

Compare the Clinical Severity and Length of Hospital Stay in Children with Bronchiolitis Treated with the 3% Hypertonic Saline Nebulization Versus Normal Saline and Salbutamol

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ABSTRACT

Background: Acute bronchiolitis, a lower respiratory tract infection, is the most common reason for hospitalizing infants and children for breathing issues. Salbutamol dissolved in sterile saline solution was commonly used to treat hospitalized infants with acute bronchiolitis. This study was conducted with the hypothesis that giving bronchiolitis-affected infants 3 % hypertonic saline solution to inhale instead of 0.9% NS+salbutamol would reduce their clinical severity ratings and length of hospitalization.

Objective: To compare the clinical severity and length of hospital stay in children with bronchiolitis treated with the 3% hypertonic saline nebulization versus Normal saline and salbutamol

Study Design: A randomized controlled trial

Place and Duration: This study was conducted at Indus Medical College The University of Modern Sciences, Tando Muhammad Khan from June 2021 to June 2022

Methodology: A total of 120 individuals with acute bronchiolitis were included in this research after exclusions and inclusions. Both the 0.9% normal saline with salbutamol nebulization and the 3% hypertonic saline nebulization (n = 60) were randomly assigned to the two groups. The data was obtained regarding, age, gender, the pattern of presentation, clinical severity at different time intervals, duration of oxygen therapy, length of hospital stay, and rapid or gradual improvement and discharge of the patient from the hospital. Chi-square and unpaired t-tests were employed as test statistics to analyse the categorical data numerical data. The level of significance was set at 5%, with p0.05 (at the 95% confidence interval) being regarded as significant.

Results: A total of 32 (53.3%) females made up group I, while 34 (56.67%) males made up group II. In groups I and II, the mean hospital stays were respectively 61.7±14.5 hours and 81.4±18.2 hours. The mean and standard deviation for group I oxygen therapy time was 13.5± 4.2, while group II was 23.8±4.9 hours. Amongst the hypertonic saline group, out of total 60 patients, 55 (91.67%)patients were recovered and discharged rapidly. Meanwhile, in group II, 32 (53.3%) patients were recovered and discharged rapidly.

Conclusion: Yet, in terms of symptom relief, oxygenation improvement, and length of hospital stay for a baby with acute bronchiolitis, the 3% hypertonic saline group outperformed the 0.9% normal saline group. Clear clinical improvements and an increase in oxygen saturation were seen in both therapy groups.

Keywords: Acute Bronchiolitis, Hypertonic Saline, Normal Saline, Salbutamol

INTRODUCTION

The most frequent cause of infant and children hospitalization for breathing problems is acute bronchiolitis, [1, 2]. The first two years of life are when a child is most at risk of getting this condition. Many signs of viral pneumonia, such as a high body temperature, wheezing, and fast breathing, are also present in acute bronchiolitis. Despite the fact that bronchiolitis hospitalizes up to 2% to 3% of high-risk children annually (compared to just 1% of healthy newborns), the best treatment for the condition is still unclear [3, 4]. Acute bronchiolitis is still often treated with supportive measures including making sure the patient gets enough oxygen and keeping them hydrated and fed [5]

The management of bronchiolitis is still debatable at the moment. Due to a lack of robust evidence-based data, the majority of clinical practice recommendations propose supportive care rather than any specific successful therapy [6]. If necessary, mechanical ventilator support, proper hydration, and more oxygen are all parts of management [6]. Due to its capacity to decrease secretion viscosity, lessen airway edema, and enhance mucociliary function, for infants with bronchiolitis, multiple studies suggested the use of nebulized 3% NaCl solution. [7-9]

Salbutamol dissolved in sterile saline solution was commonly used to treat hospitalized infants with acute bronchiolitis. This study was conducted with the hypothesis that giving bronchiolitis-affected infants 3 %hypertonic saline solution to inhale instead of 0.9% NS+salbutamol would reduce their clinical severity ratings and length of hospitalization.

METHODOLOGY

Every patient who was enrolled in the experiment had their parent or legal guardian give informed consent. The study included children between the ages of one month and two years who were admitted during the study period and who had recently experienced or were currently experiencing a runny nose, cough, difficulty breathing, or chest in-drawing, as well as whose chest x-ray revealed hyperinflation and hyper-translucency without any cardiac problem.

A total of 120 individuals with acute bronchiolitis were included in this research after exclusions and inclusions. The two groups were equally divided between the 0.9% normal saline with salbutamol nebulization (n = 60) and the 3% hypertonic saline nebulization (n = 60). The respiratory distress evaluation tool established by Wang et al. [10] is used to evaluate variables such as clinical severity score. The data was obtained regarding, age, gender, pattern of presentation, clinical severity at different time intervals, and rapid or gradual improvement and discharge of patient from the hospital. The data were processed and examined using SPSS version 23. Chi-square and unpaired t-tests were employed as test statistics to analyses the categorical data numerical data. The 95% confidence interval (CI) cutoff for significance was established at 0.05, with a 5% threshold being used.

RESULTS

In this randomized control research, 120 individuals were included.

We reported the results in two groups, the distinct groups—group-I (Hypertonic Saline group with 60 patients) and group-II (NS + salbutamol group with 60 patients)—were used to explain the results. Table I shows the instrument for Respiratory Distress Assessment Table II lists the sociodemographic characteristics of the patients. Of the 35 patients in group I, or 58.3 percent, and the 37 patients in group II, or 61.3 percent, who made up group I, were all under the age of six months. the $p=0.34$. 32 (53.3%) females made up group I, while 34 (56.67%) males made up group II. The gender distribution's p value is 0.61.

Table 1: Instrument for Respiratory Distress Assessment

Assessment	Score
Respiratory Rate (min=0, max=3)	
<30 /min	0
31-45 /min	1
46-60 /min	2
>60 breaths/min	3
Wheezing (min=0, max=3)	
None	0
Terminal expiratory or only with a stethoscope	1
Entire expiration or audible on expiration without a stethoscope	2
Inspiration and expiration without a stethoscope	3
Retraction (min=0, max=3)	
None	0
Intercostal only	1
Tracheosternal	2
Severe nasal flaring.	3
General Condition (min=0, max=3)	
Normal	0
Irritable, lethargic or poor feeding	3

Table 2: Age and Gender distribution Among Study Groups

Gender and Age	Hypertonic Saline Group (60)		NS+Salbutamol Group (60)		p-value
	n	%	n	%	
Gender					
Male	28	46.7	34	56.67	0.61
Female	32	53.3	26	43.33	
Age (m)					
<6	35	58.3	37	61.67	0.34
6 to 12	17	28.3	16	26.67	
>12	8	13.3	7	11.67	

Table 3: Pattern of Presentation of Patients

Clinical presentation	Hypertonic Saline group (n=60)		NS+ salbutamol Group (60)		P value
	n	%	n	%	
Runny nose	60	100.00	60	100.00	>0.05
Cough	60	100.00	60	100.00	>0.05
Breathing difficulty	60	100.00	60	100.00	>0.05
Feeding difficulty	33	55.00	35	58.33	0.08
Wheeze	53	88.33	56	93.33	>0.05
Chest in-drawing	60	100.00	60	100.00	>0.05
Nasal flaring	7	11.67	11	18.33	0.07
Tachypnea	54	90.00	56	93.33	>0.05
Tachycardia	55	91.67	51	85.00	>0.05
Rhonchi	60	100.00	60	100.00	>0.05
Fever	19	31.67	17	28.33	>0.05
Oxygen saturation (mean±SD)	92.3±1.2		94.6±2.6		>0.05

Table 4: Clinical Severity at different Time intervals

Mean Clinical Severity Score	Hypertonic Saline Group (n=60)	NS+ salbutamol Group (60)	P value
At baseline	8.5.0±1.7	8.9±1.8	0.4
At 12 hours	7.9±1.1	8.4±1.3	0.008
At 24 hours	6.2±1.2	6.9±2.0	0.01
At 48 hours	3.1±0.9	3.9±2.6	0.03
At 72 hours	1.2±0.6	3.1±1.8	0.01

The pattern of presentation of patients is described in table

III, and table VI describes the mean clinical severity score at different time intervals. Table V explains the comparison of duration of oxygen therapy and length of hospital stay between the two groups, the mean±SD duration of oxygen therapy of group-I was 13.5±4.2 and the mean ± SD of group-II was 23.8±4.9 and the p value was 0.04. The mean length of hospital stay in group-I was 61.7±14.5 hours and the mean length of hospital stay in group-II was 81.4±18.2 hours with p -value 0.01 (TableV). Out of a total of 60 patients in group I, 55 (91.67%) recovered quickly and were discharged, and 5 (8.3%) recovered gradually and were discharged. While this was happening, 32 (53.3%) patients in group II healed quickly and were discharged. Nonetheless, 28 (46.67%) of the patients recovered and were eventually discharged. and the related p value was found to be 0.02, indicating a significant connection. (Table.VI).

Table 5: Length of Stay and Duration of Oxygen Therapy

Duration of Oxygen Therapy (hours)	Hypertonic Saline group (n=60)	NS+ salbutamol Group (60)	P value
Mean±SD			
Duration of oxygen therapy (hours)	13.5±4.2	23.8±4.9	0.04
Length of hospital stay (hours)	61.7±14.5	81.4±18.2	0.01

Table 6: Rapid and Gradual improvement and discharge of Patients from the Hospital

Recovery and Discharge	Hypertonic Saline group (n=60)		NS+ salbutamol Group (60)		P value
	n	%	n	%	
Rapid (within 72 hours)	55	91.67	32	53.33	0.02
Gradual (after 72 hours)	5	8.33	28	46.67	

DISCUSSION

A viral respiratory infection in children known as acute bronchiolitis [11] Bronchiolitis, in children under two, is the most frequent cause of early childhood hospitalization [12]. Wheezing and air trapping are common symptoms of bronchiolitis, which has been used as justification for treatment with bronchodilators such as salbutamol and ipratropium bromide [13]. Studies have observed that hypertonic saline aids in the treatment of bronchiolitis by hydrating the liquid that lines the airways, lowering airway edema, and enhancing mucus clearance through processes including improved mucus clearance and elevated ciliary beat frequency [14].

In this study, which included 120 children with bronchiolitis, the clinical severity and length of hospital stay were compared between the 0.9% normal saline with salbutamol nebulization and the 3% hypertonic saline nebulization. The results of the study revealed that the children's clinical severity score, respiratory rate score, wheezing score, all improved within three days.

However, compared to children who got 0.9% nebulized normal saline and salbutamol, those who received 3% nebulized hypertonic saline experienced the reduction far more quickly. Researchers Chen YJ et al. and Hsieh CW observed a substantial decrease in clinical severity score in the 3% saline nebulization group, which is consistent with the findings of our investigation. [15,16]. For the hospital stay, our findings stand in line with the observations reported by Hossain RM et al who reported that 3% hypertonic saline reduced the hospital stay while conducting a study in Dhaka Bangladesh [17].

Our study has significant evidence to conclude that the condition of patients in hypotonic saline group has significantly improved compared to the group being treated with NS+salbutamol, Consistent with our findings, Mandelberg et al reported better improvement in the hypertonic saline group[18].

CONCLUSION

Although both therapy groups showed overt clinical improvement

and an increase in oxygen saturation, the 3% hypertonic saline group performed better than the 0.9% normal saline group in terms of symptom relief, oxygenation improvement, and length of hospital stay for children with acute bronchiolitis in this trial.

Recommendations: We recommend further studies with larger number of randomized groups and multicenter hospital trials for better comparison of various aspects of improvement among patients in two groups.

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