Original Article

Role of Inhaled Corticosteroid in Management of Episodic Viral Wheezing and Persistent Asthma in Pre-School Children–in A Peripheral Hospital, Bangladesh

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Abstract:

Background: Asthma is the most common chronic respiratory condition of childhood worldwide, characterized by recurrent cough and wheeze, with around 14% of children and young people affected. Viral wheezing is a common clinical condition during early childhood, approximately 50% of children experience at least one episode at preschool age. The article summarizes the inhaled corticosteroid treatment of childhood asthma and episodic viral wheeze, with an emphasis on new modalities. **Methods:** This retrospective study was conducted in combined military hospital, Sylhet. All members ages 2 to 6 years with an asthma and wheeze diagnosis during April 2021 to March 2022 and at least one hospital admission with more than one visit to child specialist were included. Asthma outcomes during the hospital admission and follow up visit were documented. **Results:** A total of 244 hospital admitted children were diagnosed with asthma and viral wheeze. Among them hospital admission was indicated 184 patients due to respiratory distress. The choice of treatment was inhaled corticosteroid along with antibiotics. Amoxicillin–clavulanate was the most prescribed antibiotics. The drugs dose, interval and route of administration were respected in all cases. Children treated with inhaled corticosteroid had significantly improve their symptoms and lung function. A substantial reduction in the prescription of corticosteroids was noted. **Conclusion:** We found significant positive outcomes after inhaled corticosteroid treatment in viral wheeze and childhood asthma. Referring paediatric asthma patients at right time at right place should be one of the goals of an asthma and viral wheezing management plan.

Keywords: Asthma, Wheeze, Preschool children.

J Com Med Col Teachers' Asso July 2025; 29(2): 98-102

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Introduction:

Asthma is a chronic respiratory disease affecting about 300 million people worldwide[1]. Asthma is characterized by chronic inflammation and airway obstruction. It is triggered by dusty environment, cold weather, upper respiratory tract infection, house hold pests, tobacco smoke and strong smell features[2]. The airway inflammation in asthma is characterized by the increased expression of multiple inflammatory genes, including those encoding for cytokines, chemokines, adhesion molecules, and inflammatory enzymes and receptors. The action of corticosteroids is to switch off these genes[3] by reversing histone acetylation of activated inflammatory genes (transrepression)[4]. Wheezing is a common clinical condition during early childhood: approximately 50% of children experience at least one episode before 6 years of age[5]. The development of asthma in children is thought to be the final step in the disease process described as the "allergic march". The allergic march may begin in infancy with food allergy-associated gastrointestinal disorders and dermatitis. Allergic rhinoconjunctivitis follows in early childhood, and asthma often completes the picture. Episodic viral wheeze has been defined recently by a European Respiratory Society task force to describe children who wheeze intermittently and are well between episodes.

DOI:https://doi.org/10.3329/jcomcta.v29i2.86026

Many preschool aged children with recurrent episodes of wheezing experience significant morbidity during acute episodes of lower respiratory tract illness (LRTI). The efficacy of ICS in the treatment for episodic viral wheeze intermittently and are well between episodes. The majority of asthma exacerbations in school-aged children are associated with viral infections[6], and this also holds true for the majority of wheezing episodes in preschool children[7]. Corticosteroids, inhaled or systemic, are the most effective treatment for asthma in adults and children and they are recommended by many international asthma management guidelines[8]. Corticosteroids have anti-inflammatory properties, which account for their effectiveness in suppressing the underlying airway inflammatory process and controlling asthma symptoms[9]. Inhaled corticosteroids (ICS) are the mainstay treatment in patients with chronic persistent asthma[9]. The majority of asthma exacerbations in pre-school aged children are associated with viral infections[10], and this also holds true for the majority of wheezing episodes in preschool children[11].

Methods:

Study Design:

This retrospective study was conducted in emergency department of combined military hospital Sylhet. Children ages 2 years to 6 years who had an asthma and viral wheeze diagnosis during the study period April 2021 and March 2022 and at least one hospital admission and more than one visit to child specialist were included in the study. The diagnosis of asthma was strictly based on history and clinical symptoms according to National guidelines Asthma & COPD (fifth edition: Jan. 2016). All relevant clinical parameters and laboratory findings were collected. The severity of the disease was assessed according to the asthma guideline (fifth edition: Jan. 2016). Demographic data, including age, sex, socioeconomic status was included in the analysis. Laboratory results, including eosinophil counts were collected. High blood eosinophils were defined as above 600mic/asthma outcomes after hospital admission and subsequent visit to child specialist were recorded. These included prescriptions for inhaled steroids (as single or combined inhalers) with or without short acting beta agonists. Patients who did not have follow-up visit were excluded from the study.

Analysis:

All collected data were sorted according to designed checklist from the CMH databases. Data were compiled into an Excel spreadsheet (Microsoft Corporation,Redmond,USA) which was used to tabulated demographic and etiological information. All data were analysed through standard statistical methods by using SPSS software, Version 16.0 (statistical package for social science SPSS Inc.Chicago,USA).

Ethical approval:

A permission was obtained from the concerned department and authority of the institute for compiling and publication of data records.

Results:

During the 2021-2022 study period, a total of 244 children ages 2 to 6 were diagnosed, among them 188 with asthma and 56 cases were viral wheeze. Most of patients had history of acute exacerbation and hospital admission. None of the children had a chronic disease, other than asthma. Demographic data are presented in Table 1. The study included 148 males (60%)). The average age was 4±2.5 years. Most patients (204.84%) were from families of intermediate socioeconomic status, whereas rest of them from families with a low socioeconomic status.

Table-I: General characteristics of the study populations (n=244)

Sex (male) –N (%)	**148 (60%)**
Age, years Mean	4±2.5
Socioeconomic status, N (%)	Intermediate -204 (84%)
Eosinophils –N (%)	220(90%)
Parental asthma	24(10%)
Smoke exposure at the home	200(80%)
Wheeze	244(100%)
Crepitation	122(50%)
Eczema	48.8(20%)
Inhaled corticosteroid	224(100%)
Oral corticosteroid	90(40%)
Antibiotics	200(80%)

Table-II: Features suggesting a diagnosis of episodic viral wheeze and asthma in children 6 years and younger, indications for initial low-dose ICS controller therapy in children.

Features of asthma and viral wheeze	**Percentage**
Wheezing during discrete time periods, often in association with clinical evidence of a viral cold	54 (22%)
Cough recurrent or persistent nonproductive cough that may be worse at night	188 (77%)
Wheezing and breathing difficulties	104 (42%)
Cough with exposure to dust, pollen	98 (40%)
Family history of asthma with allergic diseases (atopic dermatitis, allergic rhinitis)	122 (50%)

DOI:https://doi.org/10.3329/jcomcta.v29i2.86026

Table-III:Indications for initial controller therapy in asthma children aged 2-6 years.

Presenting symptoms	Preferred initial controller (12)	Percentage
Initial asthma presentation with an acute exacerbation	Oral steroid +High dose ICS	120 (49%)
Asthma symptoms once /month	High dose ICS/Medium dose ICS	96 (39%)
Asthma symptoms or need for SABA>twice a week	Low dose ICS	28 (11%)

Inhaled corticosteroids are the mainstay of pharmacotherapy for asthma control. Multiple national and international guidelines on asthma have been published[12,13,14], each with varying recommendations and level of detail regarding the use and rationale of ICS. The study population included children aged 2 to 6 years who require "step 2" asthma therapy. Few of participants required oral corticosteroids therapy over the previous year. Study participants were treated 4-15 week with the following therapies: daily ICS, daily LTRA and as-needed ICS treatment. Daily ICS therapy response was also predicted by blood eosinophil counts>300/Ul.The highest likelihood of experiencing a daily ICS response was seen among children with high eosinophil counts>300Ul. ICS therapy among these children lower the exacerbation risk.

AS summarized, daily ICS is the mainstay of therapy directed for exacerbation prevention in pre-schoolchildren. ICS regimen- In this study we follow the national guidelines Asthma & COPD (fifth edition: jan 2016, which was last updated in January 2016, as one of the comprehensive guidelines, it details-
The range of low, moderate, and high doses of ICS for children and step care plan for children up to 5 and above 5 years which is almost similar the best-known guideline is that of the Global Initiative for Asthma (GINA), last updated in April2015[12].

The step care management of ICS for children up to 5 years and above 5 years (table-IV). The indications to start ICS at low, moderate and high doses is also similar to British thoracic guideline[13]. The evidence for use of ICS in an acute exacerbation (mirrored in the guidelines of the Canadian Thoracic Society14. Our national guidelines recommended –Low-dose daily ICS is the first-line controller therapy.

Table-IV: The step care management of ICS for children up to and above 5 years

Drug	Daily dose micgm<5 years	Daily dose micgm 6-11 years
Betamethasone Dipropionate CFC	–	Low(100-200), Medium(>200-400), High (>400)
Betamethasone Dipropionate HFA	100	Low (50-100), Medium (>100-200), High (>200)
Fluticasone Propionate HFA	100	Low-(100-200), Medium (>200-500), High (>500)
Budesonide	Nebulizer-500	Nebules- Low-(250-500), Medium (>500-1000), High (>1000)
Triamcinolone acetonide	Not studied	Low-(400-800), Medium (>800-1200), High (>1200)

HFA hydrofluoroalkanepropellan

Discussion:

Asthma is mostly incurable, and the aim of treatment is to minimize exacerbations, improve quality of life and to prevent lung function deterioration. In children, asthma exacerbations can lead to numerous visits to pediatricians, emergency departments and hospital admissions. Uncontrolled asthma leads to frequent use of asthma relievers and systemic corticosteroids, consequently increase patients risk for long-term side effects[15-17]. The study investigated ICS treatment response among children aged 2 years up to 6 years with asthma or recurrent wheezing (at least 2 episodes in last year). The study described here that 100% of children initiating ICS as asthma treatment after admission and continue medication use after the treatment and only 0.5% is persistent after 2-year follow-up. Recent studies have begun to identify populations of preschool children that are likely to benefit from inhaled corticosteroids (ICS) therapy and defined ICS regimens: daily ICS in preschool children with persistent asthma and pre-emptive high-dose intermittent ICS among preschool children with intermittent disease reduce the risk of exacerbation. ICS are recommended by asthma guidelines[20,21] as the first line of therapy for school age children and adults with mild persistent asthma, as many studies have demonstrated the efficacy of these medications in term of exacerbation prevention. In addition, among preschool children with mild persistent asthma, optimizing asthma management among preschool children is essential as pre-schoolers experience

DOI:https://doi.org/10.3329/jcomcta.v29i2.86026

disproportional morbidity and health care utilization compare to school-age children with asthma[21,22]. The outcome of the analyses which revealed a 30% reduction in the risk of exacerbation with daily medium-dose ICS. Intermittent ICS therapy resulted 35% reduction in exacerbation, sometimes severe exacerbations requiring systemic corticosteroids. Daily ICS therapy with montelukast among preschool children with persistent asthma resulted in a 40% reduction in exacerbations. Recent meta-analysis has confirmed the role of ICS as the first-line therapy in pre-school children with asthma or recurrent wheezing. It also helps the clinicians to determine ICS regimens: while daily ICS therapy should be considered for preschool children with persistent[22]. We observed that preschool children with an increased specific IgE and who also wheeze had a substantially increased chance of developing asthma by the time they reached school age[23].

Conclusion:

In summary this analysis has showed the role of ICS as the first-line therapy in pre-school children with asthma or recurrent wheezing. From this studies ICS in asthma and viral wheeze have demonstrated improvement in symptoms, airway hyperrespon-siveness, and exacerbation frequency. Inhaled corticosteroids (ICS) are the cornerstone of asthma and viral wheeze treatment in children.

Limitation of the study:

The current study has some limitations. First, we only have follow-up of 2 years after start of asthma therapy. However, very few children remain persistent user after these two years we do not feel that the insight into persistent asthma medication use in this population would be much greater if were able to add more years of follow up. Second, in this study we cannot determine whether the persistent or discontinuation of medication is a just action.

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