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Association between Renal Dysfunction and General Cognitive Function in Community Dwelling Elderly People: Korean Frailty and Aging Cohort Study

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Objectives: Cognitive impairment is common in elderly people. Similarly, the prevalence of renal dysfunction is also increased in the elderly. We conducted this study to clarify the relationship between renal function and cognitive impairment in community dwelling elderly people.

Methods: A cross-sectional analysis was performed on the data of Korean Frailty and Aging Cohort Study (KFACS). Total 2847 participants (1333 men, 1514 women, and age 76.0±3.90 years) who completed baseline assessments were enrolled. The estimated glomerular filtration rate (eGFR, mL/min/1.73m^2) was calculated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation. Renal function of the participants was classified into four groups by eGFR quartile. General cognitive function was accessed with mini-mental state exam in the Korean version (MMSE-KC). Participants who had MMSE-KC score less than 1.5 standard deviation by age, gender, and education level were regarded as the cognitive impairment.

Results:

The mean eGFR in quartile 1 was 91.7 ± 3.22 ml/min/1.73m^2, and 84.9 ± 1.81 in quartile 2, 76.1 ± 3.66 in quartile 3, and 57.2 ± 10.75 in quartile 4. And the prevalence of cognitive impairment was 10.8% in quartile 1, 15.9% in quartile 2, 15.2% in quartile 3, 14.9% in quartile 4. After multiple adjustment, participants with lower eGFR had lower cognitive function scores on most quartiles (p=0.007). In a simple regression analysis, eGFR was positively correlated with MMSE-KC (r=0.056, P=0.003), memory (r=0.137, P<0.001), recall (r=0.151, P<0.001), and recognition scores (r=0.087, P<0.001). And in multiple linear regression analysis, eGFR was still significantly correlated MMSE-KC (r=0.071, P<0.001), memory (r=0.147, P<0.001), recall (r=0.153, P<0.001), and recognition scores (r=0.088, P<0.001).

Conclusions: Renal dysfunction was associated with lower global cognitive function in elderly people. These results suggest that decline of kidney function is a risk factor of cognitive decline in the elderly.

Table1. Baseline characteristics of the study group

Table 1. Demographic baseline characteristics of the study group

	Overall (n = 2847)	Quartile 1 (n = 711)	Quartile 2 (n = 712)
Age , years	76.0 ± 3.90	73.7 ± 3.13	76.2 ± 3.62
Male, *n* (%)	1333 (46.8)	262 (36.8)	318 (44.7)
Education, years	8.4 ± 5.08	7.9 ± 4.76	8.2 ± 5.03
Smoking, *n* (%)	182 (6.4)	34 (4.8)	52 (7.3)
Alcohol consumption , *n* (%)	1416 (49.7)	360 (50.6)	363 (51.0)
BMI, kg/m^2	24.4 ± 3.05	24.1 ± 3.03	24.3 ± 2.94
SBP, mmHg	131.1 ± 15.68	130.5 ± 15.37	131.2 ± 15.28
DBP, mmHg	77.4 ± 9.34	78.0 ± 9.10	77.4 ± 9.10
HTN, *n* (%)	1637 (57.5)	335 (47.2)	379 (53.2)
DM, *n* (%)	614 (21.6)	135 (19.0)	135 (19.0)
Dyslipidemia, *n* (%)	898 (31.9)	225 (32.1)	218 (30.8)
Coronary artery disease, *n* (%)	222 (1.3)	35 (5.0)	54 (7.7)
eGFR, ml/min/1.73m^2	77.49 ± 14.257	91.7 ± 3.22	84.9 ± 1.81
GDSK score	3.21 ± 3.681	3.14 ± 3.630	3.30 ± 3.736
Albumin, g/dL	4.2 ± 0.40	4.2 ± 0.37	4.2 ± 0.38
Creatinine, mg/dL	1.0 ± 0.27	0.91 ± 0.277	1.00 ± 0.00
Triglyceride, mg/dL	121.8 ± 60.93	114.7 ± 54.10	115.5 ± 55.45
HDL, mg/dL	52.4 ± 13.94	54.4 ± 14.04	53.4 ± 13.58
LDL, mg/dL	108.5 ± 33.28	111.2 ± 31.31	109.1 ± 33.90
Sodium, mmol/L	141.3 ± 2.41	141.1 ± 2.21	141.4 ± 2.26
HbA1c, %	6.1 ± 0.83	6.02 ± 0.792	6.02 ± 0.762
Hemoglobin, g/dL	13.4 ± 1.42	13.4 ± 1.26	13.5 ± 1.36
Proteinuria, *n* (%)	84 (3.0)	7 (8.3)	8 (9.5)
Hematuria, *n* (%)	793 (27.9)	178 (22.4)	213 (26.9)

BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; HTN, hypertension; DM, GDSK, geriatric depression score Korean version; HDL, high-density lipoprotein; LDL, low-density lipoprote

Table2. Logistic regression analysis of association between eGFR and cognitive impairment

Table 2. Logistic regression analysis of association between eGFR and cognitive impairment

Variable	n	Unadjusted		Adjusted	
		OR (95% CI)	p	OR (95% CI)	p
Quartile 1	711	1.00		1.00	
Quartile 2	712	1.553 (1.139, 2.119)	0.005	1.570 (1.141, 2.160)	0.006
Quartile 3	712	1.472 (1.077, 2.013)	0.015	1.535 (1.110, 2.122)	0.010
Quartile 4	712	1.440 (1.052, 1.971)	0.023	1.452 (1.043, 2.022)	0.027

Adjusted for education, smoking, alcohol consumption, body mass index, hypertension, diabetes mellitus, coronary artery disease, geriatric depression scale Korean version score, albumin, low-density lipoprotein, hemoglobin, proteinuria, hematuria