ratios and 95% confidence intervals of CKD progression according to quartiles of spot urinary potassium concentration (mmol/L) among 1,821 patients.

Supplemental Table 2. Sub-distribution hazard ratios and 95% confidence intervals of CKD progression according to quartiles of spot urinary potassium-to-creatinine ratio (mmol/g), spot urinary potassium concentration (mmol/L) among 1,821 patients, and 24-hour urinary potassium excretion (mEq/day) among 855 patients.

Supplemental Table 3. The adjusted rate of kidney function decline based on 4 categories of spot urinary potassium-to-creatinine ratio.

Supplemental Table 4. Baseline characteristics among a subset of 855 participants with 24-hour urine sample.

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Supplemental Figure 1. A flow diagram of study subjects.

Supplemental Figure 2. Cumulative incidence function of kidney outcome for competing risk model with adjustment for covariates in patients according to spot urinary potassium-to-creatinine ratio quartiles.

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Supplemental Table 1. Cause-specific hazard ratios and 95% confidence intervals of CKD progression according to quartiles of spot urinary potassium concentration (mmol/L) among 1,821 patients.

	No. of participants	No. of events (%)	Model 1		Model 2		Model 3		Model 4	
			HR (95% CI)	<i>P</i> value for trend ^A	HR (95% CI)	<i>P</i> value for trend ^A	HR (95% CI)	<i>P</i> value for trend ^A	HR (95% CI)	<i>P</i> value for trend ^A
Spot urinary potassium concentration, mmol/L										
Q1: < 29.00	452	158 (35)	9.58 (6.08-15.11)	<0.001	8.37 (5.30-13.23)	<0.001	2.55 (1.55-4.20)	<0.001	2.46 (1.49-4.05)	<0.001
Q2: 29.01 - 42.99	458	135 (29)	7.77 (4.90-12.31)		7.28 (4.59-11.54)		2.29 (1.41-3.72)		2.21 (1.36-3.59)	
Q3: 43.00 – 60.99	455	78 (17)	4.33 (2.67-7.01)		4.12 (2.54-6.67)		1.82 (1.11-2.99)		1.80 (1.10-2.95)	
Q4: ≥ 61.00	456	21 (5)	1.00		1.00		1.00		1.00	

Model 1: unadjusted crude hazard ratio. Model 2: adjusted for age, sex, smoking status, BMI, comorbid disease (diabetes, cardiovascular disease). Model 3: model 2 plus mean arterial pressure, eGFR, random urinary protein-to-creatinine ratio, C-reactive protein level, intact-PTH level, serum albumin level, serum calcium level, random urinary Na/Cr, and LDL-cholesterol level. Model 4: model 3 plus renin-angiotensin system blocker, statin and diuretics usage. 95%CI, 95% confidence interval.

Abbreviations: BMI, body mass index; eGFR, estimated glomerular filtration rate.

^A *P* values for trend across quartiles of spot urinary potassium concentration. *P* values for trend were calculated by treating quartiles as a continuous variable in each models.

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Supplemental Table 2. Sub-distribution hazard ratios and 95% confidence intervals of CKD progression according to quartiles of spot urinary potassium-to-creatinine ratio (mmol/g), spot urinary potassium concentration (mmol/L) among 1,821 patients, and 24-hour urinary potassium excretion (mEq/day) among 855 patients.

	Model 1	Model 2	Model 3	Model 4
	Sub-distribution HR (95% CI)	Sub-distribution HR (95% CI)	Sub-distribution HR (95% CI)	Sub-distribution HR (95% CI)
Spot urinary potassium-to-creatinine ratio, mmol/g				
Q1: < 33.99	2.35 (1.75-3.17)	2.67 (1.95-3.66)	1.72 (1.14-2.60)	1.68 (1.12-2.51)
Q2: 33.99 - 45.94	1.34 (0.97-1.86)	1.56 (1.11-2.18)	1.08 (0.72-1.64)	1.08 (0.72-1.62)
Q3: 45.95 - 61.69	1.58 (1.16-2.17)	1.87 (1.36-2.58)	1.29 (0.88-1.89)	1.27 (0.88-1.84)
Q4: ≥ 61.70	1.00	1.00	1.00	1.00
Spot urinary potassium concentration, mmol/L				
Q1: < 29.0	9.30 (5.96-14.50)	8.17 (5.22-12.78)	2.48 (1.58-3.90)	2.34 (1.50-3.67)
Q2: 29.0 – 42.9	7.59 (4.87-11.80)	7.08 (4.54-11.06)	2.30 (1.47-3.58)	2.21 (1.43-3.44)
Q3: 43.0 – 60.9	4.15 (2.61-6.60)	3.93 (2.47-6.26)	1.70 (1.07-2.70)	1.69 (1.07-2.66)
Q4: ≥ 61.0	1.00	1.00	1.00	1.00
24-hour urinary potassium excretion, mEq/day				
Q1: < 37	4.21 (2.51-7.06)	4.57 (2.70-7.74)	3.17 (1.67-6.04)	3.06 (1.61-5.79)
Q2: 37 - 49	2.11 (1.20-3.74)	2.64 (1.47-4.73)	2.51 (1.28-4.92)	2.37 (1.21-4.66)
Q3: 50 - 65	1.72 (0.97-3.03)	2.06 (1.17-3.64)	1.81 (0.98-3.34)	1.80 (0.99-3.28)
Q4: ≥ 66	1.00	1.00	1.00	1.00

Model 1: unadjusted crude hazard ratio. Model 2: adjusted for age, sex, smoking status, BMI, comorbid disease (diabetes, cardiovascular disease). Model 3: model 2 plus mean arterial pressure, eGFR, random urinary protein-to-creatinine ratio (24-hour urinary protein for 24-hour urinary potassium excretion), C-reactive protein level, intact-PTH level, serum albumin level, serum calcium level, random urinary Na/Cr (24-hour urinary sodium excretion for 24-hour urinary potassium excretion), and LDL-cholesterol level. Model 4: model 3 plus renin-angiotensin system blocker, statin and diuretics usage. 95%CI, 95% confidence interval.

Abbreviations: BMI, body mass index; eGFR, estimated glomerular filtration rate.

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Supplemental Table 3. The adjusted rate of kidney function decline based on 4 categories of spot urinary potassium-to-creatinine ratio

Spot urinary potassium-to-creatinine ratio	Slope of eGFR decline (95% CI) (ml min ⁻¹ 1.73 m ² /year)	P-for-difference between groups			
		Q1	Q2	Q3	Q4
Q1	-1.65 (-1.85 to -1.40)	-			
Q2	-1.39 (-1.63 to -1.15)	0.14	-		
Q3	-1.31 (-1.55 to -1.07)	0.05	0.63	-	
Q4	-1.30 (-1.54 to -1.06)	0.05	0.16	0.95	-

Covariance Structure: Independence

The slopes of eGFR decline were determined after adjustment of age, sex, smoking history, BMI, comorbid disease (diabetes, cardiovascular disease), eGFR, random urinary protein-to-creatinine ratio, hs-CRP level, intact-PTH level, serum albumin level, LDL-cholesterol level and medication use including statins, renin-angiotensin system blockers, and diuretics.

Abbreviations: eGFR, estimated glomerular filtration rate; BMI, body mass index.

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Supplemental Table 4. Baseline characteristics among a subset of 855 participants with 24-hour urine sample.

Variable	Overall (N=855)	24-hour Urinary Potassium Excretion, mEq/day			
		Q1 < 37 (n=206)	Q2 37 - 49 (n=210)	Q3 50 - 65 (n=218)	Q4 ≥ 66 (n=221)
Age, median [IQR], yr	56 [48, 64]	57 [48, 65]	57 [46, 65]	56 [47, 63]	57 [50, 64]
Men, n (%)	541 (63)	118 (57)	124 (59)	152 (70)	147 (67)
BMI, mean (s.d.), kg/m²	24.7 (3.3)	23.5 (3.4)	24.5 (3.2)	24.9 (3.2)	25.9 (3.2)
Diabetes, n (%)	339 (40)	87 (42)	67 (32)	81 (37)	104 (47)
Cardiovascular disease, n (%)	111 (13)	24 (12)	22 (10)	30 (14)	35 (16)
Smoking history, n (%)	422 (49)	104 (50)	96 (46)	110 (50)	112 (51)
eGFR, median [IQR], mL·min⁻¹·1.73 m⁻²	45 [29, 71]	32 [20, 53]	46 [29, 72]	46 [30, 75]	54 [39, 80]
eGFR, category, mL·min⁻¹·1.73 m⁻², n (%)					
≥90	129 (15)	17 (8)	34 (16)	36 (17)	42 (19)
60-90	156 (18)	22 (11)	40 (19)	45 (21)	49 (22)
30-59	336 (39)	78 (38)	81 (39)	79 (36)	98 (44)
15-29	191 (22)	69 (34)	42 (20)	55 (25)	25 (11)
<15 (non-dialysis)	42 (5)	20 (10)	13 (6)	3 (1)	7 (3)
Blood urea nitrogen, median [IQR], mg/dL	25 [17, 35]	30 [22, 45]	23 [17, 34]	23 [17, 35]	23 [17, 29]
Hemoglobin, mean (s.d.), g/dL	13 (2)	12 (2)	13 (2)	13 (2)	13 (2)
hs-CRP, median [IQR], mg/L	0.6 [0.2, 1.6]	0.6 [0.2, 1.8]	0.6 [0.2, 1.6]	0.6 [0.2, 1.4]	-0.6 [0.3, 1.8]
Intact-PTH, median [IQR], pg/mL	52.5 [35.4, 85.0]	65.6 [45.3, 113.9]	54.6 [38.0, 79.9]	48.7 [35.5, 79.0]	44.1 [29.5, 70.0]
Calcium, mean (s.d.), mg/dL	9.1 (0.5)	9.0 (0.6)	9.1 (0.5)	9.2 (0.5)	9.2 (0.5)
Albumin, mean (s.d.), g/dL	4.2 (0.4)	4.2 (0.4)	4.2 (0.5)	4.2 (0.4)	4.2 (0.4)
Uric acid, mean (s.d.), mg/dL	6.9 (1.9)	7.5 (2.0)	6.7 (1.9)	7.0 (1.8)	6.6 (1.8)
Total cholesterol, mean (s.d.), mg/dL	172 (40)	166 (35)	179 (49)	170 (36)	174 (39)
LDL-cholesterol, mean (s.d.), mg/dL	96 (32)	91 (28)	101 (38)	95 (30)	97 (32)
Triglyceride, median [IQR], mg/dL	133 [93, 199]	125 [82, 185]	136 [96, 197]	138 [96, 199]	140 [96, 202]
HDL-cholesterol, mean (s.d.), mg/dL	49 (14)	48 (15)	50 (15)	47 (13)	49 (15)
Serum potassium, mean (s.d.), mmol/L	4.7 (0.6)	4.8 (0.6)	4.6 (0.5)	4.6 (0.6)	4.7 (0.6)
Hyperkalemia (≥ 5.5 mmol/L), n (%)	80 (9)	24 (12)	17 (8)	18 (8)	21 (10)
Normal (3.5-5.4 mmol/L), n (%)	768 (90)	182 (88)	190 (91)	197 (91)	199 (90)
Hypokalemia (< 3.5 mmol/L), n (%)	4 (0.5)	0 (0)	2 (1)	2 (1)	0 (0)
24-hour Urinary protein, median [IQR], g/day	0.56 [0.19, 1.57]	0.50 [0.17, 1.58]	0.52 [0.17, 1.50]	0.61 [0.21, 1.40]	0.68 [0.24, 1.85]
24-hour Urinary sodium, median [IQR], mmol/day	149 [106, 196]	101 [71, 132]	140 [109, 177]	163 [124, 198]	204 [157, 252]
Mean arterial pressure, mean (s.d.), mmHg	93 (11)	91 (11)	93 (12)	94 (10)	95 (11)
Baseline kidney disease					

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Diabetic nephropathy, n (%)	227 (27)	64 (31)	45 (21)	60 (28)	58 (26)
Hypertensive kidney disease, n (%)	166 (19)	39 (19)	44 (21)	40 (18)	43 (19)
Glomerulonephritis, n (%)	280 (33)	66 (32)	77 (37)	71 (33)	66 (30)
Polycystic kidney disease, n (%)	117 (14)	23 (11)	34 (16)	34 (16)	26 (12)
Others	65 (8)	14 (7)	10 (5)	13 (6)	28 (13)
RASB use, n (%)	729 (85)	173 (84)	177 (84)	187 (86)	192 (87)
Diuretics use, n (%)	282 (33)	80 (39)	68 (32)	68 (31)	66 (30)
Statin use, n (%)	449 (53)	107 (52)	111 (53)	104 (48)	127 (57)

Abbreviations: BMI, body mass index; eGFR, estimated glomerular filtration rate; RASB, renin-angiotensin system blocker; CKD, chronic kidney disease.

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Supplemental Table 5. Cause-specific hazard ratios and 95% confidence intervals of CKD progression according to quartiles of spot urinary potassium to creatinine ratio (mmol/g) among 2,019 patients using a multiple imputation.

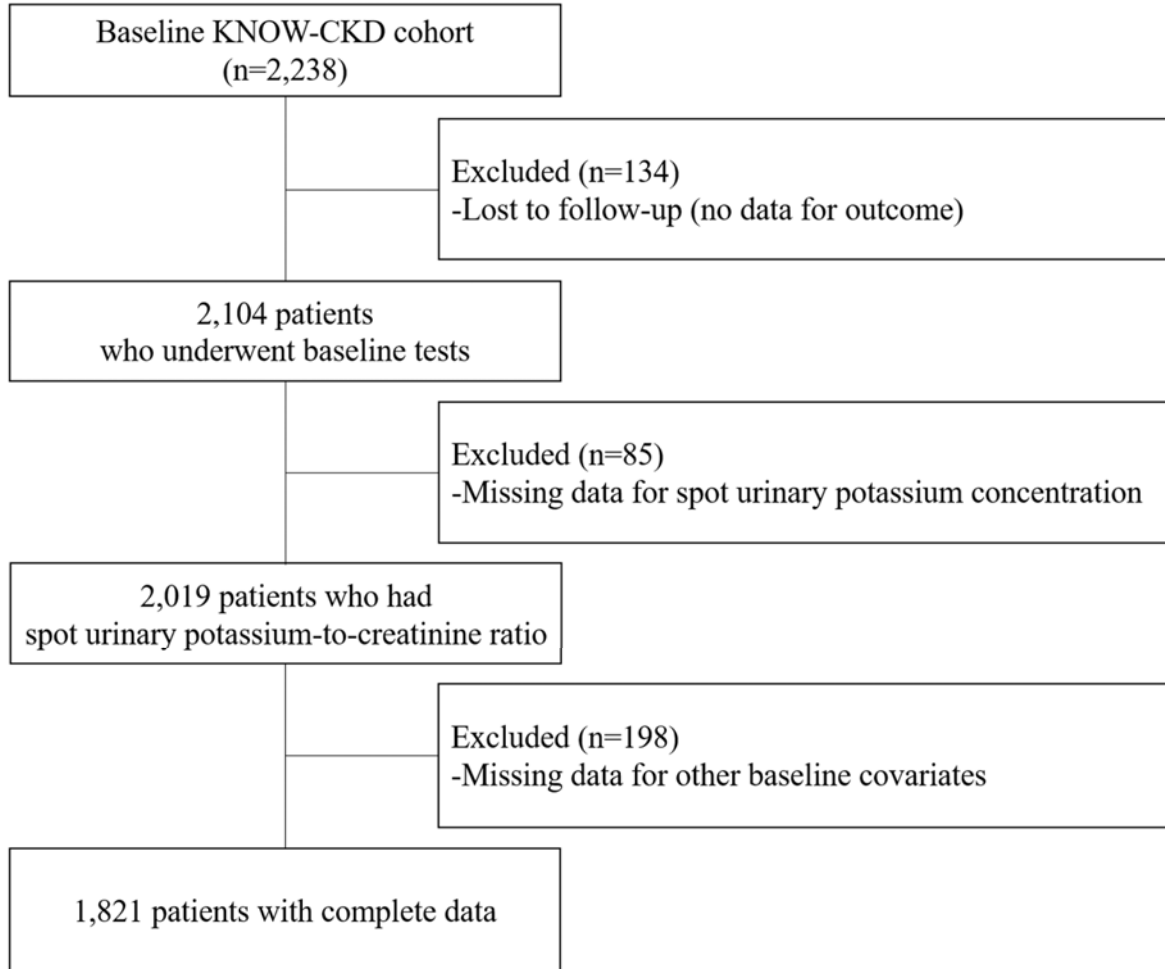
	No. of participants	No. of events (%)	Model 1	Model 2	Model 3	Model 4
			HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
Spot urinary potassium-to-creatinine ratio, mmol/g						
Q1: < 34.0	502	156 (31)	2.43 (1.83-3.23)	2.63 (1.95-3.54)	1.69 (1.19-2.40)	1.69 (1.18-2.40)
Q2: 34.0 - 45.9	506	104 (21)	1.53 (1.13-2.07)	1.72 (1.26-2.36)	1.15 (0.81-1.63)	1.15 (0.81-1.63)
Q3: 46.0 - 61.5	505	107 (21)	1.58 (1.17-2.14)	1.84 (1.35-2.50)	1.22 (0.88-1.69)	1.21 (0.87-1.69)
Q4: ≥ 61.6	506	69 (14)	1.00	1.00	1.00	1.00

Model 1: unadjusted crude hazard ratio. Model 2: adjusted for age, sex, smoking status, BMI, comorbid disease (diabetes, cardiovascular disease). Model 3: model 2 plus mean arterial pressure, eGFR, random urinary protein-to-creatinine ratio, C-reactive protein level, intact-PTH level, serum albumin level, serum calcium level, random urinary Na/Cr, and LDL-cholesterol level. Model 4: model 3 plus renin-angiotensin system blocker, statin and diuretics usage. 95% CI, 95% confidence interval.

Abbreviations: BMI, body mass index; eGFR, estimated glomerular filtration rate.

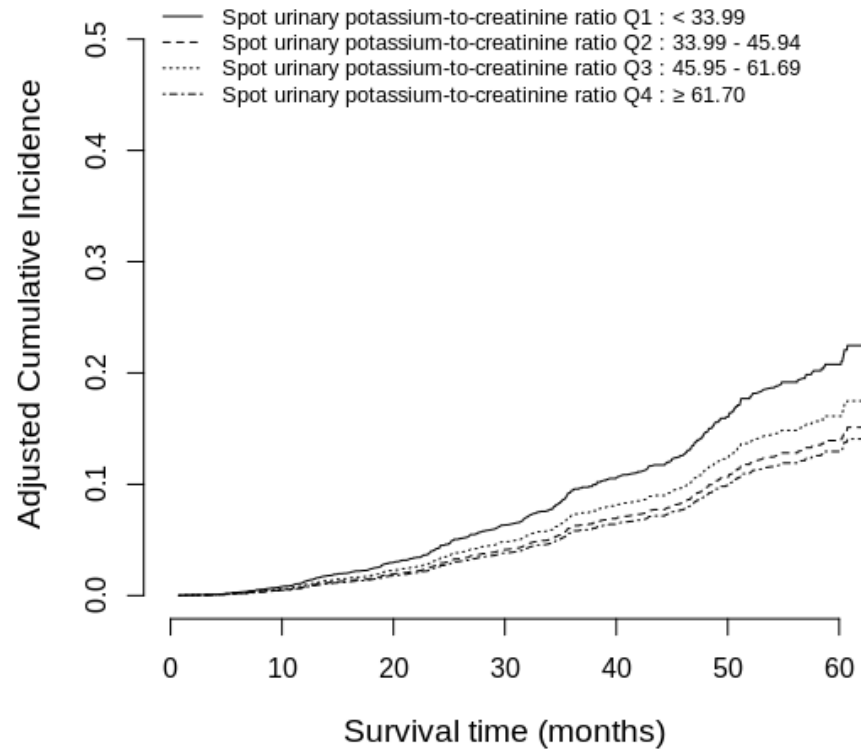
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Supplemental Figure 1. Flow chart of patients in this study.



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Supplemental Figure 2. Cumulative incidence function of kidney outcome for competing risk model with adjustment for covariates^A in patients according to spot urinary potassium-to-creatinine ratio quartiles.



^ACovariates included age, sex, smoking status, BMI, comorbid disease (diabetes, cardiovascular disease), mean arterial pressure, eGFR, C-reactive protein level, intact-PTH level, serum albumin level, serum calcium level, spot urinary Na/Cr, spot urinary protein-to-creatinine ratio, and LDL-cholesterol level, renin-angiotensin system blocker, statin and diuretics usage.