

Which is more effective for Nebulization in Bronchiolitis: Hypertonic Saline or Epinephrine

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ABSTRACT

A prospective, open labelled, controlled trial was conducted in tertiary care centre, using standard therapy ie epinephrine and hypertonic saline as study drug in two group of patients.

Children 2 month to 24 months of age with first episode of bronchiolitis were included in the study while excluding those with cardiac disease, immuno deficiency and critical illness at presentation. Nebulized epinephrine in Group A (epinephrine group) (n=33) and hypertonic saline group B (n=32) was used in patients of bronchiolitis ,respiratory score at admission and after 24 hrs and duration of stay of both the groups were compare. In adrenaline group and hypertonic saline group, there was no statistical significant difference in base line admission clinical score whereas hypertonic saline was more effective for clinical score at 24 hours ($p < 0.05$) and duration of stay ($p < 0.05$) Nebulised hypertonic saline was found to be safe, effective and superior to adrenaline (standard therapy) in management of bronchiolitis in this study

KEY WORDS: bronchiolitis, epinephrine, hypertonic saline, nebulization

INTRODUCTION:

Acute bronchiolitis is the most common lower respiratory tract illness in children in first year of life. It usually occur in children less than 2 years of age with majority being between 3 months to 6 months of age. The disease is characterized by inflammation edema, necrosis of small airway epithelium associated with bronchospasm and increased mucus production. During the prodromal period, fever is usually not marked and its degree frequently does not correlate with the extent of respiratory) distress. The temp range is quite variable, from normal to 40°C (105°F), but usually it is in the 37.8 to 39°C (100°F to 102°F) range. Bronchiolitis presents with coughing, wheezing and shortness of breath, which can cause some difficulty in feeding. It usually results from viral infections and respiratory syncytial virus (RSV) is the most frequent in infecting agent. Bronchiolitis is the seasonal illness with highest incidence between December & March in

Northern hemisphere. However there is significant regional variability in the timing & duration of RSV season throughout U.S & in tropical areas the virus is usually endemic and present in community throughout the year.^[1]

The severity of bronchiolitis varies from mild to severe. Mainstay of therapy is supportive care which includes respiratory support, adequate fluid and nutrition management. Humidified oxygen is supplemented if necessary, to maintain a transcutaneous oxygen saturation higher than 92. Nebulization has been used in treatment of bronchiolitis with varying degree of success with different modalities. In nebulization different modalities have been tried, corticosteroid, bronchodilators, epinephrine and hypertonic saline.

The bronchodilatory effect of epinephrine and its ability to reduce mucosal edema relieves bronchospasm and improves respiratory effort. Epinephrine also down regulates the release of histamine, tryptase and inflammatory and inflammatory mediators from mast cells and basophils. Hypertonic saline solutions are considered

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as muco ciliary agents and thus used to hydrate thick secretions in order to make it easier to cough it out. Inhalation of hypertonic saline have shown benefit in respiratory problems, specially bronchiolitis. Nebulized hypertonic saline is a new modality of treatment that has recently been used in bronchiolitis. It has previously been studied in the context of cystic fibrosis. Like bronchiolitis, children with cystic fibrosis have viscid secretions and wheezing. The hypertonic saline helps to reduce viscosity of secretions. A Cochrane meta-analysis of its use in cystic fibrosis concluded that nebulized hypertonic saline improves mucociliary clearance immediately after administration and that it may have a long term beneficial effect. Hence, this study focused on the effect of nebulisation with hypertonic saline vs epinephrine in bronchiolitis.

MATERIALS AND METHODS:

The study was conducted in the Department of Pediatrics, M.L.B. Medical College, Jhansi. Patients with symptoms of bronchiolitis was examined & nebulization with hypertonic saline & epinephrine was performed. Children age 2 months to 2 years, presenting with first episodes of acute bronchiolitis having respiratory distress and oxygen saturation less than 94% in room air were included in the study. Children with history suggestive of chronic cardiopulmonary disease, immune deficiencies, cases with critical illness at presentation, cases with history or use of systemic or nebulized, bronchodilators or nebulized hypertonic saline in last 24 hours were exclude from the study.

The diagnosis of bronchiolitis is based on clinical presentation, which may reveal following – tachypnea, tachycardia, fever (38-39°C), retractions, fine rales (47%), diffuse, fine wheezing, Hypoxia, Otitis media. Children were divided randomly in two groups. Group A was treated with in 2 groups bronchiolitis. Group A was treated with nebulized epinephrine (non racemic solution, 1:1000 conc 1 ml diluted in 2ml normal saline) every 6 hours for first 24 hours.

Children enrolled in second group of bronchiolitis received nebulized hypertonic saline (3%) 3 ml every 6 hours. In both groups clinical score

and heart rate was monitored. Children whose clinical score increased by 2 points or more (using admission score as baseline) or whose heart rate went above 200/min were considered as treatment failure. If the child improved or did not deteriorate using the above criteria, the treatment was considered as useful. These patients were assessed by clinical score from baseline, heart rate and duration of stay in hospital.

Children hospital's Wisconsin respiratory score, which consisted of following parameter's breath sounds, dyspnea, retraction, respiratory rate and O₂ feed, was used to assess the severity of bronchiolitis in patients distribution to both study groups at time of admission and after 24 hours of hospitalization.^[2]

If score decreased or remained same, treatment was considered successful and if score increased from baseline it was considered as failure and other treatment modality (Bronchodilator diluted with 3%NS) was given to the patients considered as failure in both score as baseline) or whose heart rate went above 200/min were considered as treatment failure. If the child improved or did not deteriorate using the above criteria, the treatment was considered as useful. These patients were assessed for clinical are by Clinical score from baseline, Heart rate and Duration of stay in hospital.

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RESULTS:

The study groups were comparable with respect to gender, age, clinical score at admission, clinical score after 24hrs of treatment, duration of stay and treatment outcome (Table 2). Total number of patients in adrenaline group were 33 and in hypertonic saline group 32. Male to female ratio was 19:14 in adrenaline group while 22:10 in hypertonic saline group. Most of patients in hypertonic saline group and

Table 1: Respiratory Distress Assessment Score.

Variable	Respiratory distress assessment instrument					Max point
	0	1	2	3	4	
	<u>Wheezing</u>					
Expiration	None	End	1/2	3/4	All	4
Inspiration	None	Part	All	N/A	N/A	2
Location	None	Segments < 2 of ? 4 limb	Diffuse	N/A	N/A	2
	<u>Retraction</u>					
Supraclavicular	None	Mild	Modrate	Marked		3
Intercostal	None	Mild	Modrate	Marked		3
Subcostal	None	Mild	Modrate	Marked		3

Table 2: Population Characteristics.

Patients characteristics	Adrenaline saline group (n=33)	Hyperotoc saline group (n=32)	p value
Male : Female	19 : 14	22 : 10	
Age (Months)	16 <6month 15 6mo-12mo 2 > 12mo	15 <6mo 10 6mo-12mo 07 >12 month	
Clinical Score at admission (Mean SD)	9.84 SD=2.06	10.65 SD=1.80	> 0.05
Clinical Score at 24 hours (Mean SD)	8.8 SD=3.02	8.09 SD=2.68	< 0.05
Duration of stay (days) mean	8.565 SD=4.26	7.093 SD=3.03	< 0.05
Treatment outcome			
Improvement	84.8%	87.5%	
Failure	15.2%	12.5%	

adrenaline group were of <6months of age while minimum patients were of >12 months of age in both the groups. Mean clinical score at admission in adrenaline group was 9.84, while 10.65 in hypertonic saline group (p value >0.05). Mean clinical score after 24 hrs of treatment in adrenaline group 8.8 while 8.09 in hypertonic saline group (p value <0.05). These observations giving the interpretation that hypertonic saline was more effective than adrenaline (standard drug) in treatment of bronchiolitis.

DISCUSSION:

The present study was conducted in the Department of Paediatrics, Maharani Laxmi Bai Medical College, Jhansi from October 2015 to November 2016. The study comprised of 65 children below 2 years of age clinically suspected to be suffering from bronchiolitis. The present study had sample size of 65 cases out of which 42 (64.5%) were male and 23 (35.5%) were female. Male: female ratio was 1.89:1. This ratio was different from other studies

due to rate of admission was more in males than females in Bundelkhand region. Equal distribution of bronchiolitis in both genders was reported by Parrot et al 1973^[3]. Kravitz et al 1965 reported that bronchiolitis was more common in boys, the male: female ratio was about 1.5:1.^[4]

Maximum patients in this study belonged to <6month age group i.e. 31 out of 65 cases (47%) while there were 25 patients 6-12 month of age and only 9 cases of >12 month of age. Age distribution was almost similar to what was observed by Parrot RH, Kim HW and Arrobio J et al, 1973.^[3] They studied 1148 children who were clinically suspected to have bronchiolitis, below 2 years of age and observed peak age of incidence between 2 to 6 months, with over 80 percent of the cases occurring during the first year of life.

Gartner PS et al, 1973 demonstrated that bronchiolitis was almost entirely confined to the children less than 2 years of age.^[5]

In study group of 65 cases, maximum 33(50.7%) cases occurred in winter (Dec-Feb) 2nd peak occurred in Autumn (Oct-Dec) with 24 (36.9%) cases. Minimum cases 3(4.6%) occurred in rainy season. Thus our study demonstrated that bronchiolitis occurs throughout the year, with two peak one in Autumn and one in winter season. This pattern of seasonal variation corresponded with the study of Spence L, Brandt N^[6] who reported that in tropical and subtropical area, outbreaks occur during the hotter rainy season. This peculiar epidemiological pattern is related to an increased amount of time spent indoors and to greater crowding during rainy and cold seasons.

While in a study of 79 cases Kim HW, Arrobio J, Brandt CD, et al, 1973 observed that 77 percent of the cases occurred between December and June that is in winter and spring seasons and the lowest incidence occurred in August (2 percent) and a smaller number of cases were seen throughout whole year.^[7]

There was no statistical difference in base line characteristics of patients of the two groups on admission; gender distribution, age distribution, severity of bronchiolitis on basis of saturation and heart rate.

Recovery pattern in bronchiolitis : It was observed in

present study that maximum recovery occurred in adrenaline group (48%) in the second week while in hypertonic saline group, maximum recovery occurred in the first week. On statistical analysis p value was (<0.001) was statistically significant. In adrenaline group only 6% patients remained to be recovered after 7 days while in hypertonic saline group. No patient was left for recovery after 14 days. Neeraj gupta et al 2011, found that there was no statistical difference in recovery pattern in adrenaline and hypertonic saline while duration of stay was statistically significant less in hypertonic saline group.^[8]

These findings were contradictory to Sharma et al 2012, who compared hypertonic saline (3%) to normal saline(0.9%) where they found no statistically significant difference of stay and clinical severity score which was monitored 12 hourly till discharge.^[9]

Cochrane meta analysis of 4 studies reported 24% shorter duration of stay with hypertonic saline. Khalid et al 2010 reported shorter length of stay with hypertonic saline, but, there was difference of few hours which was not statistically significant^[10]. Jaffery Baron et al 2016 reported shorter duration of stay in their study.^[11]

When overall treatment out come compared in both groups in epinephrine group 84.8% improved while in hypertonic saline group 87.5% improved after 24 hrs of treatment. In epinephrine group 15.2% failed to improve in 1st 24 hours of treatment while in hypertonic saline group 12.5% failed to improve. This failure of treatment might be attributed to secondary infection and associated other conditions.

Our study thus demonstrated that males were more affected than females. However this might be a reflection of admission pattern of our setting. Also bronchiolitis was found to occur more commonly in <6 month of age. Hypertonic saline was found to be more effective than epinephrine with regards to clinical score after 24 hrs of treatment and duration of stay when statistically compared (p<0.05).

CONCLUSION:

Hypertonic saline is more effective than epinephrine in bronchiolitis with regard to improvement in clinical score at 24 hours and duration of stay on the basis of our study.

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