

SHOULD WE USE SODIUM BICARBONATE DURING PEDIATRIC CARDIOPULMONARY RESUSCITATION?

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To the Editor,
because of hypoxia-induced anaerobic metabolism and reduced metabolic acid excretion caused by insufficient renal perfusion, metabolic acidosis occurs during cardiac arrest. A main decrease in plasma bicarbonate concentration produced by an increase in hydrogen ions or a loss of bicarbonate in the extracellular fluid characterizes metabolic acidosis. Hemodynamic instability, decreased myocardial contractility and arterial vasodilation, decreased cellular oxygen supply, and mitochondrial oxygen consumption, impaired catecholamine response, and insulin resistance are all symptoms of metabolic acidosis, which can contribute to increased mortality [1]. As a result, the use of sodium bicarbonate as a buffer treatment to rectify metabolic acidosis was considered. The American Heart Association discourages the use of Sodium Bicarbonate in recommendations due to the possibility of damage and a lack of evidence of benefit. It's controversial whether Sodium Bicarbonate should be given to critically ill individuals who have metabolic acidosis. As a result, the goal of this systematic review and meta-analysis was to see how using sodium bicarbonate affected mortality in children who had a cardiac arrest.

We design the study as a systematic review and meta-analysis. The trial was conducted in accordance with the Preferred Reporting Items for Sys-

tematic Review and Meta-analysis (PRISMA) guidelines. Electronic databases (PubMed, Embase, Web of Science, Cochrane Collaboration databases, and Scopus) were searched for papers comparing pediatric resuscitation with and without sodium bicarbonate. Three independent reviewers (M.P., M.Z., and M.M.) searched for research published from the databases inception to April 10th, 2022. Studies included in this meta-analysis met the following PICO criteria: (1) Participants: pediatrics patients under cardiac arrest; (2) Intervention: resuscitation with sodium bicarbonate; (3) Comparison: resuscitation without sodium bicarbonate; (4) outcomes: survival to hospital discharge. All statistical analyses were carried out by using the STATA 14 software (StataCorp LP, College Station, TX, USA). For the meta-analysis, we used the random-effects model (assuming a distribution of effects across studies) to weight estimates of studies in proportion to their significance. The significance level for all statistical tests was set at $p < 0.05$ (2-tailed).

218 studies were retrieved from database searching. After excluding duplicates and title and abstract searching, 27 articles were assessed for eligibility. After full-text evaluation, eight studies that included 12 803 pediatric patients with cardiac arrest were included in this meta-analysis [2–9]. Poled analysis showed that survival rate in sodium bicarbonate group was 33.5% compared to 54.5% for group

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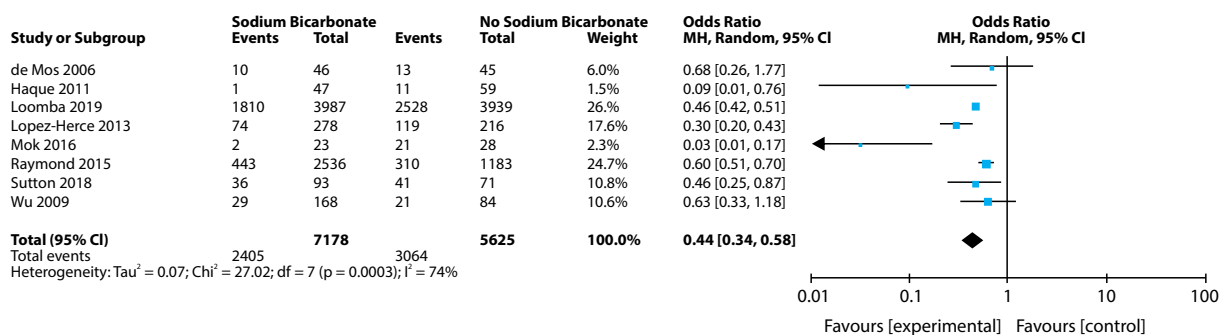


FIGURE 1. Forest plot of survival to hospital discharge in patients treated with and without sodium bicarbonate. The center of each square represents the weighted odds ratios for individual trials, and the corresponding horizontal line stands for a 95% confidence interval. The diamonds represent pooled results

treated without sodium bicarbonate [OR = 0.44; 95% CI: 0.34 to 0.58; I² = 74%; p < 0.001; (Fig. 1)].

The obtained results indicate a statistically significantly lower survival to hospital discharge in patients who received bicarbonate during resuscitation. The obtained results may be distorted due to the heterogeneous process of resuscitation over the years. It is also worth emphasizing that sodium bicarbonate reduces respiratory acidosis, however, in the case of patients who are improperly ventilated, it may aggravate intracellular acidosis — and thus reduce the chances of survival of these patients. Further large randomized clinical trials are needed to confirm these results.

Conflict of interest

None.

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