



Abstract Type : Poster exhibition

Abstract Submission No.: A-0043

Abstract Topic : Renal Conservative Care + Geriatric Nephrology + Sarcopenia

Association of Creatinine to Cystatin C Ratio with Activities of Daily Living in Elderly Patients with Non-Dialysis-Dependent Chronic Kidney Disease: A Nationwide Prospective Cohort Study

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Objectives : The creatinine (Cr) to cystatin C (CysC) ratio has emerged as a surrogate marker for muscle mass. However, its association with activities of daily living (ADL) remains unexplored. This study investigates the association between the Cr to CysC ratio (CCR) and ADL in elderly patients with non-dialysis-dependent chronic kidney disease (CKD) using nationwide prospective cohort data.

Methods : A total of 404 eligible patients were included. The CCR was stratified into quartiles separately for males and females. ADL was assessed using the Korean ADL (K-ADL) scale, which evaluates seven functional domains, categorizing patients in each domain as independent, partially in need of assistance, or fully in need of assistance. ADL impairment was defined as requiring at least partial assistance in any K-ADL domain, and a weighted total K-ADL score was calculated. The predictive value of the CCR for ADL impairment was analyzed using receiver operating characteristic (ROC) curve analysis. Multivariable logistic regression models determined whether the CCR independently predicted ADL impairment after adjusting for confounders.

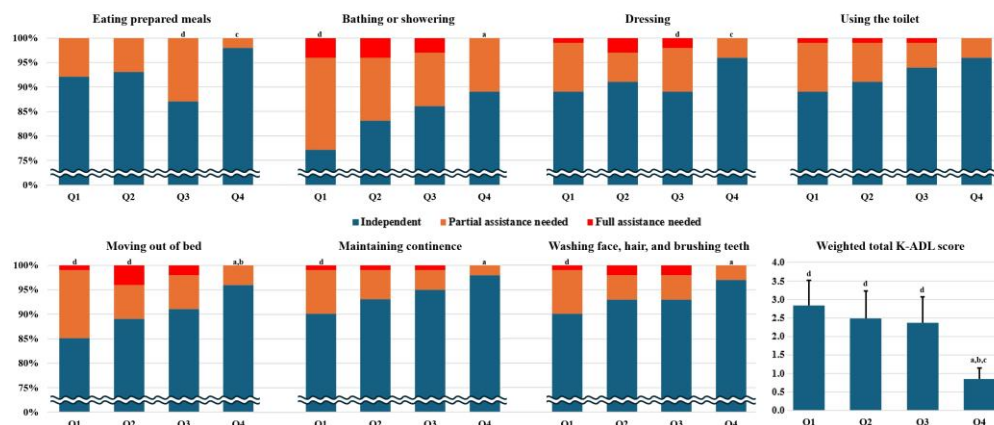
Results : Higher CCR quartiles were associated with younger age and higher serum albumin levels. Across all K-ADL domains, a higher CCR correlated with a greater proportion of patients maintaining independent activities, and the weighted total K-ADL score was significantly lower in higher quartiles (Figure 1). In ROC curve analysis, the area under the curve for the CCR was 0.656, with a cut-off value of 0.763. Notably, in multivariable logistic regression analyses, the CCR remained an independent risk factor of ADL impairment across all adjustment models (Table 1).

Conclusions : The CCR demonstrated a clear association with ADL in elderly CKD patients. These findings suggest that CysC measurement may be useful not only for assessing kidney function but also for evaluating overall functional status in elderly CKD patients.



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Figure 1. Comparison of patient proportions across K-ADL domains and weighted total K-ADL scores by CCR quartiles



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Table 1. Multivariate logistic regression analysis for ADL impairment

	Univariate OR (95% CI)	Model 1 Multivariate OR (95% CI)	Model 2 Multivariate OR (95% CI)	Model 3 Multivariate OR (95% CI)
Cr to CysC ratio (per 0.1)	0.731 (0.618–0.864)	0.821 (0.689–0.978)	0.821 (0.689–0.978)	0.832 (0.698–0.993)
Age (per 1 year)	1.154 (1.096–1.214)	1.135 (1.076–1.196)	1.135 (1.076–1.196)	1.124 (1.065–1.186)
BMI (per 1 kg/m ²)	1.019 (0.946–1.097)	-	-	-
DM (Ref. No)	0.871 (0.521–1.455)	-	-	-
HTN (Ref. No)	0.880 (0.419–1.851)	-	-	-
Excessive polypharmacy (Ref. No)	1.509 (0.896–2.540)	-	-	-
eGFR _{Cr-CysC} (per 1 ml/min/1.73m ²)	0.991 (0.974–1.009)	-	-	-
Hemoglobin (per 1 g/dL)	0.845 (0.728–0.980)	-	-	-
Albumin (per 0.1 g/dL)	0.874 (0.815–0.937)	-	-	0.897 (0.832–0.967)

404 patients (100%) were included in each of the multivariate logistic regression models. Model 1 was adjusted for age and BMI. Model 2 included the variables in model 1 and additionally adjusted for DM, HTN, and excessive polypharmacy. Model 3 included the variables in model 2 with further adjustments for eGFR_{Cr-CysC}, hemoglobin, and albumin. ADL, activities of daily living; BMI, body mass index; CI, confidence interval; Cr, creatinine; CysC, cystatin C; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate; HTN, hypertension; OR, odds ratio; Ref., reference.