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Differential early phosphate and magnesium dynamics according to metabolic acidosis severity in diabetic ketoacidosis: a multicenter eICU study*

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Abstract

Diabetic ketoacidosis (DKA) is accompanied by substantial electrolyte shifts, but early phosphate and magnesium trajectories during treatment have not been directly compared in a large multicenter adult cohort. We examined whether these minerals change differently according to the severity of metabolic acidosis. This retrospective study used the eICU Collaborative Research Database. Adults admitted to an intensive care unit with DKA were eligible. Phosphate and magnesium were defined by the earliest measurements at 0-3 h and 6-12 h after ICU admission, and patients were required to remain in the ICU for at least 12 h. Among 774 admissions with paired phosphate and magnesium measurements, 681 had an early bicarbonate value and constituted the main analysis cohort from 114 hospitals. Median phosphate decline was 0.387 mmol L⁻¹ in patients with bicarbonate <10 mmol L⁻¹ and 0.016 mmol L⁻¹ in those with bicarbonate ≥18 mmol L⁻¹ ($p<0.001$). In the fully adjusted model ($n=620$), each 5 mmol L⁻¹ lower bicarbonate was associated with a 0.111 mmol L⁻¹ greater phosphate decline (95% CI 0.091-0.132, $p<0.001$). The corresponding association with magnesium decline was small and not significant (0.006 mmol L⁻¹; 95% CI - 0.005-0.016, $p=0.286$). The results were consistent after excluding patients with a documented phosphate-containing treatment before follow-up and among patients with a documented insulin infusion. Early phosphate depletion in DKA therefore shows a clear acidosis-related gradient that is substantially more pronounced than the change in magnesium.

Keywords: diabetic ketoacidosis, phosphate, magnesium, metabolic acidosis, intensive care

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