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[Intervention Review]

Nebulised hypertonic saline solution for acute bronchiolitis in infants

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ABSTRACT

Background

Airway oedema (swelling) and mucus plugging are the principal pathological features in infants with acute viral bronchiolitis. Nebulised hypertonic saline solution (≥ 3%) may reduce these pathological changes and decrease airway obstruction. This is an update of a review first published in 2008, and previously updated in 2010 and 2013.

Objectives

To assess the effects of nebulised hypertonic (≥ 3%) saline solution in infants with acute bronchiolitis.

Search methods

We searched the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, MEDLINE Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE Daily, Embase, CINAHL, LILACS, and Web of Science on 11 August 2017. We also searched the World Health Organization International Clinical Trials Registry Platform (WHO ICTRP) and ClinicalTrials.gov on 8 April 2017.

Selection criteria

We included randomised controlled trials and quasi-randomised controlled trials using nebulised hypertonic saline alone or in conjunction with bronchodilators as an active intervention and nebulised 0.9% saline, or standard treatment as a comparator in children under 24 months with acute bronchiolitis. The primary outcome for inpatient trials was length of hospital stay, and the primary outcome for outpatients or emergency department trials was rate of hospitalisation.

Data collection and analysis

Two review authors independently performed study selection, data extraction, and assessment of risk of bias in included studies. We conducted random-effects model meta-analyses using Review Manager 5. We used mean difference (MD), risk ratio (RR), and their 95% confidence intervals (CI) as effect size metrics.

Main results

We identified 26 new trials in this update, of which 9 await classification due to insufficient data for eligibility assessment, and 17 trials (N = 3105) met the inclusion criteria. We included a total of 28 trials involving 4195 infants with acute bronchiolitis, of whom 2222 infants received hypertonic saline.

Hospitalised infants treated with nebulised hypertonic saline had a statistically significant shorter mean length of hospital stay compared to those treated with nebulised 0.9% saline (MD -0.41 days, 95% CI -0.75 to -0.07; P = 0.02, I^2 = 79%; 17 trials; 1867 infants) (GRADE quality of evidence: low). Infants who received hypertonic saline also had statistically significant lower post-inhalation clinical scores than infants who received 0.9% saline in the first three days of treatment (day 1: MD -0.77, 95% CI -1.18 to -0.36, P < 0.001; day 2: MD -1.28, 95% CI -1.91 to -0.65, P < 0.001; day 3: MD -1.43, 95% CI -1.82 to -1.04, P < 0.001) (GRADE quality of evidence: low).

Nebulised hypertonic saline reduced the risk of hospitalisation by 14% compared with nebulised 0.9% saline among infants who were outpatients and those treated in the emergency department (RR 0.86, 95% CI 0.76 to 0.98; P = 0.02, I^2 = 7%; 8 trials; 1723 infants) (GRADE quality of evidence: moderate).

Twenty-four trials presented safety data: 13 trials (1363 infants, 703 treated with hypertonic saline) did not report any adverse events, and 11 trials (2360 infants, 1265 treated with hypertonic saline) reported at least one adverse event, most of which were mild and resolved spontaneously.

Authors' conclusions

Nebulised hypertonic saline may modestly reduce length of stay among infants hospitalised with acute bronchiolitis and improve clinical severity score. Treatment with nebulised hypertonic saline may also reduce the risk of hospitalisation among outpatients and emergency department patients. However, we assessed the quality of the evidence as low to moderate.

PLAIN LANGUAGE SUMMARY

Is hypertonic saline solution via nebuliser effective and safe for infants with acute bronchiolitis?

Review question

Is hypertonic saline solution via nebuliser effective and safe for the treatment of infants with acute bronchiolitis, compared to normal saline solution?

Background

Acute bronchiolitis is the most common lower respiratory tract infection in children aged up to two years. Bronchiolitis occurs when small structures (bronchioles) leading to the lungs become infected, causing inflammation, swelling, and mucus production. This makes breathing difficult, especially in very young children, who develop coughs and wheezing.

Because bronchiolitis is usually caused by a virus, drug treatment is usually not effective. Hypertonic saline (sterile salt water solution) breathed in as a fine mist using a nebuliser may help relieve wheezing and breathing difficulty.

We compared nebulised hypertonic (≥ 3%) saline solution with nebulised normal (0.9%) saline for infants with acute bronchiolitis.

This is an update of a review previously published in 2008, 2010, and 2013.

Search date

11 August 2017

Study characteristics

We identified 26 new studies in this update, of which 9 await assessment and 17 trials (N = 3105) were added. We included a total of 28 trials involving 4195 infants with acute bronchiolitis.

Key results

Nebulised hypertonic saline may reduce hospital stay by 10 hours in comparison to normal saline for infants admitted with acute bronchiolitis. We found that 'clinical severity scores', which are used by doctors to assess patient health, for children treated as outpatients

or in hospital improved when administered nebulised hypertonic saline compared to normal saline. Nebulised hypertonic saline may also reduce the risk of hospitalisation by 14% among children treated as outpatients or in the emergency department. We found only minor and spontaneously resolved adverse effects from the use of nebulised hypertonic saline when given with treatment to relax airways (bronchodilators).

Reductions in hospital stay were smaller than previously thought. However, an average reduction of 10 hours in the length of hospital stay for infants is significant because bronchiolitis usually has a short duration. Nebulised hypertonic saline appears to be safe and widely available at low cost.

Quality of evidence

The quality of the evidence was low to moderate: there were inconsistencies in results among trials and risk of bias in some trials. Future large trials are therefore needed to confirm the benefits of nebulised hypertonic saline for children with bronchiolitis treated as outpatients and in hospital.