



DECREASED RENAL FUNCTION AS A RISK FACTOR FOR POOR THREE-MONTH OUTCOMES IN PATIENTS WITH ACUTE ISCHEMIC STROKE

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Objectives

- Decreased renal function is an independent risk factor for all-cause and cardiovascular mortality in the general population as well as various populations with comorbidities
- Most patients with chronic kidney disease (CKD) are particularly vulnerable to multisystem organ dysfunction. Particularly, in the acute stroke patients with CKD, adequate management may be disrupted owing to difficulties in fluid management, drug prescription, electrolyte disturbance, and increased susceptibility to cardiovascular events and infection.
- With the data from a hospital-based stroke registry, we evaluated the effect of baseline eGFR on clinical outcomes 3 months after acute ischemic stroke. In addition, we also investigated the impact of CKD on neurological deterioration and mortality during hospitalization

Methods

- This prospective study included 1,373 patients with acute ischemic stroke, consecutively admitted to Hallym University Sacred Heart Hospital between July 2007 and July 2012. Registration criteria were patients who had an acute ischemic stroke within 7 days after symptom onset.
- The eGFR was calculated using CKD Epidemiology Collaboration (CKD-EPI) equations. In accordance with the 2012 KDIGO Clinical Practice Guideline, patients were classified into 4 groups: eGFR ≥ 60 mL/min/1.73m² (CKD stage 1 or 2), eGFR 45 – 59 mL/min/1.73m² (CKD stages 3a), eGFR 30 – 44 mL/min/1.73m² (CKD stage 3b) and eGFR < 30 mL/min/1.73m² (CKD stage 4 or 5).
- The primary endpoint was 3-month death or dependency as poor functional outcome (mRS score ≥3). Secondary endpoints were neurological deterioration during hospitalization or in-hospital mortality. The neurological deterioration was defined as an increase in NIHSS score by 4 or more points between admission and discharge.

Results

- Mean age was 66.7 ± 13.1 years, and 597 (43.5%) patients were female. Mean eGFR was 84.5 ± 20.8 (range, 10.0 to 152.0) mL/min/1.73m².
- In this study, 476 (34.7%) patients showed death or dependency at 3 months after a stroke, and median length of hospital stay was 8 days (interquartile range 6, 14).
- The primary endpoint was more frequently occurred at more advanced stages of CKD (31.9%, 53.7%, 55.0% and 63.6% in CKD stage 1-2, 3a, 3b and 4-5, respectively, p < 0.001). Secondary endpoint, neurological deterioration during hospitalization and in-hospital mortality, were also more frequently occurred at more advanced stages of CKD. Neurological deterioration was observed in 103 patients (7.7%) and the median increase in the NIHSS score was 6 (interquartile range 4 to 8). And in-hospital mortality was 3.9% (Table 1).

Table 1. Clinical outcomes of stroke according to baseline renal function

Variables	Stages of baseline renal function				Total	P
	eGFR ≥ 60	eGFR 45-59	eGFR 30-44	eGFR <30		
	(n=1,218)	(n=82)	(n=40)	(n=33)	(n=1,373)	
Primary endpoint						
-poor functional outcome (mRS 3-6), n (%)	389 (31.9)	44 (53.7)	22 (55.0)	21 (63.6)	476 (34.7)	<0.001
Secondary endpoint						
-neurological deterioration during hospitalization*, n (%)	79 (6.7)	11 (14.1)	5 (12.5)	8 (24.2)	103 (7.7)	<0.001
-in-hospital mortality, n (%)	39 (3.2)	6 (7.3)	4 (10.0)	4 (12.1)	53 (3.9)	<0.001

Figure 1. Kaplan-Meier analysis revealed a statistically significant difference in event-free survival among the 4 groups (Figure 1)

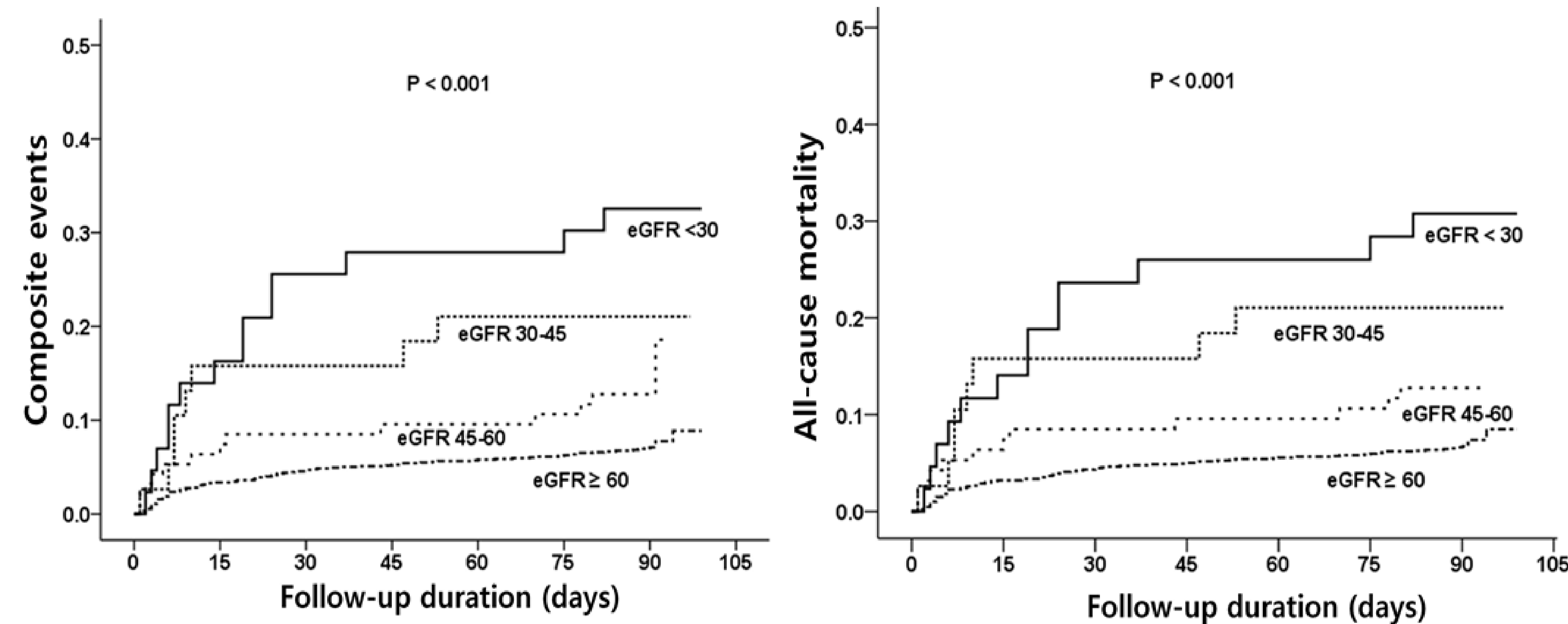


Table 2. Adjusted odds ratios for the association between eGFR levels and clinical outcomes

Odds ratio (95% CI)	eGFR ≥ 60 (n=1,218)	eGFR 45-59 (n=82)	eGFR 30-44 (n=40)	eGFR <30 (n=33)
Primary endpoint				
Model 1	Reference	1.53 (1.12-2.10)*	2.36 (1.01-2.36)*	2.14 (1.38-3.33)*
Model 2	Reference	1.35 (0.98-1.87)	1.32 (0.90-2.04)	1.79 (1.13-2.84)*
Model 3	Reference	1.28 (0.93-1.78)	1.20 (0.77-1.88)	1.75 (1.10-2.79)*
Model 4	Reference	1.24 (0.95-2.98)	1.16 (0.77-2.92)	1.78 (1.11-2.85)*
Secondary endpoint				
Model 1	Reference	1.90 (0.97-3.71)	1.45 (0.55-3.87)	3.43 (1.48-7.99)*
Model 2	Reference	1.67 (0.83-3.36)	1.34 (0.48-3.73)	3.81 (1.52-9.56)*
Model 3	Reference	1.50 (0.73-3.11)	1.19 (0.42-3.33)	3.53 (1.35-9.18)*
Model 4	Reference	1.69 (0.79-3.59)	1.09 (0.38-3.13)	3.27 (1.23-8.67)*

- Model 1: Adjusted for age, sex
- Model 2: Adjusted for age, sex, smoking, systolic blood pressure, and diastolic blood pressure, BMI, white blood cell count, and hemoglobin
- Model 3: Adjusted for age, sex, smoking, systolic blood pressure, and diastolic blood pressure, BMI, white blood cell count, hemoglobin, diabetes, hypertension, dyslipidemia, Afib, tPA and TOAST
- Model 4: Adjusted for age, sex, smoking, systolic blood pressure, and diastolic blood pressure, BMI, white blood cell count, hemoglobin, diabetes, hypertension, dyslipidemia, Afib, tPA, TOAST, baseline NIHSS, and neurological deterioration (only for primary endpoint)
- In multivariate analysis, age, female, diabetes, dyslipidemia, Afib, the use of tPA, higher baseline NIHSS score and neurological deterioration during hospitalization were statistically significant determinants. In regard to renal function, a baseline eGFR < 30 mL/min/1.73m² significantly increased the risk of primary endpoint by 1.78-fold.

Conclusions

- In this study, we found that a low baseline eGFR is closely associated with poor clinical outcomes, including all-cause mortality and dependency 3 months after acute ischemic stroke.
- In particular, we found that risks vary depending on the degrees of baseline renal dysfunction. Severely decreased renal function (particularly eGFR < 30 mL/min/1.73m²) is prognostic of a poor outcome even in models adjusted to other risk factors of stroke.
- In addition, we demonstrated that decreased renal function is associated with neurological deterioration, which also significantly increased the risk of poor outcome in these patients.
- A low baseline eGFR was highly predictive of either poor clinical outcome 3 months after acute ischemic stroke or neurological deterioration/mortality during hospitalization.

