

## Original Research Article

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# Hypertonic saline and adrenaline nebulization in the treatment of bronchiolitis: a retrospective study

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### ABSTRACT

**Background:** Bronchiolitis is the leading cause of acute illness and hospitalization in young children. There is limited role for diagnostic laboratory or radiographic tests in typical cases of bronchiolitis. Several large recent trials have revealed lack of efficacy of either bronchodilators or corticosteroids. Novel treatment like hypertonic saline and adrenaline nebulizations need to be evaluated for their efficacy.

**Methods:** In this retrospective case control study, we included children aged between 6 months to 2 years admitted for bronchiolitis between August 2017 till July 2018. Each of the 45 children treated with adrenaline nebulisation was assigned a child who was given hypertonic saline nebulization only matched for age and duration of symptoms.

**Results:** 45 children given adrenaline nebulization and 45 children given only hypertonic saline nebulization were compared. Mean duration of stay for children treated with adrenaline nebulization was 5.3 days and those given hypertonic saline was 4.8 days. p value of 0.29.

**Conclusions:** Adrenaline nebulization did not shorten hospital stay in children admitted for bronchiolitis as compared to children given hypertonic saline.

**Keywords:** Adrenaline nebulization, Bronchiolitis, Hypertonic saline

### INTRODUCTION

Bronchiolitis is the most common lower respiratory tract infection in the first year of life: one in five infants is affected and 2-3% are admitted to hospital.<sup>1</sup> An initial coryzal illness progresses over three to five days to troublesome cough, increased work of breathing and feeding difficulty. Mild illness can be managed at home, but in children with respiratory distress, hospitalization is required.

In a prospective, multicenter study on bronchiolitis (the Multicenter Airway Research Collaboration 30 (MARC-3) study), involving 2207 children <2 years, it was

demonstrated that 30% of children hospitalized with bronchiolitis were infected with >1 virus.<sup>2</sup> Although most (72%) children in this study were infected with respiratory syncytial virus (RSV), a substantial proportion (26%) was infected with human rhinovirus (HRV).

There is limited role for diagnostic laboratory or radiographic tests in the outcome of typical cases of bronchiolitis.

The 2006 American Academy of Pediatrics (AAP) bronchiolitis clinical practice guideline (CPG) recommended no routine laboratory or radiologic studies

in bronchiolitis, but there is evidence that a substantial amount of testing is still performed.<sup>3</sup>

Two recent investigations have analyzed trends in emergency department chest x-ray (CXR) use. They demonstrated that CXR use did not change between 1995 and 2009 while an analysis revealed a statistically significant decline from 65% before the 2006 AAP guidelines to 49% after the guidelines.<sup>4,5</sup> While this decline is encouraging, CXRs are still being performed on almost half of children with bronchiolitis. CXRs are associated with avoidable costs, radiation exposure, and subsequent antibiotic administration.<sup>6</sup>

Even within countries there is wide variation in the management of bronchiolitis.<sup>7</sup> Several large recent trials have revealed lack of efficacy of either bronchodilators or antibiotics which are being used unnecessarily prompting the need for guidelines to be set up and followed.<sup>8</sup> Novel treatment like hypertonic saline and adrenaline nebulizations have shown some promise and need to be evaluated further for their efficacy.

Because the pathophysiology of bronchiolitis is characterized by bronchial wall edema and epithelial sloughing but not bronchospasm, the vasoconstrictive attributes of alpha-agonists should theoretically make them more effective than beta-agonists.<sup>9</sup> A meta-analysis of 19 trials involving 2256 patients demonstrated a small but significant reduction in hospitalization rates with epinephrine compared to placebo and a shorter LOS with epinephrine compared to beta-agonists, but not when compared to saline.<sup>10</sup> However, in a more recent trial involving 404 hospitalized infants, inhaled racemic adrenaline was no better than inhaled saline.<sup>11</sup> Interestingly, infants in this trial had a shorter LOS when either treatment (adrenaline or saline) was given “on-demand” rather than more frequently on a fixed schedule, supporting the notion that interventions of any kind can be harmful to a struggling infant with bronchiolitis.<sup>12</sup>

## METHODS

In this retrospective case control study, we aim to find out if there is a significantly shorter duration of stay between children who were given hypertonic saline nebulisation and adrenaline nebulisation. Authors were included children aged between 6 months to 2 years admitted for bronchiolitis between August 2017 till July 2018. Each of the 45 children treated with adrenaline nebulisation was assigned a child who was given hypertonic saline nebulization matched for age, duration and severity of symptoms.

### Inclusion criteria

- Age 6 months to 2 years
- Diagnosed between August 2017 and July 2018 with bronchiolitis defined as the first presentation with a viral respiratory tract infection with respiratory

distress without any previous visits to health care provider for these symptoms.

- Infants aged less than 12 months with respiratory rate more than 60cpm and those more than 12 months with respiratory rate more than 50cpm.
- Patients with saturation less than 96% at room air.

Exclusions were previous diagnosis of bronchiolitis within past month of index episode, coexistent lung disease, congenital heart disease, immunodeficiency, neuromuscular disorder or previous enrolment.

The age, sex, antibiotics given if any and the duration of hospital stay was recorded and compared.

The Statistical software namely SPSS 18.0, and R environment ver.3.2.2 were used for the analysis of the data.

## RESULTS

The 45 children given adrenaline nebulization and 45 children given only hypertonic saline nebulization were compared.

The use of additional bronchodilators were present in both groups. (p:0.334) using chi square test (Table 1). Among children given adrenaline nebulization, 41 received bronchodilators while 4 did not. In the hypertonic saline group, 38 received bronchodilators while 7 did not receive. P value of 0.334 using chi square test was obtained which indicates that this factor does not significantly affect the final outcome.

**Table 1: Bronchodilators distribution in two groups of patients studied.**

Bronchodilators	Group Adrenaline	Hypertonic saline	Total
No	4(8.9%)	7(15.6%)	11 (12.2%)
Yes	41(91.1%)	38(84.4%)	79 (87.8%)
Total	45(100%)	45(100%)	90 (100%)

P=0.334, Not significant, Chi-Square test.

Similarly antibiotics were used in both groups and therefore did not impact the results (p:1.00). (Table 2)

This table shows the number of children administered with antibiotics in each of the two groups. In the adrenaline group, out of 45 children, 42 children were given antibiotics and in hypertonic saline group 43 children were given antibiotics. Using Fisher exact test, p value of 1 was obtained which was not significant.

Mean duration of stay for children treated with adrenaline nebulization was 5.3 days and those given hypertonic saline was 4.8 days. p value of 0.29 using Student t test

(not significant). (Table 3). Table 3 gives a breakdown of number of days of hospitalisation in each of the two groups. In the adrenaline group, out of 45 subjects, 18 stayed for less than 5 days, 25 children stayed for 5 to 8 days and remaining 2 stayed for more than 8 days.

**Table 2: Antibiotics distribution in two groups of patients studied.**

Antibiotics	Group Adrenaline	Hypertonic saline	Total
No	3(6.7%)	2(4.4%)	5(5.6%)
Yes	42(93.3%)	43(95.6%)	85(94.4%)
Total	45(100%)	45(100%)	90(100%)

P=1.000, Not significant, Fisher Exact test.

**Table 3: Number of Days distribution in two groups of patients studied.**

Number of Days	Group Adrenaline	Hypertonic saline	Total
<5	18(40%)	24(53.3%)	42(46.7%)
5-8	25(55.6%)	18(40%)	43(47.8%)
>8	2(4.4%)	3(6.7%)	5(5.6%)
Total	45(100%)	45(100%)	90(100%)
Mean±SD	5.31±1.77	4.89±2.01	5.10±1.90

P=0.294, Not significant, Student t test.

Among the children treated with hypertonic saline, 24 stayed for less than 5 days, 18 for 5 to 8 days and remaining 3 stayed for more than 8 days. Overall, the mean duration of stay for children in adrenaline group is 5.31 days whereas that for children administered with hypertonic saline is 4.89 days. Using Student t test, p value or 0.294 was obtained. Therefore, there was no significant variation in the duration of stay among the 2 groups.

## DISCUSSION

In this study, adrenaline nebulization had no beneficial effect on the length of hospital stay. Mechanism of adrenaline is bronchodilatation by B2 sympathomimetic activity, reversal of tissue edema by vasoconstriction by A1 action and physiological antihistaminic effect.

A systematic review done by Cochrane shows that there is no difference for length of hospital stay between those given adrenaline nebulization and placebo but adrenaline combined with glucocorticoids significantly reduces hospital admissions.<sup>13</sup>

Regarding role of hypertonic saline, AAP guidelines do not recommend its use in the emergency department but only in hospitalized children. From a recent meta-analysis, hypertonic saline seems to slightly reduce the length of hospital stay.<sup>14</sup>

By analyzing the most recent meta-analysis, the latest Cochrane review of the use of bronchodilators for the treatment of bronchiolitis showed no effect on oxygen saturation and no reduction in hospital admission, In addition, antibiotics did not seem to have any effect on the course of disease.<sup>15,16</sup>

A possible shortcoming of this study is the limited number of patients studied and the concomitant use of bronchodilators. Adrenaline nebulization cannot be recommended as treatment of choice based on this study.

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