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ASSOCIATION BETWEEN RENAL FUNCTION AND COGNITIVE PERFORMANCE IN ELDERLY COMMUNITY-DWELLING MEN WITHOUT DEMENTIA

To the Editor: We read with great interest the recent article by Yaffe and colleagues[1] that stated that poorer cognitive function was associated with poorer kidney function in a large sample of older adults with chronic kidney disease (CKD). In light of that and other reports,[2–6] CKD has been linked to the risk of cognitive decline in middle-aged and older adults, although the presence of cognitive impairment (or clinical dementia) could result in decline in ability to perform activities of daily living and thus poor physical condition (e.g., dehydration). It remains unclear whether kidney function may affect cognitive performance in older people without dementia. Therefore, we would like to add our data to the association of medical confounders with cognitive performance based on an older community-dwelling sample without dementia. We also tested whether renal function was associated with specific domains of aging cognition.

We analyzed 228 subjects (100% male; aged 79.4 ± 4.9, range 63–98; 5.8 ± 4.7 years of education, range 0–16) derived from our previously published works regarding the analysis of the genetic association of cognitive function[7] and cardiovascular physiology[8] in older Chinese men without dementia and with normal function of daily activities. These subjects had full physical and laboratory profiles available, including body mass index, heart rate, blood pressure, hemoglobin, fasting blood sugar, lipid, liver, and kidney function tests.

Cognitive functions were assessed using the Cognitive Abilities Screening Instrument (CASI; mean ± SD 84.7 ± 9.1, range 54–100).[9] The CASI is a 100-point cognitive test that provides quantitative assessment in nine domains of cognitive function (long-term memory, short-term memory, attention, concentration and mental manipulation, orientation, abstraction and judgment, language, visual construction, and list-generating fluency). Multiple linear regression analysis with a forward stepwise method was used to identify significant predictors of cognitive performance, using the CASI assessment as a dependent variable and age, education duration, and physical and laboratory data as predictors. A general linear model was used to assess the difference in cognitive performance between subgroups with and without CKD, controlling for predictors identified in the regression model.

According to the estimated glomerular filtration rate (eGFR) data, 117 (51.3%) subjects had normal kidney function (eGFR > 60 mL/min per 1.73 m^2), 104 (45.6%) had Stage 3 CKD, six (2.6%) had Stage CKD 4, and one (0.4%) had Stage 5 CKD. Table 1 summarizes the significant predictors accounting for the total CASI score and its component scores. Total CASI score correlated positively with education (correlation coefficient (r) = 0.24, $P < .001$) and eGFR ($r = 0.18$, $P = .008$). For CASI components, kidney function was associated with concentration and mental manipulation (blood urea nitrogen (BUN) $r = -0.19$, $P = .007$), orientation (BUN: $r = -0.20$, $P = .004$), drawing (eGFR: $r = 0.22$, $P = .001$), and list generating fluency (eGFR: $r = 0.16$, $P = .02$). In addition, systolic blood pressure was correlated negatively with attention ($r = -0.21$, $P = .002$) and abstract thinking ($r = -0.18$, $P = .008$). Triglyceride level was correlated negatively with short-term memory ($r = -0.15$, $P = .03$). In a comparison of subgroups with and without CKD, CASI was significantly lower in subjects with CKD than in those with normal kidney function (82.9 ± 9.4 vs 86.4 ± 8.6, $F = 7.02$, $P = .009$). For CASI components, subgroups according to CKD differed significantly only in drawing category (CKD vs control: 7.6 ± 2.5 vs 8.7 ± 1.8, $F = 8.93$, $P = .003$).

In accordance with previously published reports, these findings indicate a weak but significant association between renal function and cognitive performance in elderly community-dwelling men without dementia. The eGFR predicted 3.2% variance of CASI data and was linked to executive functions such as drawing and list-generating fluency. The findings complement prior reports in that the study sample was screened and excluded for presence of clinical dementia, reducing the confounding effect of cognitive impairment on physical conditions. BUN, a marker for nitrogenous waste, was associated with concentration and orientation. Significantly higher BUN could result in neurological disturbances, such as delirium or uremic encephalopathy. These results suggest that in older adults without dementia, variations in BUN level (average

Table 1. Forward Multiple Linear Regression Analysis of Cognitive Performance and Its Predictors

Predictor	β	Standard Error	*t*	Partial Correlation	*P*-Value
Cognitive Abilities Screening Instrument total score ($R^2 = 0.088$, $F = 10.00$, $P < .001$)					
Education	0.46	0.13	3.60	0.24	<.001
eGFR	0.11	0.04	2.67	0.18	.008
Long-term memory ($R^2 = 0.020$, $F = 4.21$, $P = .04$)					
Education	0.02	0.01	2.05	0.14	.04
Short-term memory ($R^2 = 0.098$, $F = 11.33$, $P < .001$)					
Age	−0.12	0.03	−4.38	−0.29	<.001
Triglyceride	−0.002	0.001	−2.12	−0.15	.03
Attention ($R^2 = 0.060$, $F = 6.66$, $P = .002$)					
Age	−0.04	0.02	−2.17	−0.15	.03
Systolic blood pressure	−0.01	0.004	−3.12	−0.21	.002
Concentration and mental manipulation ($R^2 = 0.121$, $F = 14.31$, $P < .001$)					
Education	0.14	0.03	4.39	0.29	<.001
BUN	−0.05	0.02	−2.74	−0.19	.007
Orientation ($R^2 = 0.039$, $F = 8.39$, $P = .004$)					
BUN	−0.06	0.02	−2.90	−0.20	.004
Abstraction and judgment ($R^2 = 0.049$, $F = 5.39$, $P = .005$)					
Education	0.05	0.02	2.05	0.14	.04
Systolic blood pressure	−0.01	0.01	−2.68	−0.18	.008
Language ($R^2 = 0.116$, $F = 27.50$, $P < .001$)					
Education	0.09	0.02	5.24	0.34	<.001
Drawing ($R^2 = 0.103$, $F = 11.91$, $P < .001$)					
Education	0.11	0.03	3.59	0.24	<.001
eGFR	0.03	0.01	3.32	0.22	.001
List-generating fluency ($R^2 = 0.023$, $F = 5.24$, $P = .02$)					
eGFR	0.02	0.01	2.29	0.16	.02

Body mass index, hemoglobin, fasting blood sugar, cholesterol, liver function tests were not significant predictors in all models.
R^2 = coefficient of determination; eGFR = estimated glomerular filtration rate; BUN = blood urea nitrogen.

19.9 ± 8.3 in the current study) could alter orientation or concentration and add to the mechanisms of association between CKD and cognitive impairment.

Study limitations include that this was a cross-sectional study and that all of the participants were male. Other physiological confounders might be present. For example, it has been shown preliminarily that autonomic function is associated with cognitive performance.[10] Despite these limitations, the current study showed that CKD is associated with lower but normal cognitive performance in an older population without dementia. CKD may be a cause or a consequence of dementing symptoms. A longitudinal study is warranted to examine the risk of dementia associated with CKD.

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MEASURES FOR ENHANCING THE MOBILITY OF OLDER PEOPLE WITH DEMENTIA IN JAPAN: SHOULD IT BE A MATTER OF SELF-HELP?

To the Editor: There were more than 10 million driver's license holders aged 65 and older in Japan in 2006.[1] It has been estimated that there are approximately350,000 people with dementia who continue to drive in Japan.[2] With the provision of the revised Road Traffic Act in 2002, which includes dementia as a reason for license revocation,[3,4] a number of older people will face a crucial decision about driving cessation for reasons of aging or age-related diseases such as dementia. It was previously found that a decision about driving cessation is highly situation dependent, and therefore, it should be considered as a matter of policy, such as institutionalizing the availability of transportation alternatives.[5]

The present study investigated the following two issues: the current practices of municipal governments with regard to measures to enhance the mobility of older residents with dementia and the difficulties that municipal governments have in taking such measures. The possible implications for assisting older drivers with dementia who are confronted with a crucial decision to cease driving before they progress to severe dementia were investigated.

METHODS

The governments of 1,809 municipalities in Japan in existence as of October 1, 2008, were sent a self-administered questionnaire regarding support measures for enhancing the mobility of older residents; 1,027 (56.8%) responded. The questions analyzed in this study were:

1. Does your municipal government have a support program aimed specifically at enhancing the mobility of older residents with dementia? (yes/no question)
2. What difficulties or problems have you encountered regarding measures aimed at enhancing the mobility of older residents with dementia? (open-ended question)

Answers to questions with open-ended responses were analyzed using IBM SPSS Text Analytics for Surveys 3.0.1 (SPSS, Inc., Chicago, IL). Data were categorized according to the frequency of appearance of the keywords abstracted ($F \geq 10$).

RESULTS

Only 11.7% (n = 120) of municipalities had implemented support measures aimed at enhancing the mobility of older residents with dementia. In large municipalities with a population greater than 300,000, the rate of implementation (9.0%, n = 6) was slightly lower than in other, smaller municipalities (< 10,000 population, 10.6%, n = 25; 10,000–30,000 population, 10.9%, n = 28; 30,000–100,000 population, 13.2%, n = 45; 100,000-300,000 population, 12.7%, n = 16).

How to determine or delineate the people in need was raised as the most fundamental problem to address before implementing support measures (n = 40, 25.0%). In this category, not only the keywords and phrases relating to "lack of criteria for dementia," but also ethical concerns such as "confrontation about protection of personal information" and "not asking for help or support for fear of discrimination against dementia" were found.

Providing extra support measures focusing specifically on older residents with dementia was also raised as a difficulty because they are eligible for the existing system, "Japan's Long Term Care (LTC) insurance" (Figure 1;

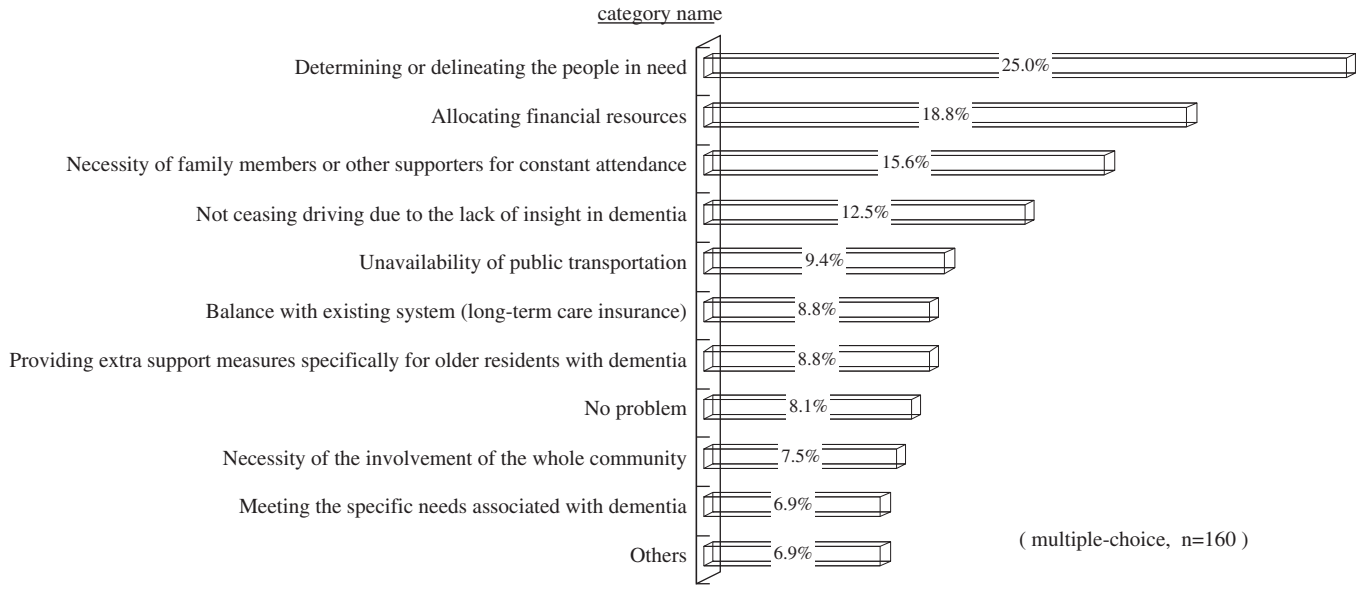


Figure 1. Difficulties or problems regarding measures for enhancing the mobility of older residents with dementia.

Rank in Category: JOURNAL OF THE AMERICAN GERIATRICS SOCIETY

Journal Ranking

For **2010**, the journal **JOURNAL OF THE AMERICAN GERIATRICS SOCIETY** has an Impact Factor of **3.913**.

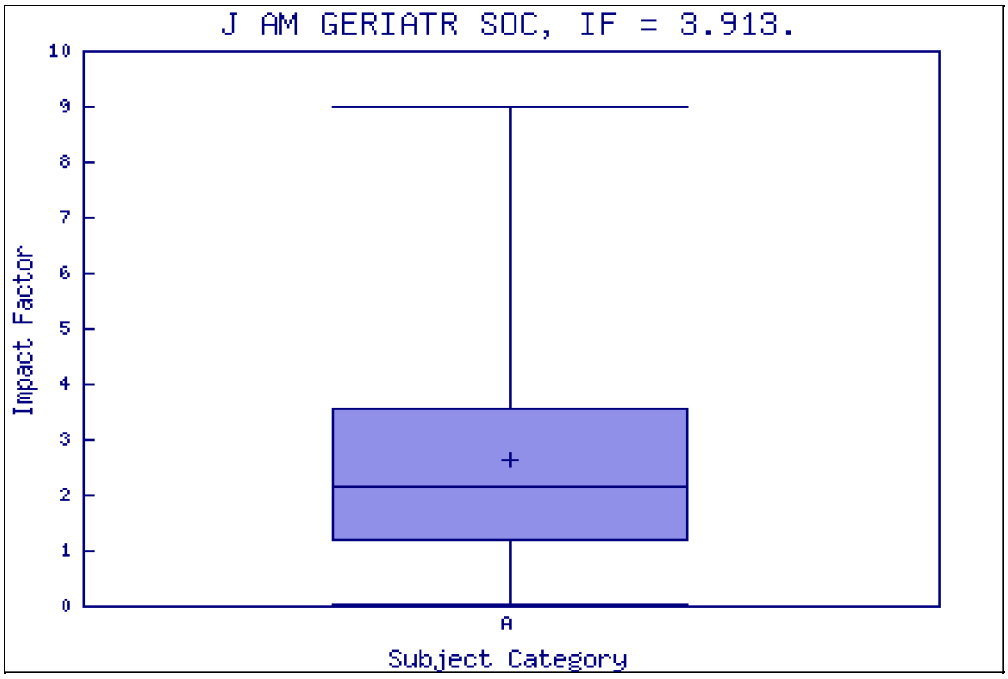
This table shows the ranking of this journal in its subject categories based on Impact Factor.

Category Name	Total Journals in Category	Journal Rank in Category	Quartile in Category
GERIATRICS & GERONTOLOGY	44	9	Q1

Category Box Plot

For **2010**, the journal **JOURNAL OF THE AMERICAN GERIATRICS SOCIETY** has an Impact Factor of **3.913**.

This is a box plot of the subject category or categories to which the journal has been assigned. It provides information about the distribution of journals based on Impact Factor values. It shows median, 25th and 75th percentiles, and the extreme values of the distribution.



Key

A - GERIATRICS & GERONTOLOGY