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Serum Magnesium and Outcomes in Acute Heart Failure: Evidence of a U-Shaped Association with Mortality

Wankawee Jeerangsapasuk, Nattakorn Utapiya, Satha Lerwiwattaworn, Tanaboon Rimdusit, Aphichat Chatkrailert
Department of Internal Medicine-Nephrology, Division of Nephrology, Department of Medicine, Faculty of Medicine, Thammasat University Hospital, Pathum Thani, Thailand, Thailand

Objectives : Hypomagnesemia is theoretically associated with cardiac dysfunction; however, its clinical impact in acute heart failure remains uncertain. This study aimed to evaluate the outcomes associated with hypomagnesemia in hospitalized patients with acute heart failure and to identify clinical predictors of hypomagnesemia.
Methods : We conducted a prospective cohort study of patients admitted with acute heart failure to Thammasat University Hospital between June and December 2025. Hypomagnesemia was defined as a serum magnesium level ≤ 1.7 mg/dL at admission. The primary outcome was 30-day mortality, analyzed using Cox proportional hazards models. Secondary outcomes included arrhythmia, inotropic requirement, duration of mechanical ventilator support, and kidney dysfunction. Clinical predictors of hypomagnesemia were assessed using multivariable logistic regression.
Results : A total of 172 patients were included (mean age 73.9 years; 58% female), of whom 59 (34.3%) had hypomagnesemia. Thirty-day mortality did not differ between patients with and without hypomagnesemia (adjusted hazard ratio 1.32; 95% CI 0.47–3.68; p = 0.59; log-rank p = 0.94). However, hypomagnesemia was associated with longer duration of mechanical ventilator support (p = 0.02) and higher peak serum creatinine levels (p = 0.03). There were no significant differences in the rates of arrhythmia or inotropic requirement (all p > 0.05). Restricted cubic spline analysis demonstrated a U-shaped relationship between serum magnesium and mortality, with the lowest predicted mortality at approximately 2.1–2.2 mg/dL. Diabetes mellitus independently predicted hypomagnesemia (adjusted OR 2.37; 95% CI 1.21–4.66; p = 0.01), while beta-blocker use showed a protective association (adjusted OR 0.50; 95% CI 0.25–0.98; p = 0.04).
Conclusions : Hypomagnesemia was not associated with increased 30-day mortality in patients hospitalized with acute heart failure but was associated with longer mechanical ventilator support and higher peak serum creatinine levels. Diabetes mellitus predicted hypomagnesemia, while beta-blocker use appeared to be protective.

Mg_figure1.png

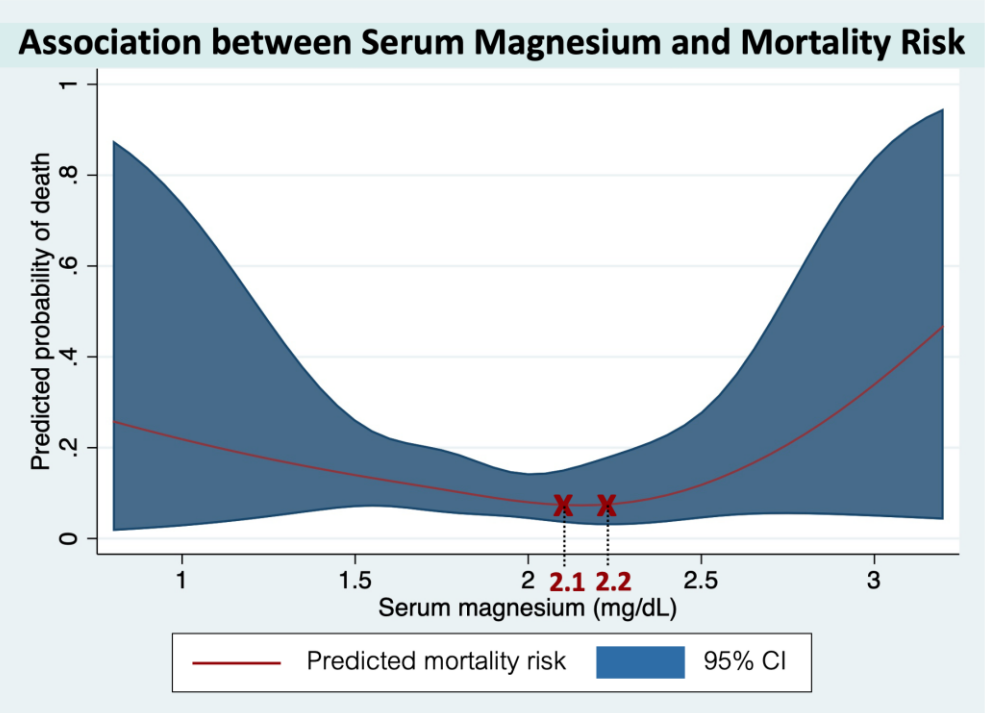

Figure 1. Restricted cubic spline analysis showing a U-shaped association between serum magnesium and predicted 30-day mortality, with the lowest risk at 2.1 – 2.2 mg/dL.

Mg_figure1.png

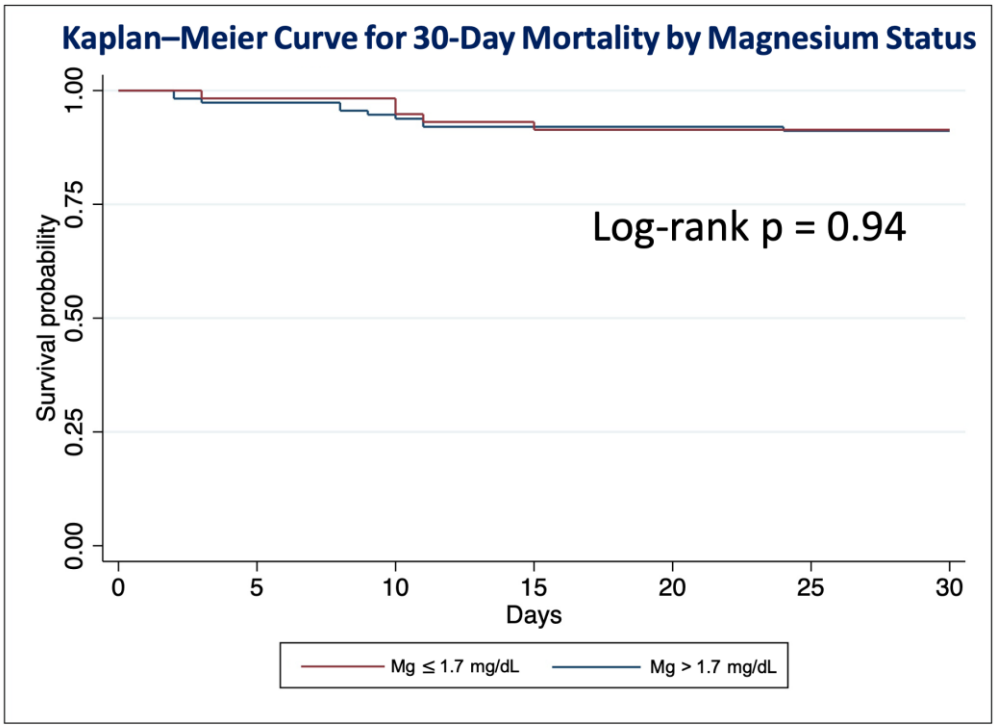

Figure 2. Kaplan–Meier curves for 30-day mortality comparing hypomagnesemia (≤1.7 mg/dL) and non-hypomagnesemia (>1.7 mg/dL); log-rank p = 0.94.