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ORIGINAL RESEARCH

Clinico-epidemiological profile of wheezing bronchitis and effect of 3% saline nebulization in children: a prospective study

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Abstract

Objective: Current prospective study was conducted to evaluate the clinico-epidemiological profile of acute wheezing bronchitis in children and role of 3% saline nebulization as a treatment modality.

Methods:260 children in the age group 6 months to 5 years with acute wheezing bronchitis attending a tertiary care center were included in the study. All cases were divided into two therapeutic groups sequentially: Group A- patients nebulized with 3% saline; Group B- patients nebulized with salbutamol and budesonide.

Results: The mean age of the cohort was 16.8±11.2 months with predominance of males (59%). Fever, cough, cold and fast breathing were the universal clinical manifestations.Add on therapy requirement was less in children receiving nebulization of 3% saline as compared to those receiving combined Salbutamol and Budesonide nebulization ($p<0.001$). Similarly, the duration of hospital stay was significantly lesser in 3% saline nebulization group as compared to combined nebulization of Salbutamol and Budesonide ($p<0.001$).

Conclusion: Requirement of add-on therapy and duration of hospital stay was significantly less in 3% Saline nebulization group as compared to combined nebulization of Salbutamol and Budesonide. However, large trials are needed to confirm these findings.

Keywords: Bronchitis, wheezing, nebulization, hypertonic saline

Introduction

Bronchitis is one of the most common infections in childrenyounger than 5 years of age, and is a leading cause of hospitalization(1).The diagnostic term ‘acute bronchitis’ is imprecise and is often loosely applied to episodes of illness that involve cough as the chief symptom.It is characterized by acute inflammation, edema, increased mucus production and necrosis of epithelial cell lining of respiratory small airways and leads to bronchospasm. Wheezing bronchitis is characterized by acute cough due to inflammation of trachea and lung airway without evidence of pneumonia (1). Acute bronchitis is common in under five children. About 25 percent of children by nine months of age and 50 percent of children by six years of age have at least one episode of wheezing (2). Most common virus implicating in wheezing bronchitis are rhinovirus, respiratory syncytial virus, enterovirus, influenza A and B, parainfluenza A and B, coronavirus, human metapneumovirus and adenovirus. Bacteria may also be the primary cause of acute bronchitis predominantly Hemophilus influenza, Streptococcus pneumoniae and Moraxella catarrhalis (3). It is well recognized that supportive therapy remains the mainstay of treatment of wheezing bronchitis and that there is little justification for most of the pharmacological agents traditionally administrated to children with wheezing bronchitis. Antibiotics have been shown to be ineffective in children with uncomplicated acute bronchitis. Most children with wheezing bronchitis can be managed at home by their parents with careful attention to feeding and respiratory status. Treatment of hospitalized children includes humidified oxygen to maintain SPO_2, moderate fluid supply and minimal handling. The rationale for the treatment of bronchitis with β2 agonist is weak (4). Recently, use of 3% saline nebulization treatment has been tried in managing wheezing bronchitis (5). Current prospective study was conducted to evaluate the clinico-epidemiological profile of acute wheezing bronchitis in children and role of 3% saline nebulization as a treatment modality.

Materials and methods: Children of age group 6 months to 5 years attending the pediatrics department of a tertiary care teaching hospital and diagnosed with acute wheezing bronchitis were included in the study after obtaining written parental consent. Children with chronic disease affecting cardiopulmonary status, bronchopulmonary dysplasia, severe respiratory distress requiring mechanical ventilation, foreign body aspiration and congenital malformations of lung or heart were excluded. Relevant clinical and demographic

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history, vital parameters and physical examination findings were recorded. Severity of respiratory distress was scored by using Respiratory Distress Assessment Instrument (RDAI) by Lowell et al (6). Relevant investigations including chest radiograph, complete blood count, blood gas analysis and electrocardiography or echocardiography as needed were done for all included children.All cases were divided into two therapeutic groups for the study sequentially as patient admitted in wards: Group A- Patients nebulized with 3% saline; Group B- Patients nebulized with Salbutamol and Budesonide.Nebulization was done at a 20-minute interval and then, I.V. fluid and supportive treatment were given to all admitted patients on a clinical basis as per need. Each day the child was assessed for fever, cough, SPO_2, tachypnea, respiratory distress, feeding, oxygen requirement and RDAI score; and they were given treatment till improvement. Nebulization was stopped when RDAI score reached 4 and then duration in improvement was calculated. Add-on therapy in the form of I.VDexamethasone at the dose of 0.3 to 0.6 mg/kg/day were added in those patients who did not improve with either nebulization with 3% saline or combination of Salbutamol-Budesonide nebulization. Data were collected in a structured proforma after obtaining ethical clearance from the institute ethics committee. Frequency and proportion statistics were used for descriptive analysis. The Chi-square or Fisher's exact test was used for the univariate analysis of categorical variables, student-test was used for normally distributed continuous variables and Mann-Whitney test was used for non-normally distributed continuous variables. A p value<0.05 was considered significant. Data analysis was done by using statistical package for social science (SPSS) version 23.

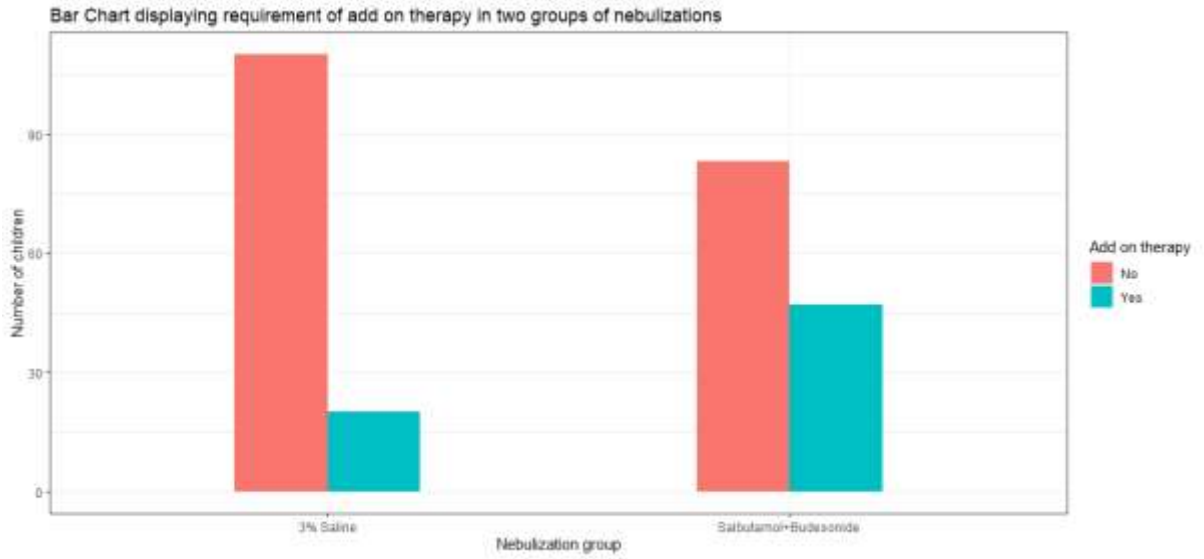
Results: A total of 260 children were included in the study. Males outnumbered the females (Males=59%). Two-fifths of the children were in the age group of 6-11 months (Table 1).

Table 1: Demographic distribution

Sl.No.	Parameter		Number (N=260)	Percentage
1	Sex	Male	154	59
		Female	106	41
2	Age Category	6-11 months	116	44.6
		12-35 months	112	43.1
		36-60 months	32	12.3
3	Religion	Hindu	205	78.8
		Muslim	55	21.2

Fever, cough, cold and fast breathing were the universal clinical manifestations.The mean age of the children was 16.8±11.2 months. Clinical manifestations were not different between males and females. Requirement of Dexamethasone as add-on therapy was more if the duration of cough was more than 5 days or they had severe chest retractions (p<0.05). Duration of stay was significantly longer if the duration of fever, cough and cold was more (p<0.05). Similarly, duration of stay was significantly longer if the chest indrawing was severe (subcostal and intercostal). Add-on therapy requirement was less in children receiving nebulization of 3% saline as compared to those receiving combined Salbutamol and Budesonide nebulization (p<0.001) (Figure 1). Similarly, the duration of hospital stay was significantly lesser in 3% saline nebulization group as compared to combined nebulization of salbutamol and Budesonide (p<0.001) (Figure 2).

Figure 1: Comparison of two nebulization groups for the requirement of add-on therapy



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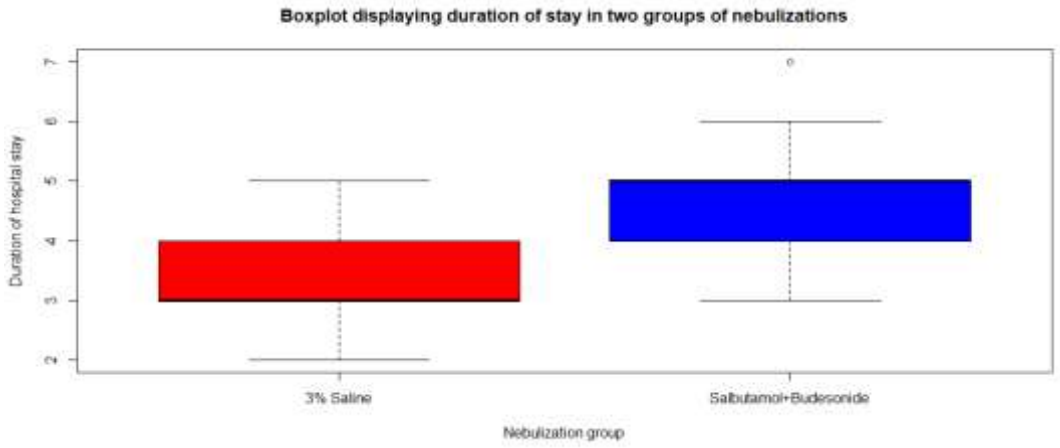

Figure 2: Boxplot comparing two groups of nebulization for the duration of hospitalization.

Discussion

In the current study, almost half of the children were less than 12 months of age (Table1). This agrees with previous studies which have reported under 12 months as the most involved age group (7, 8). Similarly, lower respiratory infection is major cause of hospitalization in children during first year of life, as reported previously (9, 10). Most common signs and symptoms of acute bronchitis in children are dry or mucus-filled cough, vomiting or gagging, runny nose, often before a cough starts, chest congestion or pain, an overall body discomfort or not feeling well, chills, slight fever, back and muscle pain, wheezing and sore throat (7, 11). In our study also, the common clinical manifestations were fever, cough, cold, fast breathing, and chest indrawing.With the use of normal saline as the diluent in nebulizers and the oxygen as vaporizer, the water molecules or drugs can be breathed through the mouth or nose and spread to the respiratory tract and lungs by the airflow. Studies have reported that after the alveolar capillaries absorb the molecules, the drugs can dilute the secretions in the respiratory tract, then induce expectoration and relieve symptoms of bronchospasm (12, 13). Recent studies pointed out that hypertonic saline (3%) is beneficial in inducing the penetration of water molecules into the lung mucosa, allowing the bronchial mucosa or submucosal layers to absorb water molecules and reduce the possibility of edema of the airway (14, 15). A systematic literature review and meta-analysis demonstrated that the use of hypertonic saline can significantly shorten the length of hospital stay, but the article did not provide an explanation for the high heterogeneous results (16). Our study reported that add-on therapy requirement was less in children receiving 3% Saline nebulization as compared to those receiving combined nebulization of Salbutamol and Budesonide ($p<0.001$). Similarly, the duration of hospital stay was significantly lesser in 3% saline nebulization group as compared to combined Salbutamol and Budesonide nebulization ($p<0.001$). One systematic review showed that those who used hypertonic saline for nebulizing treatment had 0.54 less day of hospitalization compared to those who used normal saline (17). The study has three main limitations: 1) Study design – This is a non-randomized study which is not appropriate to answer the research question of comparison of two types of nebulization with respect to duration of hospital stay in children with acute bronchitis. 2) Etiological study of acute bronchitis. 3) Small sample size. Analysis of various subgroups based on duration of symptoms/signs and inclusion of RDAI score to assess the severity of respiratory illness in children with acute bronchitis are the strengths of the current study.

Conclusion

Requirement of add on therapy and duration of hospital stay was significantly less in 3% Saline nebulization group as compared to combined nebulization of Salbutamol and Budesonide.However, large trials are needed to confirmthese findings.

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