

## A Comparative Trial of Nebulized Hypertonic Saline versus Epinephrine in Bronchiolitis in Infants

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### Abstract

A comparative trial was conducted in Department of Pharmacology, Govt. Medical College and Hospital, Purnea, Bihar, from April 2022 August 2022 using standard therapy i.e. epinephrine and hypertonic saline as study drug in two group of patients. Samples were collected from Department of Pediatrics, GMCH, Purnea, Bihar. Children having a first episode of bronchiolitis between the ages of 2 months and 24 months were included in the study, but those who had cardiac disease, an immune weakness, or a serious illness at presentation were not. Patients with bronchiolitis were treated with nebulized epinephrine in Group A (epinephrine group) (n = 33) and hypertonic saline in Group B (n = 32). The respiratory scores at admission and after 24 hours, as well as the length of stays in both groups, were compared. There was no statistically significant difference between the hypertonic saline and adrenaline groups for the baseline clinical score upon admission, however hypertonic saline was more effective for the clinical score at 24 hours and the length of stay (both  $p < 0.05$ ). In this study, it was discovered that nebulized hypertonic saline was more secure, efficient, and superior to adrenaline (conventional therapy) in treating bronchiolitis.

**Keywords:** Bronchiolitis, Epinephrine, Hypertonic Saline, Nebulization

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### Introduction

The most typical lower respiratory tract condition affecting children in their first year of life is acute bronchiolitis. With the majority of cases occurring between 3 months and 6 months of age, it typically affects children under the age of 2 years. Inflammation, edoema, necrosis of the small airway epithelium linked to bronchospasm, and increased mucus production are

symptoms of the condition. Fever is typically not noticeable during the prodromal phase, and its severity frequently does not correspond with the severity of respiratory distress. The temperature can range from normal to 40°C (105°F), however it typically hovers between 37.8 and 39°C (100°F to 102°F). Coughing, wheezing, and shortness of breath are the

symptoms of bronchiolitis, and these symptoms can make it difficult to feed. Respiratory syncytial virus (RSV) is the most common infectious agent and typically develops from viral illnesses. Bronchitis can range in intensity from mild to severe. Supportive care, which involves managing nutrition and drink intake as well as supporting the respiratory system, is the foundation of therapy. If additional humidified oxygen is required to keep the transcutaneous oxygen saturation level over 92, it is given. With variable degrees of efficacy and a variety of modalities, nebulization has been used to treat bronchiolitis.

Different modalities, including corticosteroids, bronchodilators, epinephrine, and hypertonic saline, have been tested in nebulization. Additionally, histamine, tryptase, and inflammatory and inflammatory mediators from mast cells and basophils are downregulated by epinephrine. Hypertonic saline solutions are used to hydrate thick secretions to make them easier to cough out since they are thought to be mucociliary agents. Hypertonic saline inhalation has been demonstrated to be helpful in treating respiratory conditions, particularly bronchiolitis. A novel method of therapy recently employed in the treatment of bronchiolitis is nebulized hypertonic saline. It has been previously researched in relation to cystic fibrosis.

Children with cystic fibrosis develop viscid discharges and wheezing, similar to bronchiolitis. The viscosity of the secretions is decreased by the hypertonic saline. Nebulized hypertonic saline increases mucociliary clearance right away after delivery, according to a Cochrane meta-analysis of its usage in cystic fibrosis, and it may also have a positive long-term effect. Therefore, the focus of this study was on the effectiveness of hypertonic saline

nebulization against epinephrine in bronchiolitis [1-3].

### Materials and Methods

From April 2022 to August 2022, samples were taken from the Department of Pediatrics at the Government Medical College in Purnea, Bihar for the study, which was carried out there. Nebulizing with hypertonic saline and epinephrine was done on patients who had bronchiolitis symptoms after they had been assessed.

In the study, children between the ages of 2 months and 2 years who had their first episodes of acute bronchiolitis and had respiratory distress or oxygen saturation below 94% in room air were included. Children with immunological deficits, severe illness at presentation, a history of systemic or nebulized bronchodilators usage, or a history of nebulized hypertonic saline use in the previous 24 hours were excluded from the trial.

The clinical presentation, which may include the following: tachypnea, tachycardia, temperature (38-39°C), retractions, fine rales (47%), diffuse, fine wheezing, hypoxia, and otitis media, is used to make the diagnosis of bronchiolitis. Children were split into two groups at random. For the first 24 hours, Group A received treatment with nebulized epinephrine (non-racemic solution, 1:1000 conc 1 ml diluted in 2ml normal saline). Nebulized hypertonic saline (3%) 3 ml was given to children in the second group of bronchiolitis patients every 6 hours. Heart rate and clinical score were observed in both groups.

Children were deemed to have failed therapy if their clinical score increased by two points or more (using their admission score as a baseline) or if their heart rate exceeded 200 beats per minute. Using the aforementioned standards, the treatment was deemed effective if the child showed improvement

or did not deteriorate. Clinical score from baseline, heart rate, and length of hospital stay were used to evaluate these individuals. The severity of bronchiolitis in patients assigned to both study groups was evaluated at the time of admission and 24 hours after hospitalisation using the Children Hospital of Wisconsin respiratory score, which included the following parameters: breath sounds, dyspnea, retraction, respiratory rate, and O<sub>2</sub> feed [2].

Treatment was deemed successful if the score decreased or stayed the same. Treatment failure was deemed to occur if the score increased from baseline and another treatment modality (Bronchodilator diluted with 3%NS) was administered to patients who were deemed to have failed in both the baseline and final scores or whose heart rates exceeded 200 beats per minute. Using the aforementioned standards, the treatment was deemed effective if the child showed improvement or did not deteriorate. These patients' clinical status was evaluated using their baseline clinical score, heart rate, and length of hospital stay.

The severity of bronchiolitis in patients was evaluated in both study groups at the time of admission and after 24 hours in the hospital using the Wisconsin respiratory score for children's hospitals. Therapy was deemed

successful if the score reduced or stayed the same, unsuccessful if the score increased from baseline, and patients in both groups who fell into the latter category received additional treatment (Bronchodilator diluted with 3% NS).

## Results

Regarding gender, age, clinical score at admission, clinical score after 24 hours of treatment, length of stay, and treatment outcome, the study groups were equivalent (Table 2). There were 32 patients total in the hypertonic saline group and 33 patients total in the epinephrine group. In the epinephrine group, the male to female ratio was 19:14, while it was 22:10 in the hypertonic saline group.

Most of the patients in the hypertonic saline and epinephrine groups were under 6 months old, whereas the minimum age for patients in both groups was >12 months. In the epinephrine group, the mean clinical score at admission was 9.84, while it was 10.65 in the hypertonic saline group (p value >0.05). After 24 hours of treatment, the mean clinical score in the epinephrine group was 8.8, while it was 8.09 in the hypertonic saline group (p 0.05). These findings support the hypothesis that hypertonic saline was superior to the conventional medication, epinephrine, in treating bronchiolitis.

**Table 1: Respiratory Distress Assessment Score**

Variable	Points					Max. Point
	0	1	2	3	4	
<b>Wheezing</b>						
Expiration	None	End	1/2	3/4	All	4
Inspiration	None	Part	All	N/A	N/A	2
Location		Segment < 2 of 4 limb	Diffuse	N/A	N/A	2
<b>Retraction</b>						
Supraclavicular	None	Mild	Moderate	Marked		3
Intercostal	None	Mild	Moderate	Marked		3
Subcostal	None	Mild	Moderate	Marked		3

**Table 2: Population Characteristics**

Patients Characteristics	Epinephrine group (n=33)	Hypertonic saline group (n=32)	Pvalue
Male : Female	19:14	22:10	
Age (months)	16 (<6 months)	15 (<6 months)	
	15 (6 months-12months)	10 (6 months-12months)	
	2 (>12months)	7 (>12months)	
Clinical Score at admission (Mean±SD)	9.84±2.06	10.65±1.80	>0.05
Clinical Score at 24 hours (Mean±SD)	8.8±3.02	8.09±2.68	<0.05
Duration of stay (days) (Mean±SD)	8.565±4.26	7.093±3.03	<0.05
<b>Treatment outcome</b>			
Improvement	84.8%	87.5%	
Failure	15.2%	12.5%	

## Discussion

65 toddlers under the age of two who were clinically believed to have bronchiolitis participated in the trial. The sample size for the current study was 65 cases, including 42 (64.5%) men and 23 (35.5%) women. The ratio of men to women was 1.89:1. This ratio differed from earlier research because more men than women were admitted at this time. According to Parrot *et al.* 1973, bronchiolitis is equally distributed in both sexes. According to Kravitz *et al.* 1965, bronchiolitis [3] was more frequent in boys, with a male to female ratio of roughly 1.5:1 [4].

Out of 65 instances, 31 patients (or 47%) were under 6 months old, followed by 25 patients (6–12 months) and only 9 patients (or 9 cases) who were beyond 12 months old. The age distribution was almost identical to that seen in 1973 by Parrot RH, Kim HW, and Arrobio J, among others. They examined 1148 [3] children under the age of two who had bronchiolitis that was clinically indicated, and they found that the peak age of occurrence was between 2 and 6

months, with more than 80% of cases occurring in the first year of life.

Bronchitis was shown by Gartner PS *et al.* in 1973 to be virtually entirely restricted to children under the age of two [5].

Recovery pattern in bronchiolitis: In the current study, it was shown that maximum recovery in the epinephrine group (48%) took place in the second week, whereas maximum recovery in the hypertonic saline group took place in the first week. P-value (<0.001) was statistically significant according to statistical analysis.

Compared to the hypertonic saline group, only 6% of the patients in the epinephrine group were still recovering after 7 days. After 14 days, no patient was still alive for recovery. According to Neeraj Gupta *et al.* (2011), the recovery patterns of the groups receiving adrenaline and hypertonic saline were not statistically different; however the duration of stay was statistically significantly shorter in the hypertonic saline group [6-8].

These results were at odds with those of Sharma *et al.* (2012), who compared hypertonic saline (3% concentration) to normal saline (0.9%) and found no statistically significant change in length of stay or clinical severity score (monitored every 12 hours till release) [9]. Hypertonic saline resulted in a 24% shorter length of stay, according to a Cochrane meta-analysis of 4 trials. Although Khalid *et al.* 2010 observed a difference of a few hours that was not statistically significant; they did find a shorter length of stay when using hypertonic saline. Jeffery [10] in their study from 2016, Baron *et al.* reported lower lengths of stay [11].

After 24 hours of treatment, the hypertonic saline group saw a better overall treatment success than the epinephrine group (84.8% vs. 87.5%). In the first 24 hours of treatment, 15.2% of the epinephrine group did not improve, whereas 12.5% of the hypertonic saline group did not. Secondary infection and related disorders may be to blame for this therapy failure.

Thus, our study showed that men were more impacted than women. However, this can be a reflection of our setting's admissions tendency. Bronchitis was also discovered to be more frequent in infants under 6 months of age. When epinephrine and hypertonic saline were statistically evaluated for clinical score after 24 hours of treatment and length of stay, hypertonic saline was found to be more efficacious ( $p < 0.05$ ).

### Conclusion

Considering improvement in clinical score at 24 hours and length of stay, hypertonic saline is superior to epinephrine in treating bronchiolitis, according to our study.

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