Association Between Body Mass Index and Patient Outcome in Patients with Acute Kidney Injury Requiring Continuous Renal Replacement Therapy

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Objectives: We retrospectively reviewed medical records to investigate the association between body mass index(BMI) and mortality or ESRD incidence in critically ill patients who admitted to intensive care unit (ICU) and receiving continuous renal replacement therapy(CRRT).

Methods: 891 adult patients were admitted to the ICU and received CRRT at three institutions of the Catholic Medical Center from July 2012 to December 2020. 845 subjects were eligible for the study, excluding patients without BMI data or patients with ECMO treatment. Patients were categorized into 4 groups according to the BMI. The association between BMI and 1-year overall mortality and 1-year ESRD incidence were investigated.

Results: The 1-year mortality was 43.3%, 47.9%, 36.2% and 39.0% in the underweight, normal, overweight, and obese groups respectively. The mortality rate of obese patients was significantly lower than that of normal patients in Kaplan-Meier analysis (p=0.002). Multivariable logistic regression analysis showed that obese patients had a lower risk of mortality than normal group (hazard ratio [HR], 0.60; 95% confidence interval [CI], 0.42-0.85; P=0.005). The 1-year ESRD incidence was 43.6%, 37.9%, 32.4% and 25.0% in the underweight, normal, overweight, and obese groups respectively. In a multivariable logistic regression analysis adjusted for confounding factors, obesity was associated with a decreased risk of ESRD (HR, 0.56; 95% CI, 0.34-0.92; P=0.023). In subgroup analysis according to age, 1-year mortality consistently showed an inverse correlation between BMI and mortality, but ESRD incidence was inversely related with obesity only in patients with age > 65. There was no significant difference among the 4 groups according to BMI in CRRT duration, ICU length of stay, hospital length of stay and CRRT restart.

Conclusions: In critically ill patients admitted to ICU with AKI requiring CRRT, obesity (BMI>25.0kg/m^2) was associated with lower 1-year mortality and 1-year ESRD incidence, suggesting obesity paradox in patient survival and renal survival.
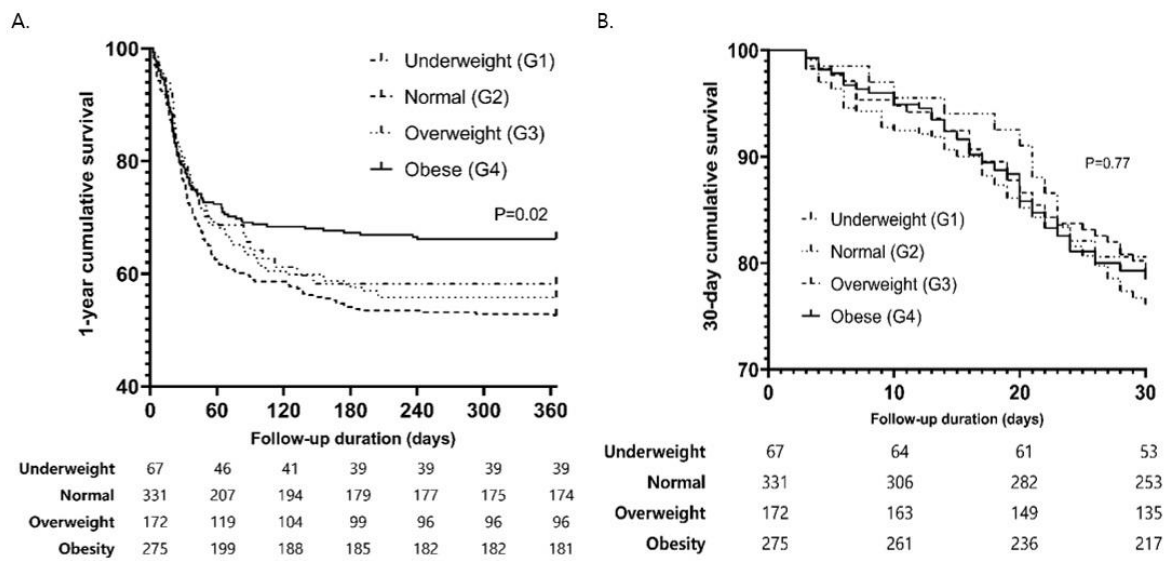
Figure 1. Flow chart of the study cohort
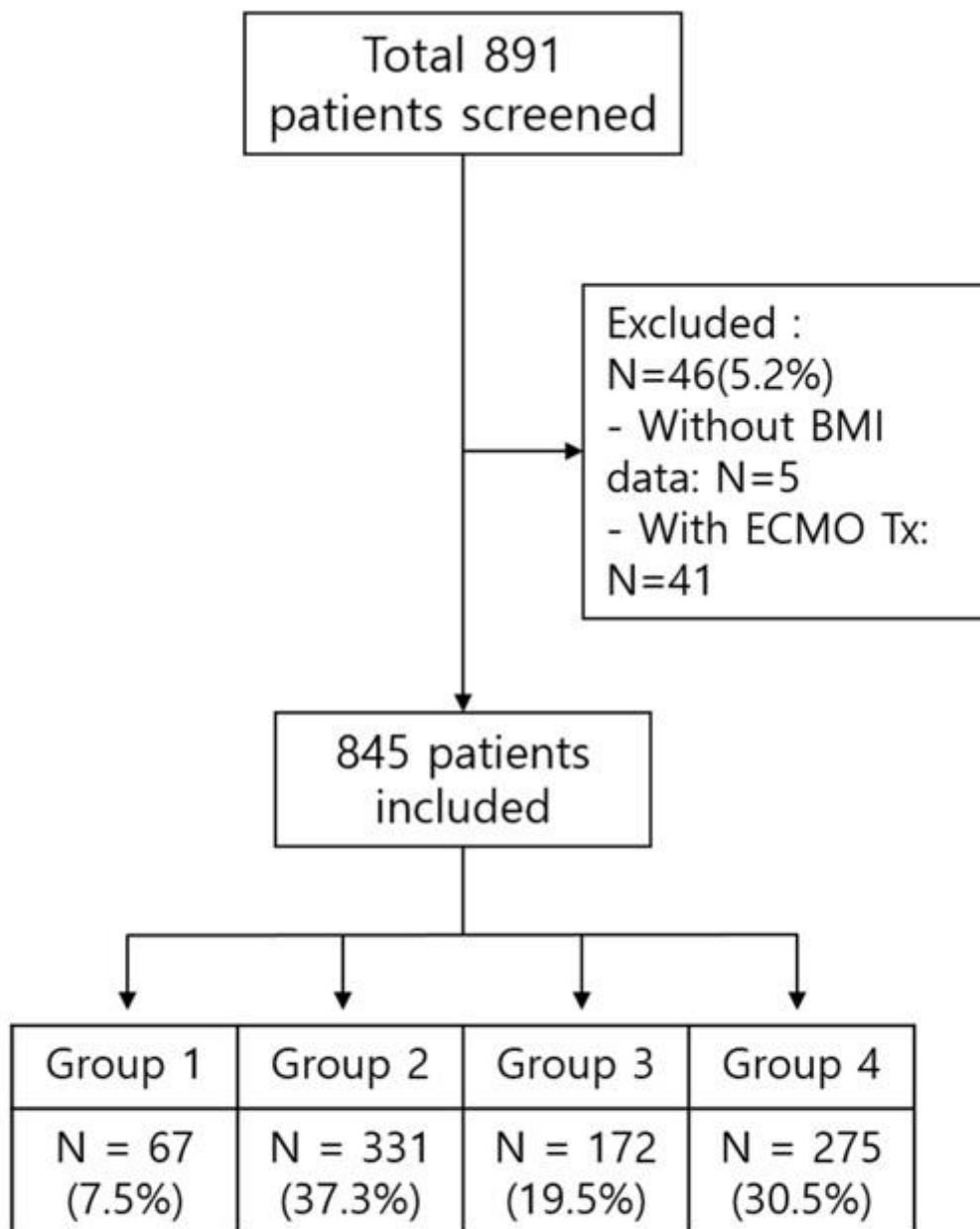
Figure 1. Flow chart of the study cohort.

Abbreviation : BMI, body mass index; ECMO, extracorporeal membrane oxygenation.

Figure 2. Kaplan-Meier curves for 1-year cumulative survival

A.

Underweight	67	46	41	39	39	39	39
Normal	331	207	194	179	177	175	174
Overweight	172	119	104	99	96	96	96
Obesity	275	199	188	185	182	182	181

B.

Underweight	67	64	61	53
Normal	331	306	282	253
Overweight	172	163	149	135
Obesity	275	261	236	217

Figure 2. Kaplan-Meier curves for 1-year cumulative survival. (A) When prognosis was evaluated by 4 BMI group, 1-year cumulative survival was best in obese group and worst in normal group (log-rank p for pooled analysis=0.02, pair wise analysis; p=0.002 for G2 vs G4). (B) 30-day cumulative survival of 4 BMI group didn't showed significant difference between groups (log-rank p for pooled analysis=0.77). G1, underweight group; G2, normal group; G3, overweight group; G4, obese group; BMI, body mass index.