Estimated glomerular filtration rate, anemia and outcomes in patients with acute ischemic stroke

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Background and Aims: Anemia is highly prevalent in patients with low estimated glomerular filtration rate (eGFR), the combined effect of anemia and low eGFR on the prognosis of outcome after stroke has not been well studied.

Method: Data of ischemic stroke patients in the prospective cohort study of China National Stroke Registry was reviewed. According to the levels of eGFR and hemoglobin, patients were categorized into four groups: low eGFR (< 60 mL/min per 1.73 m²) or normal eGFR (≥ 60 mL/min per 1.73 m²) with or without anemia. Multivariable logistic regression method was used to analyze the association between low eGFR with or without anemia and the poor functional outcome, dependence, mortality and stroke reoccurrence at 3 months and 1 year after stroke.

Results: This study included 8,303 stroke patients. After adjustment for the confounding factors, low eGFR alone increased risk of mortality (Odds ratio [OR]=1.50, 95% confidence interval [95% CI]1.14-1.97), but anemia alone was not associated with any of poor outcome at 1-year of follow up. In patients with both low eGFR and anemia, there was an increased risk of poor functional outcome (OR 1.73, 95% CI 1.30-2.29), mortality (OR 2.64, 95% CI 1.94-3.59) and stroke reoccurrence (OR 1.42, 95% CI 1.06-1.91) during 1-year of follow up, except that the dependence (OR 1.17, 95% CI 0.83-1.64).

Table 1. Adjusted odds ratio of estimated glomerular filtration rate (eGFR) with anemia or not for poor outcome at 1 year

Outcome		N	N of Events (%)	Crude OR (95% CI)	P value	Adjusted OR* (95% CI)	P value
Poor functional outcome†	None of both	1697	28.3	1	-	1	-
	Anemia with normal eGFR	550	36.7	1.47 (1.30-1.65)	<0.001	1.01 (0.87-1.17)	0.87
	Low eGFR without anemia	259	52.6	2.82 (2.34-3.39)	<0.001	1.07 (0.84-1.37)	0.57
	Anemia with low eGFR	187	59.0	3.64 (2.89-4.56)	<0.001	1.73 (1.30-2.29)	0.001
Dependence‡	None of both	1109	20.5	1	-	1	-
	Anemia with normal eGFR	321	25.3	1.31 (1.14-1.51)	0.001	0.93 (0.79-1.10)	0.42
	Low eGFR without anemia	108	31.7	1.80 (1.42-2.28)	<0.001	0.97 (0.73-1.29)	0.85
	Anemia with low eGFR	74	36.3	2.21 (1.65-2.96)	<0.001	1.17 (0.83-1.64)	0.38
All-cause death	None of both	588	9.8	1	-	1	-
	Anemia with normal eGFR	229	15.3	1.66 (1.41-1.95)	<0.001	1.14 (0.94-1.39)	0.19
	Low eGFR without anemia	151	30.7	4.07 (3.30-5.02)	<0.001	1.50 (1.14-1.97)	0.004
	Anemia with low eGFR	113	35.7	5.09 (3.99-6.51)	<0.001	2.64 (1.94-3.59)	<0.001
Any stroke reoccurrence	None of both	876	15.3	1	-	1	-
	Anemia with normal eGFR	288	20.3	1.42 (1.22-1.64)	<0.001	1.10 (0.94-1.29)	0.23
	Low eGFR without anemia	121	28.1	2.18 (1.74-2.72)	<0.001	1.14 (0.89-1.47)	0.30
	Anemia with low eGFR	91	32.0	2.62 (2.02-3.40)	<0.001	1.42 (1.06-1.91)	0.017

*Adjusted for age; sex; medical history of hypertension, diabetes, hyperlipidemia, current smoking, heavy drinking, stroke history, coronary arterial disease, heart failure, atrial fibrillation, family stroke history; baseline NIHSS score; stroke etiology; fasting glucose; in-hospital use of antiplatelets, statin, hypoglycemic agents or hypertensive agents; in-hospital pneumonia and urinary tract infection.
†Poor functional outcome denotes modified Rankin scale score 3–6.
‡Dependence, modified Rankin scale score 3-5

Conclusion: Ischemic stroke patients with concurrent low eGFR and anemia had increased risks of poor functional outcome, mortality and stroke reoccurrence, but not dependence during 1-year follow up.