Glycemic variability in critically ill patients: risk factors and association with mortality

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To the Editor: Glycemic variability (GV) has a significant influence on the outcome in critically ill patients.[1-4] Diabetic status of the patient affects the relationship between GV and mortality; increased GV is a more potent risk factor for mortality among patients without diabetes mellitus (DM) than among patients with DM.[5] This retrospective study of 1234 intensive care unit (ICU) patients was conducted to determine the significant factors that contribute to high GV and to assess the association between GV and outcome in critically ill patients.

First, this study showed that the ICU and hospital mortality was 8.3% and 11.7%, respectively among patients with a coefficient of variation (CV) <15.0%; 14.3%, and 21.9%, respectively among patients with a CV between 15.0%–30.0%; 21.9% and 29.0%, respectively among patients with a CV between 30.0%–45.0%; and 36.7% and 45.9%, respectively among patients with a CV ≥45%. There was a significant difference between ICU mortality ($P < 0.01$) and hospital mortality ($P < 0.01$) among the four groups of patients; patients with a higher CV had both higher ICU and hospital mortality.

Next, our study determined the ICU and hospital mortality rates among the following four groups of patients: those with low GV and DM, low GV and no DM, high GV and DM, and high GV and no DM [Figure 1]. The ICU and hospital mortality was 8.0% and 12.9%, 16.0% and 23.5%, 19.9% and 26.1%, and 33.7% and 43.2% among the groups of patients with low GV and DM, low GV and no DM, high GV and DM, and high GV and no DM, respectively. There was a significant difference between ICU ($P < 0.01$) and hospital ($P < 0.01$) mortality rate among the four groups. Patients with low GV and DM had the lowest ICU and hospital mortality, and patients with high GV and no DM had the highest ICU and hospital mortality. Patients without DM had significantly higher ICU and hospital mortality than patients with DM either in the low GV group (16.0% *vs.* 8.0%, $P < 0.01$; 23.5% *vs.* 12.9%, $P < 0.01$) or the high GV group (33.7% *vs.* 19.9%, $P < 0.01$; 43.2% *vs.* 25.8%, $P < 0.01$).

Finally, we performed multivariate logistic regression analysis to identify the independent risk factors for high GV. Acute Physiologic Assessment and Chronic Health Evaluation (APACHE II) score (odds ratio [OR], 1.074; 95% confidence interval [CI], 1.047–1.102; $P < 0.001$), female gender (OR, 1.698; 95% CI, 1.288–2.239; $P < 0.001$), mechanical ventilation (OR, 1.658; 95% CI, 1.157–2.375; $P = 0.006$), DM (OR, 1.429; 95% CI, 1.078–1.898; $P = 0.013$), and serum creatinine level (OR, 1.119; 95% CI, 1.015–1.233; $P = 0.024$) were significantly associated with high GV.

This study showed that patients with higher GV have significantly higher mortality and that non-diabetic patients have higher mortality than diabetic patients with equivalent GV. APACHE II score, female gender, mechanical ventilation, DM, and serum creatinine level are independent risk factors for critically ill adult patients with high GV.

Conflicts of interest

None.

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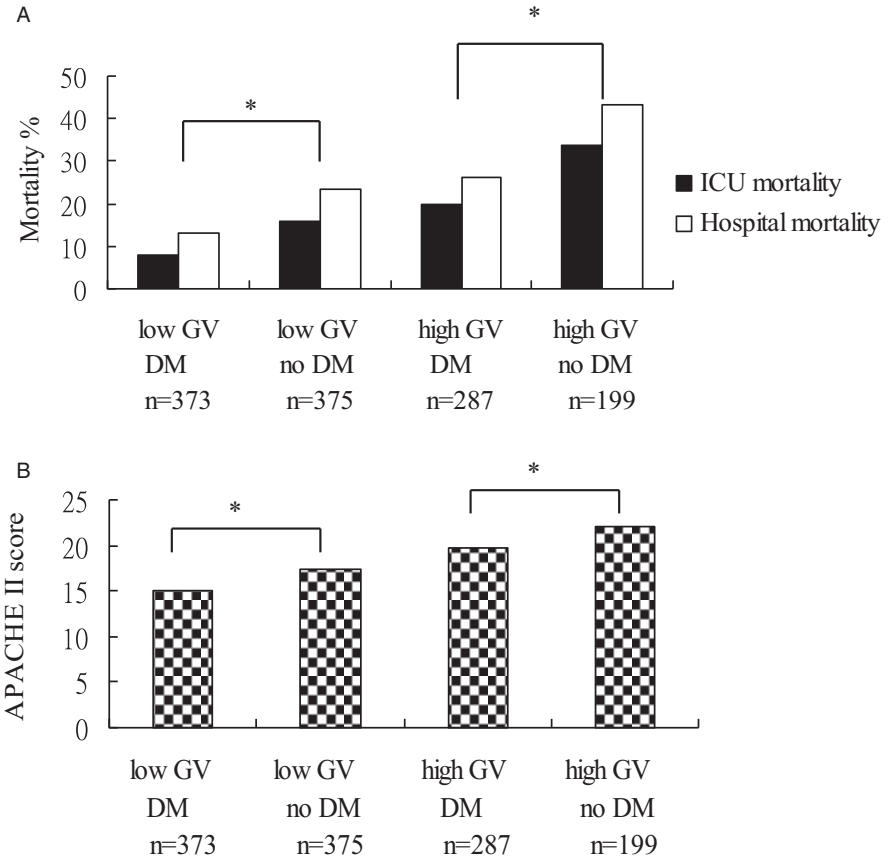

Figure 1: The ICU and hospital mortality (A) and APACHE II scores (B) for the four groups of patients with low GV and DM, low GV and no DM, high GV and DM, and high GV and no DM. *$P < 0.01$ for comparison of ICU and hospital mortality, and APACHE II score between patients with DM and patients without DM in the high or low GV group. APACHE: Acute physiology and chronic health evaluation; DM: Diabetes mellitus; GV: Glycemic variability; ICU: Intensive care unit.

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