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Critical Care

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SERUM BICARBONATE: A NEW PREDICTOR FOR MORTALITY IN SEPSIS

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PURPOSE: Sepsis is the leading cause of death worldwide with a mortality rate of 30%. Despite being an important pathophysiological component, information on serum bicarbonate level and its predictive value in sepsis is limited. We hypothesize that lower serum bicarbonate level at presentation is a predictor of poor outcomes in patients admitted with a diagnosis of sepsis.

METHODS: This is a single centered retrospective research study on patients admitted to MICU with a diagnosis of sepsis, severe sepsis and septic shock from 01/2013 till 12/2017. ICD 9 and ICD 10 codes were used to identify the patients. Patients were divided into 2 broad groups – non-CKD and CKD, in order to eliminate the bias caused by kidney disease. Each group was divided into 3 subgroups based on serum bicarbonate level at presentation - <22 meq/l, 22-28 meq/l and >28 meq/l. We compared the clinical outcomes between these sub-groups with primary endpoint being in-hospital mortality. Secondary endpoints were vasopressor requirements, days on mechanical ventilation, total ICU and hospital days. 2962 patients met the inclusion criteria of which 617 patients had CKD.

RESULTS: In both CKD and non-CKD group, lower serum bicarbonate level (<22 meq/l) was associated with increased SOFA score (10.9; p<.0001/10.7; p<.0001), increased heart rate (98 bpm; p=0.0004/106 bpm; p<.0001), lower MAP (73; p=0.0164/74;p <.0001), lower body temperature (97.9 F; p=0.001/98.1 F; p<.0001) and elevated serum lactate level (3 mmol/l; p<.0001 /3.9 mmol/l; p<.0001). Patients (both CKD and non-CKD) with lower serum bicarbonate required more frequent use of vasopressor support (82.9%; p=0.0009/80.8%; p<.0001) and required it for longer duration (4.7 days; p=0.0046/3.9 days; p<.0001) compared to patients in higher serum bicarbonate sub-group (22-28 meq/l>28 meq/l).In the non-CKD group, patients with lower bicarbonate levels had a shorter MICU (9.4 days; p<.0001), overall hospital stay (18.4 days; p=0.0002) and average days on mechanical ventilation (8.8 days; p<.0001) while in the CKD group, this difference was not statistically significant. In the non-CKD group, serum bicarbonate level at presentation was a significant predictor of short term mortality (39.1%; p=0.0006) whereas in the CKD group (38.4%; p=0.6705), this difference was not statistically significant.

CONCLUSIONS: Low serum bicarbonate level (<22 meq/l) at presentation can be used to predict increased short-term mortality in patients with no history of underlying CKD and possibly CKD. Low serum bicarbonate was associated with higher vasopressor requirement and increase in duration when compared to other subgroups independent of history of CKD.

CLINICAL IMPLICATIONS: Low serum bicarbonate is commonly seen in patients with more severe sepsis and can be a strong predictor of poor clinical outcomes including mortality.

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