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Original research paper

The clinical efficacy of combined nebulized adrenaline with injection dexamethasone versus 3% normal saline (3%NS) nebulization in acute bronchiolitis

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Abstract

Bronchiolitis, a lower respiratory tract disorder is most commonly caused by respiratory syncytial virus (RSV) infection. Acute bronchiolitis has become one of the major cause of hospitalization in infants. Management of acute bronchiolitis is mainly supportive therapy, though the various modalities of supportive therapy are upcoming effectiveness is unclear. This study is done to know the effectiveness of combined adrenaline nebulization with injection dexamethasone versus 3% NS (Normal saline) nebulization in acute bronchiolitis. Various modalities for management of acute bronchiolitis is on trials with the preliminary evidences for combination of various therapies in comparison with the novel therapy hypertonic saline nebulization. A synergism with adrenaline and steroids combination was found effective and encouraging in management of acute bronchiolitis. A hospital based simple randomized control study was carried out among 200 cases of acute bronchiolitis with 2 groups, combined nebulized adrenaline with injection dexamethasone and 3% NS nebulization group each carrying 100 cases. Among 200 participants of acute bronchiolitis. There is reduction in the duration of the hospital stay in adrenaline nebulization with injection dexamethasone (4.58 ± 0.85).

Keywords: Adrenaline, dexamethasone, acute bronchiolitis

Introduction

Bronchiolitis is a disorder commonly caused by viral lower respiratory tract infection in infants, is characterized by acute inflammation, edema and necrosis of epithelial cells lining the small airways, and increased mucus production [1].

Most common cause of acute bronchiolitis is respiratory syncytial virus (RSV), other agents include rhinovirus, parainfluenza virus, influenza virus, human metapneumovirus, boca virus, adeno virus [2]. Globally in 2015 there were about 33.1 million RSV infected acute bronchiolitis and about 3.2 million needed hospital admissions and 59,600 in-hospital deaths in children younger than 5 years accounting for mortality of 13-22% [3], contributing to important cause of respiratory morbidity globally.

Bronchiolitis is a self-limiting disease usually lasting for about 3-7 days [4]. The incubation period of acute bronchiolitis is 4-6 days [5]. The main clinical manifestation of bronchiolitis

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are difficulty in breathing, coryza, poor feeding, cough, wheeze and crepitation on auscultation and generally occurs in the winter months [2]. The clinical presentation varies from mild symptoms to acute respiratory failure needing invasive mechanical ventilation [6]. The severity of the disease depends on various risk factors and pre-existing medical conditions [2, 6].

The diagnosis of bronchiolitis is mainly clinical and management is mainly supportive therapy, hospitalization of the children with respiratory distress, oxygen supplementation through various oxygen delivery systems, maintaining hydration by intravenous fluids and enteral feeds [2].

3% hypertonic saline was found to reduce mucosal edema of the small airways, increase the mucociliary clearance, induce cough and sputum production [7]. Racemic epinephrine by its α-adrenergic action causes vasoconstriction of sub mucosal vessels thus reduces the airway edema, relieves airway obstruction and distress in acute bronchiolitis [8]. A synergism was observed between adrenaline nebulization and high dose systemic or oral dexamethasone in acute bronchiolitis [9]. This study was considered to see clinical efficacy of combined adrenaline nebulization with steroid over 3% NS nebulization in hospitalized patients of acute bronchiolitis.

Objectives

- To study the clinical efficacy of combined nebulized adrenaline with injection dexamethasone versus 3% normal saline (3% NS) nebulization in acute bronchiolitis.

Methodology

Study design and study setting

Hospital based simple randomized control study.

Study place

Emergency ward, PICU and general wards of Vijayanagara Institute of Medical Science, Ballari.

Study period

January 2019-December 2019.

Study population

Age group between 2 months to 2 years.

A. Inclusion criteria

- Children with age group 2 months to 2 years.
- Acute onset of respiratory symptoms associated with fever, cough, tachypnea.
- First episode wheeze.
- Chest radiograph findings consistent with acute bronchiolitis.

B. Exclusion criteria

- Previous history of wheeze.

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- Previous use of steroids and bronchodilators.
- Congenital heart disease.
- Chronic cardiopulmonary disease.
- Severe respiratory distress.
- Immunodeficiency.
- Clinical or radiological evidence of bacterial pneumonia.

Sample size

Total 200 cases of acute bronchiolitis with 100 cases in each group.

Materials and methods

Ethical committee approval was obtained from institutional ethical committee. Written informed consent was obtained from the parents or guardian after explaining the procedure in their own understandable language.

Bronchiolitis was defined clinically with symptoms of upper respiratory tract infection and first episode of bilateral wheeze or crackles on auscultation, subcostal retraction and no other explanation for wheezing such as pneumonia, atopy with the age group between 2 months to 2 years.

Using inclusion and exclusion criteria eligible candidates were selected. All the eligible candidates were equally distributed between AD&DEX group and 3% NS group by simple randomization method. Complete blood count, CRP, Chest X ray was done to all children.

AD&DEX group received 0.5ml/kg per dose of 1:1000 dilutions [0.5ml/kg adrenaline] of adrenaline mixed in a normal saline to make a volume of 4ml and nebulized using 6L/min oxygen flow every 6^{th} hourly. 0.6mg/kg/day of intravenous dexamethasone was given once daily for first five days. 3% NS group received 4ml of hypertonic saline nebulization with oxygen flow of 6L/min every fourth hourly.

Clinical parameters like wheeze, sub costal retractions, heart rate, respiratory rate, and oxygen saturation by pulse oximetry were recorded on 0 min, 30^{th} min and 90^{th} min after 10 min of nebulization on day 1, later daily once till discharge. Number of days of hospital stay was also noted. The child was excluded from the study if there were any adverse events and worsening of the clinical condition.

Results

Table 1: Duration of Hospital Stay

Group		N	Mean	Std. Deviation	t	P	Inference
Days	3% NS	100	4.95	0.85	0.375	0.002 (<0.05)	Significant
	AD & DEX	100	4.58	0.85			

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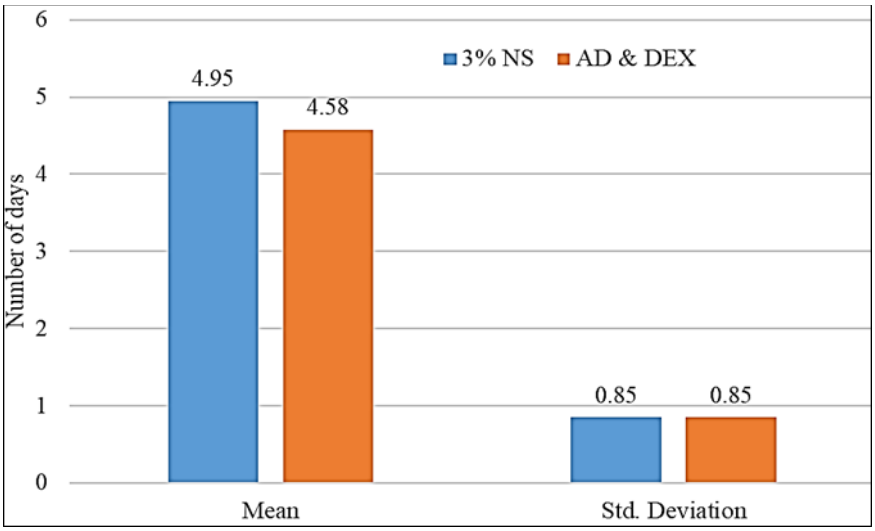

Graph 1: Duration of Hospital Stay

Graph 1. Duration of Hospital Stay: There is a significant improvement in the duration of the hospital stay in AD&DEX group as compared to 3% NS nebulization with 4.58 and 4.95 days respectively and p value 0.002.

Discussion

Bahadily *et al.* [10] had showed 3% NS had a significant improvement in clinical symptoms and reduction in the duration of the hospital stay in acute bronchiolitis cases. The mean duration of hospital stay in our study in 3% NS group is 4.95 ± 0.85 is comparable with the duration of hospital stay of 3% NS group in the study of Bahadily *et al.* [10] 4.7 (±1.9) and Zang L *et al.* [11]. 3 studies Mandelberg *et al.* [12] 2003, Sarrell *et al.* [13] 2006, Kuzik *et al.* [14], demonstrated benefit of nebulized 3% saline in reducing the duration of hospitalization in acute bronchiolitis.

In 2011 Hartling *et al.* [15] showed epinephrine nebulization decreased need for hospital admission on day 1 in outpatient and not on day 7 but had no effect on duration of the hospital stay but decreased the duration compared to salbutamol nebulization. Skjerven *et al.* [16] concluded that adrenaline nebulization did not decrease the hospital stay in acute bronchiolitis cases but shortened the duration if given on demand and decreased the need for supportive therapy.

Garrison *et al.* [17] concluded dexamethasone in acute bronchiolitis has a statistically significant improvement in clinical symptoms, length of stay and duration of symptoms. In Schuh *et al.* [18] dexamethasone in addition to decreasing the duration hospital stay showed association between increased response to the increased severity of the disease. Ermers *et al.* [19] studied the efficacy of dexamethasone in acute bronchiolitis where wheezing showed a symptomatic improvement with small increase in relative risk (32%) but was not statistically significant.

The above studies concluded that dexamethasone alone or adrenaline nebulization alone won't show improvement in duration of hospital or severity of the disease they only show initial transient improvement hence not safe to use alone as a therapy in acute bronchiolitis.

In Plint *et al.* [20] nebulized adrenaline and corticosteroid showed promising results in improvement clinical symptoms and reducing the length of hospital stay and rate of hospitalization in out patients while Bawazeer *et al.* [21] on same combination showed null effect.

The mean duration of hospital stay in AD&DEX group was 4.95±1 day and 3% NS group was 4.58 ±1 day with the p-value showing 0.002 (<0.05) which is statistically significant.

There was a significant reduction in the duration of the hospital stay with adrenaline nebulization with injection dexamethasone compared to 3% NS nebulization in acute bronchiolitis.

Conclusion

The outcome of acute bronchiolitis with combined nebulized adrenaline and injection dexamethasone showed improvement in terms of reduction in the duration of the hospital stay.

Limitations

- It is a small study.
- The study includes only children with mild to moderate bronchiolitis may not be applicable to severe bronchiolitis which needs additional interventions.
- Grading of severity of acute bronchiolitis was not done.
- The study is not double blinded.
- The quantitative analysis of CRP was not done.
- The effects of co infection have not been included in the analysis.

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