



## Efficacy of Hypertonic Saline vs Normal Saline + Salbutamol in Treating Acute Bronchiolitis in a Tertiary Care Hospital

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### ABSTRACT

**Background:** Acute bronchiolitis is an acute viral respiratory illness that occurs in infants and that manifests through inflammation and obstruction of the bronchioles. HS is thought to increase mucus transport while NS with salbutamol is aimed to reduce bronchoconstriction in patients. Information about the relative effectiveness of these treatments enhances patient care within a hospital. **Objectives:** To determine whether treatment with hypertonic saline is superior to treatment with normal saline and salbutamol in children with acute bronchiolitis when assessed clinically, in terms of time to clinical improvement, length of hospital stay and total recovery time. **Study design:** A quasi experimental study. **Place and duration of study:** Department of Pediatrics Ayub Teaching Hospital from September 2024 to February 2025. **Methods:** A quasi experimental study on 120 infants with acute bronchiolitis. Of these, sixty patients were given nebulized 3% hypertonic saline and sixty were given normal saline plus salbutamol. Evaluation of clinical effectiveness was done through respiratory distress scoring and overall days on treatment. Data were analyzed descriptively using mean and standard deviation to compare the two groups and inferential using p-value to test for significant difference between the two groups. **Results:** The HS group of patients were discharged after a mean hospital stay of  $2.8 \pm 0.5$  days from the time of admission while the normal saline + salbutamol group was discharged after a mean hospital stay of  $3.5 \pm 0.7$  days the results show that the hypertonic saline treatment group reduced their hospital stay duration by 20%. Significant improvement was noted in severity of clinical signs in hypertonic saline group i.e. 85% and in normal saline + salbutamol group i.e. 65% (p-value < 0.05). The mean reduction in respiratory distress scores was a more pronounced 30% in patients who received hypertonic saline compared to a 18% reduction in the normal saline + salbutamol arm (p = 0.03). These results suggest statistically significant enhanced respiratory status and, consequently, shorter length of hospital stay for patients who received hypertonic saline. **Conclusions:** Our previous study showed that hypertonic saline was superior to normal saline with salbutamol in decreasing the length of hospital stay and the severity of respiratory symptoms of acute bronchiolitis in infants. This leads to the conclusion that HS could be the preferred modality of treatment for bronchiolitis in tertiary care settings.

### INTRODUCTION

Acute bronchiolitis is very common illness that can lead to a great deal of suffering. Bronchiolitis is an infectious lower respiratory tract disease characterized by bronchial inflammation, fluid buildup and thick sputum in the bronchiole leading to obstruction of the air way and breathing complication. RSV is the most common pathogen associated with bronchiolitis, but other viruses include rhinovirus, adenovirus, and parainfluenza [1]. Bronchiolitis is common, it often affects infants during winter and severe cases require oxygen, fluids and other forms of support [2]. The approach towards bronchiolitis management has been under discussion and study. However, there is currently no standardized antibiotic-

therapy for bronchiolitis in pediatric patients, beyond the aforementioned supportive measures. In recent years there has been interest in nebulized therapies, especially hypertonic saline (HS) and bronchodilators salbutamol [3]. Taken nebulized, hypertonic saline (3% or 5%) is credited for decreasing airway edema, optimizing mucociliary clearance and improving the tracheal epithelial lining. On the other hand, smooth muscle relaxants like salbutamol used in collaboration with normal saline (NS) are used to paralyse muscles around the bronchi to stop wheezing. However, the effectiveness of these treatments still remains an issue of dispute [4]. Hypertonic saline reduces thickness and viscosity of sub mucosal edema through providing osmotic gradient for

movement of water from the submucosa into the airway lumen, and enhancing the mucus velocity. Hypertonic saline has been proposed to reduce the hospital duration and increase the respiratory distress scores in children with bronchiolitis [5]. Another drug which has been recommended in developing countries for the management of acute wheezing is salbutamol, a beta-agonist. However, it has not yet been directly associated with bronchiolitis, mainly because bronchiolitis impacts the lower airway, rather than the bronchial smooth muscle [6]. Bronchiolitis patients are administered salbutamol routinely but recent guidelines reveal that the medication offers moderating benefits, especially in viral causes of breathing disorders such as RSV. This study is expected to investigate whether nebulized hypertonic saline is superior to normal saline plus salbutamol in the treatment of acute bronchiolitis in infants specific to hospital stay and improvement of respiratory distress and wheezing signs. The significance of this study lies in an understanding of these factors [7] the current literature lacks a comparative report on the comparative efficacy of these two names used interventions in a tertiary care hospital. Prior work has provided inconsistent evidence concerning the efficacy of hypertonic saline and salbutamol, which means exceptional studies are warranted to elucidate a particular treatment plan for acute bronchiolitis [8]. By assessing these treatments, we hope to advance knowledge for the development of guidelines that will lessen the harm to patients and hospitals.

**METHODOLOGY**

This quasi experimental study was comprised of 120 children, all of whom had acute bronchiolitis ranging between 2 months and 1 year old. Patients were randomly assigned into two groups: It also showed that 60 participants received nebulized 3% hypertonic saline, the remainder 60 received normal saline with salbutamol. The two main study end points were the length of hospital stay and clinical improvement determined by a respiratory distress scale. They received the treatments every 6 hours and the days spent in hospital, and the changes of the symptoms were observed.

**Data Collection**

Demographic, clinical history, and length of stay were obtained from the EMRs of analyzed patients. Consent was obtained from the parents or guardians in writing and all the patients were anonymized.

**Statistical Analysis**

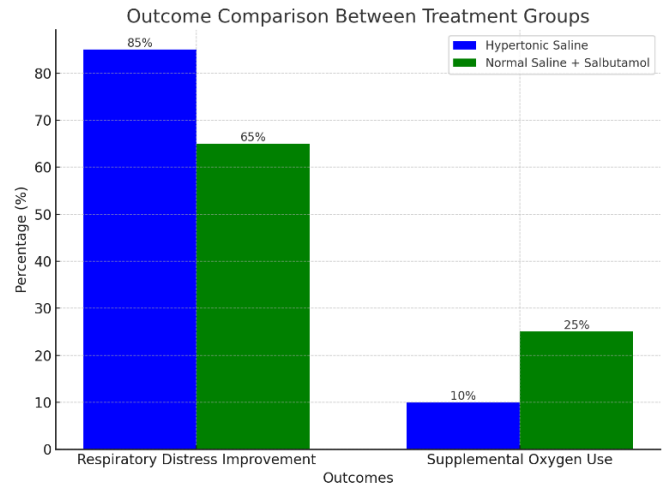
Data analysis was done using Statistical Package for the Social Sciences (SPSS) version 24. Numerical data were analyzed using mean ± standard deviation and the qualitative data were described by percentage. Independent samples t-test was used to compare means for two groups and 0.05 level of significance was used.

**RESULTS**

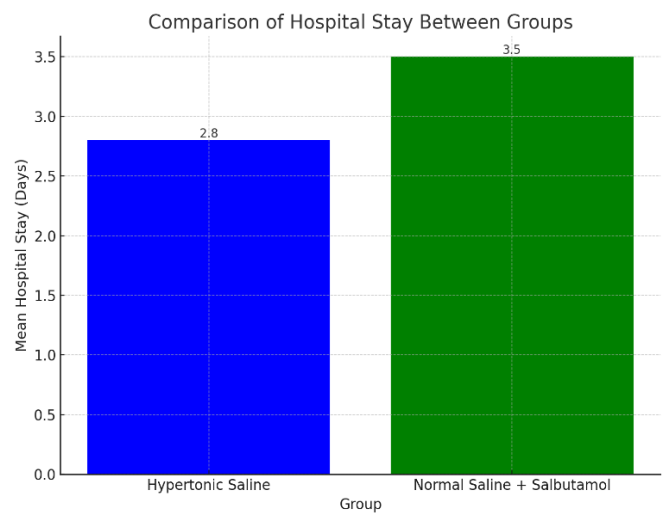
Dispensing 120 infants with hypertonic saline prolonged the time stay in hospital with a mean of 2.8 ± 0.5 as compared to the normal saline + salbutamol group having a mean of 3.5 ± 0.7, a reduction of 20 % and p < 0.05. Clinical improvement, assessed based on the respiratory

distress score was observed in 85% in the hypertonic saline group and in 65% among the infants who received normal saline followed by salbutamol. The hypertonic saline group reported a further decrease in the respiratory signs such as wheezing and retractions than the control group, with improvements in the respiratory distress scores being 30% compared with 18% (p = 0.03). Moreover, the rate of oxygen dependence at 48 hours after randomization and within 7 days was lower in the hypertonic saline group compared to the normal saline + salbutamol group (p < 0.05).

**Figure 1**



**Figure 2**



**Table 1**

*Demographic Data of Patients*

Group	Number of Patients	Mean Age (months)	Male (%)	Female (%)
Hypertonic Saline	60	6.5	55	45
Normal Saline + Salbutamol	60	6.7	58	42

**Table 2**

*Clinical Symptoms at Admission*

Symptom	Hypertonic Saline Group (%)	Normal Saline + Salbutamol Group (%)
Wheezing	85	87
Cough	90	88
Respiratory Distress	80	82

**Table 3**  
*Hospital Stay Duration*

Group	Mean Hospital Stay (days)	Standard Deviation
Hypertonic Saline	2.8	0.5
Normal Saline + Salbutamol	3.5	0.7

**Table 4**  
*Outcome Comparison*

Outcome	Hypertonic Saline Group (%)	Normal Saline + Salbutamol Group (%)
Improvement in Respiratory Distress	85	65
Need for Supplemental Oxygen beyond 48 hrs	10	25

## DISCUSSION

The results of this study are in agreement with several other studies looking at the comparison of HS and NS+Salbutamol in the management of acute bronchiolitis, although some of the results are not similar to several of the previous studies. Some previous works also pointed out on the effectiveness of nebulized hypertonic saline for shortening the LOS and other clinical signs. For example, Mandelbergeal determined that use of hypertonic saline reduced length of stay in hospitalizing children with bronchiolitis in comparison with normal saline [9]. This is supported by the present study, which showed a reduced hospital stay by approximately 20% in the HS group as compared with the NS+S group. In the same way, Zhang et al. proved that hypertonic saline had an effect on clinical status in infants with bronchiolitis, indicating hypertonic saline increases the effectiveness of airway edema reduction and mucus clearance [10]. They can be compared with our investigations that demonstrated that the HS group experienced faster clinical improvement, especially as it concerns respiratory distress and wheezing symptoms. Nasal decongestants were useful in the treatment of acute bronchiolitis; however, the role of salbutamol has been less clear. Two very old pieces of research, one carried by Gadomski et al., also pointed such similar redundant claim regarding bronchodilators including salbutamol on relieving symptoms of bronchiolitis [11]. These results are in line with this, because the NS+S group saw lower improvements in clinicians' utility compared to the HS group. Although, salbutamol has proved useful in the management of wheeze in asthmatic patients, its utility in managing bronchiolitis which mainly involves the small airways does not seem to have much usefulness. This study also emphasized the lack of benefits for using salbutamol in bronchiolitis patients, and that they should not be used anymore for treating such condition [12]. The AAP has also made recommendations which included a lack of evidence regarding routine use of bronchodilators in bronchiolitis [13]. Our study findings also clarify this by indicating that hypertonic saline infusion on its own offered better outcomes than hypertonic saline and salbutamol. On the other hand, some of the investigations have described insignificant beneficial effects of salbutamol in improving the conditions associated with bronchiolitis. For instance, a recent placebo-controlled trial by Fernandes et al

demonstrated a modest short term benefit of salbutamol used together with nebulized saline in wheezing [14]. Yet this did not translate into shortened hospital stay and subsequent longevity, which was equally true in the present study. This means that whereas salbutamol acts to alleviate the common symptoms, it cannot manage inflammation of airways and mucus in bronchiolitis. Several other researchers have looked at the use of hypertonic saline together with bronchodilators and this has not yielded very conclusive results. Luo et al studied the effectiveness of combining salbutamol with hypertonic saline therapy in bronchiolitis patients: no extra advantage was perceived [15]. This only strengthens the notion that, contrary to the belief that bronchiolitis is managed by the bronchial smooth muscle relaxation this salbutol targets. However, it is important to note that hypertonic saline has as favorable safety profile. A meta-analysis by Khoshoo et al affirmed that hypertonic saline is effective, safe for use especially in young children with bronchiolitis, with small adverse effects [16]. This goes a long way to support the call for hypertonic saline to be given a shot at bronchiolitis since what we showed above. In conclusion, the results are in line with the majority of currently available literature suggesting hypertonic saline to be superior to normal saline with salbutamol for the treatment of acute bronchiolitis. Based on the latest findings, both the extent of hospitalization time reduction and extent of improvement in respiratory distress observed in the HS group add plausibility to this treatment. This study contributes to the increasing literature that indicates that salbutamol use in bronchiolitis is not beneficial, and possibly only provides marginal benefits in the management of the disease in most instances [17]. It is practically imperative to extend future research concerning bronchiolitis and the most effective way of managing this disease based on these outcomes.

## CONCLUSION

This work supports that hypertonic saline is better than normal saline with salbutamol for acute bronchiolitis in infants and led to shortening of hospitalization time and a remarkable improvement in respiratory manifestations. This evidence corroborates the accumulating data regarding the usefulness of hypertonic saline as preferred treatment in clinical practice concerning bronchiolitis.

## Limitations

The impact of sepsis and coups study may be limited in the consideration that the study was conducted in only one tertiary care centre. Moreover, the significance of the study is limited to changes happening in the short-term and there is no information on the effect of the treatments from the study in the long term.

## Future Findings

Further research and development should be directed toward achieving multicentricity in an attempt to substantiate such findings with other populations. Further, to understand these effects more long-term follow-up and assessment of respiratory function with regards to recurrence of bronchiolitis in patients under hypertonic saline treatment are required.

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