

Abstract Submission No. : 1243

Risks of mortality and causes of death according to kidney function parameters: A nationwide observational study in Korea

Sehyun Jung¹, Soojin Lee², Yaerim Kim⁴, Semin Cho⁷, Hyeok Huh⁸, Dong Ki Kim⁵, Kyungdo Han³, Sehoon Park⁶

¹Department of Internal Medicine-Nephrology, Gyeongsang National University Hospital, Korea, Republic of

²Department of Internal Medicine-Nephrology, Uijeongbu Eulji University Medical Center, Korea, Republic of

³Department of Department of Statistics and Actuarial Science, Soongsil University, Korea, Republic of

⁴Department of Internal Medicine-Nephrology, Keimyung University Dongsan Medical Center, Korea, Republic of

⁵Department of Internal Medicine-Nephrology, Seoul National University Hospital, Korea, Republic of

⁶Department of Department of Biomedical Sciences, Seoul National University College of Medicine, Korea, Republic of

⁷Department of Internal Medicine-Nephrology, Gwangmyeong Chung-Ang University Hospital, Korea, Republic of

⁸Department of Internal Medicine-Nephrology, Inje University Busan Paik Hospital, Korea, Republic of

Objectives: The association between the eGFR and death risks was reported to be U-shaped in previous studies. In addition, previous studies have reported the clinical significance of albuminuria in the general population, and the quantified albuminuria showed a linear association with mortality. However, as mortality occurs due to various causes, additional study is warranted to investigate the association between kidney function parameters and death by specific causes.

Methods: We screened 10,585,843 adult (age ≥ 20 years old) who received health examinations conducted in 2009 using the National Health Insurance Database (NHID). After exclusion of those previously diagnosed with renal failure and those with missing data, 9,917,838 individuals with available baseline kidney function measurements were included. The primary outcome was mortality and cause-specific death identified through the death certificates based on the ICD-10 diagnostic codes performed until 2019. Multivariable Cox regression analysis adjusted for various clinicodemographic and social characteristics was used to assess the risks of mortality.

Results: Figure 1 shows the heatmap according to risk relationships for all-cause mortality. The risks of mortality were divided by eGFR according to the presence or absence of albuminuria, as shown in Table 1. Most causes of death showed a U-shaped association with eGFR in both univariable and multivariable regression analyses, regardless of the presence or absence of albuminuria. Namely, both eGFR ranges < 60 and ≥ 120 mL/min/1.73 m² were associated with a higher risk of death by various causes. Those with baseline albuminuria, regardless of eGFR, showed a significantly higher risk of all-cause mortality and deaths by diverse causes than those with eGFR in the reference range (90-120 mL/min/1.73 m²) without albuminuria.

Conclusions: We reconfirmed the significant association between eGFR, albuminuria, and mortality. Health care providers should keep in mind that albuminuria and decreased eGFR as well as kidney hyperfiltration are independent predictors of mortality.

Figure 1. Risk of death by all-cause mortality according to baseline eGFR and albuminuria.

Outcome	Dipstick albuminuria	eGFR	HR(95% C.I)	
			Univariable model	Multivariable model ^a
All-cause mortality	Negative, Trace	<60	3.723(3.688,3.758)	1.234(1.222,1.246)
		60-90	1.588(1.577,1.599)	0.951(0.944,0.958)
		90-120	1(Ref.)	1(Ref.)
		≥120	1.327(1.309,1.344)	1.143(1.128,1.158)
	Positive	<60	9.488(9.303,9.676)	2.124(2.082,2.167)
		60-90	3.451(3.391,3.513)	1.379(1.354,1.403)
		90-120	2.155(2.091,2.221)	1.445(1.401,1.489)
		≥120	2.982(2.822,3.15)	1.765(1.67,1.864)

Table 1. Risk of death by specific causes according to baseline eGFR and albuminuria.

Type of death	Dipstick albuminuria	eGFR	HR (95% CI)	
			Univariable model	Multivariable model ^a
Infection	Negative, trace	<60	4.944(4.663,5.242)	1.311(1.233,1.393)
		60-90	1.728(1.648,1.813)	0.937(0.893,0.984)
		90-120	1(Ref.)	1(Ref.)
		≥120	1.462(1.342,1.593)	1.189(1.091,1.295)
	Positive	<60	11.183(9.891,12.643)	2.063(1.821,2.337)
		60-90	3.777(3.372,4.231)	1.361(1.214,1.526)
		90-120	2.171(1.773,2.657)	1.443(1.179,1.767)
		≥120	3.111(2.17,4.46)	1.765(1.231,2.531)



KSN 2022

SEOUL, KOREA MAY 26 - 29

		<60	2.585(2.542,2.629)	0.957(0.941,0.974)
Malignancy	Negative, trace	60-90	1.499(1.482,1.517)	0.937(0.926,0.948)
		90-120	1(Ref.)	1(Ref.)
		≥120	1.234(1.208,1.261)	1.097(1.074,1.121)
		<60	4.61(4.414,4.814)	1.198(1.146,1.251)
Malignancy	Positive	60-90	2.788(2.704,2.874)	1.227(1.19,1.266)
		90-120	1.889(1.795,1.987)	1.352(1.285,1.423)
		≥120	2.384(2.164,2.626)	1.539(1.397,1.695)
		<60	8.893(8.42,9.392)	1.973(1.863,2.089)
Endocrine	Negative, trace	60-90	1.875(1.784,1.972)	1.016(0.966,1.069)
		90-120	1(Ref.)	1(Ref.)
		≥120	1.638(1.502,1.787)	1.296(1.189,1.414)
		<60	61.526(57.485,65.85)	6.021(5.611,6.46)
Endocrine	Positive	60-90	11.295(10.446,12.212)	2.372(2.192,2.567)
		90-120	6.363(5.587,7.246)	2.252(1.977,2.566)
		≥120	9.881(7.953,12.275)	2.852(2.295,3.544)



KSN 2022

SEOUL, KOREA MAY 26 - 29

		<60	5.995(5.87,6.124)	1.535(1.501,1.569)
Cardiovascular	Negative, trace	60-90	1.929(1.894,1.963)	1.029(1.01,1.048)
		90-120	1(Ref.)	1(Ref.)
		≥120	1.377(1.332,1.423)	1.14(1.103,1.179)
		<60	15.852(15.232,16.499)	2.673(2.566,2.784)
Cardiovascular	Positive	60-90	5.092(4.902,5.289)	1.698(1.634,1.764)
		90-120	2.749(2.567,2.944)	1.696(1.584,1.817)
		≥120	3.308(2.897,3.776)	1.788(1.566,2.041)
		<60	5.17(5.009,5.336)	1.193(1.155,1.233)
Respiratory	Negative, trace	60-90	1.994(1.944,2.046)	0.974(0.949,0.999)
		90-120	1(Ref.)	1(Ref.)
		≥120	1.421(1.356,1.49)	1.14(1.087,1.195)
		<60	10.423(9.724,11.173)	1.724(1.607,1.85)
Respiratory	Positive	60-90	4.086(3.848,4.339)	1.366(1.285,1.451)
		90-120	2.149(1.923,2.401)	1.446(1.294,1.616)
		≥120	2.977(2.434,3.641)	1.802(1.473,2.204)



KSN 2022

SEOUL, KOREA MAY 26 - 29

			2.851(2.714,2.995)	
		<60		1.22(1.159,1.284)
Digestive	Negative, trace	60-90	1.17(1.128,1.214)	0.81(0.781,0.841)
		90-120	1(Ref.)	1(Ref.)
		≥120	1.754(1.657,1.858)	1.492(1.409,1.58)
			7.064(6.339,7.872)	1.866(1.671,2.083)
Digestive	Positive	<60		
		60-90	3.011(2.752,3.294)	1.29(1.178,1.413)
		90-120	2.692(2.362,3.069)	1.648(1.445,1.88)
		≥120	5.707(4.711,6.913)	2.994(2.471,3.628)
Renal	Negative, trace	<60	17.547(16.179,19.03)	3.686(3.388,4.009)
		60-90	2.521(2.328,2.73)	1.231(1.136,1.334)
		90-120	1(Ref.)	1(Ref.)
		≥120	1.49(1.285,1.728)	1.185(1.022,1.374)
Renal	Positive	<60	154.381(141.105,168.906)	19.79(18.021,21.733)
		60-90	14.993(13.338,16.853)	4.114(3.655,4.631)
		90-120	5.78(4.624,7.224)	3.138(2.509,3.925)
		≥120	8.515(5.8,12.5)	3.938(2.682,5.784)



KSN 2022

SEOUL, KOREA MAY 26 - 29

		3.005(2.948,3.063)	
	<60		1.219(1.195,1.244)
Negative, trace	60-90	1.424(1.404,1.444)	0.937(0.924,0.95)
	90-120	1(Ref.)	1(Ref.)
	≥120	1.302(1.269,1.336)	1.154(1.125,1.183)
Other		5.491(5.233,5.762)	
	<60		1.595(1.52,1.675)
	60-90	2.494(2.399,2.592)	1.183(1.138,1.231)
	90-120	1.725(1.617,1.839)	1.262(1.183,1.346)
	≥120	2.587(2.313,2.894)	1.683(1.505,1.883)