

SENSITIVITY AND SPECIFICITY OF STRONG ION DIFFERENCE IN DETECTING METABOLIC ACIDOSIS AND ALKALOSIS CASES DETERMINED BY BICARBONATE BASED MODEL

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Objectives:

The Strong Ion Difference (SID) is the difference between the sums of concentrations of the strong cations and strong ions ($[SID] = [Na^+] + [K^+] + [Ca^{+2}] + [Mg^{+2}] - [Cl^-] - [Other\ Strong\ Anions]$). With normal protein levels, $[SID]$ is about 38-40 mmol/L. The traditional approach to acid-base balance is based on bicarbonate $[HCO_3^-]$ levels (1,2).

In this study, we aimed to investigate the sensitivity and specificity of SID in detecting metabolic acidosis and alkalosis cases diagnosed by traditional model.

Methods:

A total of 493 blood gas measurements included into the study. The measurements were obtained retrospectively from subjects monitored in intensive care unit and internal medicine clinics. If the $SID \leq 38$ mmol/L and $SID \geq 40$ mmol/L were considered as metabolic acidosis and alkalosis, respectively.

Results:

Hundred fifty-six of the measurements were metabolic acidosis and 218 metabolic alkalosis. The sensitivity of SID for metabolic acidosis was %96 and specificity was %39. The positive predictive value (PPV) and negative predictive value (NPV) were %42 and %96, respectively (Table 1). The sensitivity of SID for metabolic alkalosis was %45 and specificity was %56. The PPV and NPV were %89 and %69, respectively (Table 2).

Table 1. SID performance in detecting metabolic acidosis cases diagnosed by $[HCO_3^-]$ centered approach

	SID < 38 mmol/L	SID ≥ 38 mmol/L	Total
Metabolic Acidosis (+)	150	6	156
Metabolic Acidosis (-)	205	132	337
Total	355	138	493

Table 2. SID performance in detecting metabolic alkalosis cases diagnosed by $[HCO_3^-]$ centered approach

	SID > 40 mmol/L	SID ≤ 40 mmol/L	Total
Metabolic Alkalosis (+)	98	120	218
Metabolic Alkalosis (-)	12	263	275
Total	110	383	493

Conclusions:

Finally, $[SID]$ and $[HCO_3^-]$ centered models investigated with respect to their consistency with each other in this study. It seems that SID values of less than 38 mmol/L is not reliable for detecting metabolic acidosis, based upon PPV. However, SID values of more than 40 mmol/L may be used for diagnosing metabolic alkalosis cases, considering PPV obtained in the study.

References:

1. Waters JH, Scanlon TS, Howard RS, Leivers D: Role of minor electrolytes when applied to Stewart's acid-base approach in an acidotic rabbit model. *Anesth Analg* 1995;81: 1043-51.
2. Rastegar A: Clinical utility of Stewart's method in diagnosis and management of acid-base disorders. *Clin J Am Soc Nephrol* 2009; 4:1267-74.

