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Time-Varying Mortality Risk of Metabolic Syndrome in CKRT Patients: A Nationwide Cohort Study

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Objectives : Continuous kidney replacement therapy (CKRT) represents the primary renal replacement modality used in Korean intensive care units. Although an obesity paradox has been documented among CKRT recipients, the influence of metabolic syndrome on long-term clinical outcomes remains poorly characterized. This study aimed to examine the associations between metabolic syndrome, obesity, and both short- and long-term mortality in CKRT patients using a large national database.

Methods : We conducted a retrospective cohort study using the National Health Insurance Service database, identifying 41,339 patients aged 20 years or older who commenced CKRT between 2010 and 2019 and had completed a national health screening examination within the preceding 2 years. Metabolic syndrome was defined in accordance with International Diabetes Federation criteria. Cox proportional hazards regression was employed to evaluate the risk of all-cause mortality across different time periods.

Results : Among 41,339 patients (mean age 66.2±12.2 years; 66% male), 24,426 (59.1%) had metabolic syndrome prior to CKRT. Metabolic syndrome was associated with lower in-hospital mortality (adjusted hazard ratio [aHR] 0.674, 95% CI 0.646–0.703) and lower mortality within 1 year after discharge (aHR 0.834, 95% CI 0.791–0.879). However, beyond 1 year after discharge, metabolic syndrome was associated with increased mortality risk (aHR 1.107, 95% CI 1.030–1.117). Concomitant obesity further reduced mortality risk. Regular exercise modified the long-term association: patients with metabolic syndrome who exercised regularly did not have increased mortality beyond 1 year (aHR 0.942, 95% CI 0.812–1.094 vs. 1.138, 95% CI 1.059–1.224 for non-regular exercise; P for interaction = 0.024).

Conclusions : Metabolic syndrome demonstrates a biphasic mortality pattern in patients undergoing CKRT, offering early survival benefit with protective effects in the early post-discharge period transitioning to increased mortality risk in long term. Sustained engagement in regular physical activity may mitigate the adverse long-term prognostic effects associated with metabolic syndrome among CKRT survivors.