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Title: Mixed acid-base disorders, hydroelectrolyte imbalance and lactate production in hypercapnic respiratory failure: The role of noninvasive ventilation

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Body: Hypercapnic COPD exacerbation in patients with comorbidities is complicated by mixed acid-base, hydro-electrolyte and lactate disorders. Aim of this study was to determine the relationships of these disorders with the requirement for and duration of noninvasive ventilation (NIV). Methods. Sixty-seven consecutive patients who were hospitalized for hypercapnic COPD exacerbation had their clinical condition, respiratory function, blood chemistry, arterial blood gases, blood lactate and volemic state assessed. Heart and respiratory rates, pH, PaO_2 and $PaCO_2$ and blood lactate were checked at the 1^{st}, 2^{nd}, 6^{th} and 24^{th} hours after starting NIV. Results. Nine patients were transferred to the intensive care unit. NIV was performed in 11/17 (64.7%) mixed respiratory acidosis–metabolic alkalosis, 10/36 (27.8%) respiratory acidosis and 3/5 (60%) mixed respiratory-metabolic acidosis patients ($p=0.026$), with durations of 45.1±9.8, 36.2±8.9 and 53.3±4.1 hours, respectively ($p=0.016$). The duration of ventilation was associated with higher blood lactate ($p<0.001$), lower pH ($p=0.016$), lower serum sodium ($p=0.014$) and lower chloride ($p=0.038$). Hyponatremia without hypervolemic hypochloremia occurred in 11 respiratory acidosis patients. Hypovolemic hyponatremia with hypochloremia and hypokalemia occurred in 10 mixed respiratory acidosis–metabolic alkalosis patients, and euvolemic hypochloremia occurred in the other 7 patients with this mixed acid-base disorder. Conclusions. Mixed acid-base and lactate disorders during hypercapnic COPD exacerbations predict the need for and longer duration of NIV.