Randomized Control Trial of 3% Nebulized Hypertonic Saline in Reducing the Length of Hospital Stay in Children with Bronchiolitis

Nafisa Zaman[1], Bedanta Majumder[2], Md. Mazharul Islam[3], Bikash Kumar Majumder[4], Shahana Afreen[5], Prahlad Kumar Shil[6]

1. Medical Officer
   Department of Psychiatry
   Rangpur Medical College, Rangpur
2. Intern Doctor
   BIRDEM, Dhaka
3. Assistant professor
   Department of ENT
   Rangpur Medical College, Rangpur
4. Ex-Professor of Pediatrics
   Rangpur Medical College, Rangpur
5. Outdoor Medical Officer
   Department of Pediatrics
   Rangpur Medical College, Rangpur
6. Registrar
   Department of Pediatrics
   Rangpur Medical College, Rangpur

Correspondence to:
Nafisa Zaman
Medical Officer
Department of Psychiatry
Rangpur Medical College
Rangpur
Mobile No:01715059493
Email:drnafisa.zaman@gmail.com

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Abstract

Background:
Bronchiolitis is the most common cause of lower respiratory tract infections within the first 2 years of life. Despite tantalizing efforts, an effective optimized treatment for bronchiolitis still remains elusive. Nebulized hypertonic saline may improve clinical severity scores and reduce length of hospital stay among infants with non-severe acute bronchiolitis.

Objective:
The objective of this study was to evaluate efficacy of 3% hypertonic saline in reducing the length of hospital stay in children with bronchiolitis.

Method:
This randomized control trial was conducted in the department of Paediatrics, Rangpur Medical College Hospital between July 2018 to June 2020. After acceptance and ethical clearance, 72 infants and young children fulfilling the selection criteria were enrolled into this study. Children were randomly divided into two groups, designed as group–A and group–B. Patients in group A were nebulized with 3% hypertonic saline and group B with normal saline. Patients in each group were nebulized three times 8 hourly during hospital stay. Each group received the same standard supportive measures. Data was analyzed through SPSS (version 23.0) software using chi-square test, student t' test, where applicable. Statistical significance was set as 0.05 level.

Results:
Among the 72 children, 72.22% (26/36) of group A and 58.33% (21/36) of group B were male, with a male female ratio of 1.88:1. Mean age of the children of group A (7.5±1.94 months) was significantly higher than that of group B (5.8±2.01 months) (p=0.032). Baseline clinical characteristics were almost similar, except oxygen saturation (p<0.001) between the two groups. 88.9% (32/36) patients of group A and 41.7% (15/36) from group B recovered and were discharged within 72 hours. After 72 hours, 11.1% (4/36) from group A and 58.3% (21/36) from group B recovered and were discharged (p<0.001). Mean length of hospital stay was shorter in the hypertonic saline group (2.28 ± 0.45 days) than that in the normal saline group (3.72 ±0.45 days).

Conclusion:
The length of hospital stay was effectively reduced by 3% nebulized hypertonic saline in children with bronchiolitis.

Keywords: Bronchiolitis, Nebulization, 3% hypertonic saline, Length of hospital stay

Introduction:

Bronchiolitis is the most common acute respiratory infection (ARI) in infancy and young children.[1] These children are often indiscriminately treated with antibiotics with the presumptive diagnosis of pneumonia. Being a viral disease, there is no cost-effective therapeutic options to treat bronchiolitis. Hypertonic saline (HS) has proved to be promising in recent studies.[2-5] However, other studies have shown equivocal results with little clinical benefits with the use of hypertonic saline.[6] There is dearth of data on comparison of important outcomes like readiness for discharge and need for repeat hospital visits, which are important indicators of morbidity.[7] A recent Cochrane Database Systemic Review of 28 non-emergency based trials (n=4195) analyzed the role of hypertonic saline in acute bronchiolitis among 2222 infants. This review concluded that nebulized 3% hypertonic saline may significantly reduce the length of hospital stay and improve clinical severity score in acute bronchiolitis.[8]

Methods :
This randomized control trial was done among total 72 children between July 2018 to June 2020 in the department of Paediatrics, Rangpur Medical College Hospital. Children aged from 1 month up to two years of both gender, presenting with first episode of wheeze, were enrolled into this study. Patients were randomly divided into two groups, designed as group A and group B. Patients in group A were nebulized with 3% hypertonic saline and group B with normal saline (NS). Patients in each group were nebulized three times daily during hospital stay. All the parents were masked to assigned intervention. After then data was processed carefully and analyzed through SPSS (version 23.0) software using chi-square test, student t' test, where applicable and p- value <0.05 was considered as statistically significant.

Results:
Table-I Showed that the majority of children below 6 months old belonged to group B (25/36, 69.44%). Conversely, in age group 6-12 months, majority (20/36, 55.56%) were from group A. The mean age of the children in group A and group B were 7.58 ±1.94 and 5.86±2.01 months, respectively(p=0.032). Male was predominant in group A (26/36, 72.22%) and group B (21/36, 58.33%) (p= 0.216).

Table I: Distribution by age and sex of respondents (n=72)

Variable	Group- A [n=36(%)]	Group-B [n=36(%)]	p-value
Age in months			
<6	16 (44.44)	25 (69.44)	0.032(S)
6-12	20 (55.56)	11 (30.56)	
> 12	0	0	
Mean±SD	7.58 ±1.94	5.86 ± 2.01	
Sex			
Male	26 (72.22)	21(58.33)	0.216(NS)
Female	10 (27.77)	15(41.66)	

S=Significant
NS= Not significant

Table-II showed baseline clinical characteristics of both groups were almost similar (p >0.05) except oxygen saturation (p <0.001) and the length of hospital stay was significantly less in group A than group B (p<0.001).

Table II: Comparison of clinical presentation, oxygen saturation and length of hospital stay between group A and group B on admission (n=72)

Variable	Group- A [n=36 (%)]	Group-B [n=36 (%)]	p-value
Clinical presentation			
Runny nose	36(100)	36(100)	>0.05(NS)
Cough	36(100)	36(100)	>0.05(NS)
Breathing difficulty	36(100)	36(100)	>0.05(NS)
Chest retraction	36(100)	36(100)	>0.05(NS)
Wheeze	36(100)	36(100)	>0.05(NS)
Feeding difficulty	36(100)	36(100)	>0.05(NS)
Tachypnoea	36(100)	36(100)	>0.05(NS)
Tachycardia	31(86)	33(92)	0.453(NS)
Nasal flaring	36(100)	36(100)	>0.05(NS)
Ronchi	33(92)	35(97)	0.620(NS)
Fever	17(47)	14(39)	0.475(NS)
Oxygen saturation			
Mean±SD	86.22±1.43	81.69±1.45	<0.001(S)
Length of hospital stay (days)			
Mean±SD	2.28±0.45	3.72±0.45	<0.001(S)

NS= Non-significant
S=Significant

Discussion:
In the present study, in group B, the majority of the children (25/36, 69.44%) were less than 6 months of age. In the age group 6-12 months, most cases (20/36, 55.56%) were from group A or 3% hypertonic saline group. The mean age of the children of group A (7.5±1.94 months) was significantly higher than that of group B (5.8±2.01 months) (p=0.032). A previous study conducted by Islam et al also stated similar finding, where mean age group in hypertonic saline was 5.2±3.2 and in control group 5.5 ± 3.0 months.[3]
In this study, among 72 children (26/36,72.22%) of group A and (21/36,58.33%) of group B were male with male female ratio of 1.88:1. This finding was almost similar to the study conducted in South India reporting male to female ratio of 1.6:1.[9] In this study, baseline clinical characteristics were almost similar between the two groups. There was no significant difference relating the presence of runny nose, cough, breathing difficulty, nasal flaring, tachypnoea , chest retraction, tachycardia, wheeze, feeding difficulty, fever and presence of ronchi (p>0.05). However, significant difference was observed in mean oxygen saturation, 86.22 ±1.43 in group A and 81.69 ±1.45 in group B

(p<0.001). In the present study,3% hypertonic saline significantly reduced the length of hospital stay (p=0.02). Most patients in the hypertonic saline group were discharged within 3 days of treatment, and mean length of hospital stay was shorter in the hypertonic saline group (2.28 ± 0.45) than that in the normal saline group (3.72 ±0.45). Islam KT et al. observed that, nebulization with 3% hypertonic saline significantly reduced clinical severity, length of hospital stay (58.1±22.0 hours vs 74.7±27.2 hours, 95% CI -26.89 to- 6.17, p=0.002) in case of acute bronchiolitis in comparison to 0.9% normal saline and was safe.[3] Zhang L et al included four trials involving 254 infants with acute viral bronchiolitis (189 inpatients and 65 outpatients) in their review stated that, patients treated with nebulized 3% saline had a significantly shorter mean length of hospital stay compared to those treated with nebulized 0.9% saline (mean difference (MD) -0.94 days, P = 0.0006).[8] Kujik et al observed 26% reduction in length of hospital stay with the use of 3% hypertonic saline to 2.6 +/- 1.9 days, compared with 3.5 +/- 2.9 days in the 0.9% normal saline group (P = .05).[10] The 2 years pooled data of Tal et al study revealed that adding 3% saline to the inhalation mixture decreased hospitalization stay from 3.6 +/- 1.6 to 2.8 +/- 1.3 days (P< 0.05).[11] Mandelberg et al in their study using 3% hypertonic saline nebulization in moderate bronchiolitis arrived at a finding of 1(25%) day reduction in length of stay.[12]

Conclusion:

The study concluded that 3% hypertonic saline nebulization significantly reduced the length of hospital stay in children of bronchiolitis. Recovery and discharge from hospital was rapid in children treated with hypertonic saline. 3% hypertonic saline can be used as an effective and safe treatment for patients of acute bronchiolitis The economic benefit of this comparably priced treatment modality can be immense in terms of hospital costs with parents resuming their works soon. A multicentre study with large sample size should be carried out to validate the use of 3% hypertonic saline nebulization in reducing length of hospital stay in bronchiolitis.

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