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Management of Asthma in Children: A Review

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ABSTRACT: Since 1980, the incidence of asthma in children has risen by 160 percent, affecting over 5 million children in the United States. The National Asthma Education and Prevention Program offers recommendations for better asthma treatment. Through comprehensive education of doctors, children, and caregivers, the program's objectives are to reduce the frequency, severity, and expense of asthma exacerbations. Regular evaluation and monitoring, control of variables that contribute to or exacerbate symptoms, pharmacologic treatment, and education of children and their carers are the four components of asthma management. The recommendations suggest a progressive approach to pharmacologic treatment, with vigorous medication first to establish control and then a "drop down" to the bare minimum to maintain control. Short-acting beta2 agonists are primarily used to provide immediate symptom alleviation. In youngsters with persistent symptoms, long-term control medications should be explored. The most effective long-term anti-inflammatory medicines are inhaled corticosteroids. Long-acting beta2 agonists, cromolyn sodium and nedocromil, antileukotriene agents, and theophylline are among the other possibilities. In certain circumstances, each has benefits and drawbacks.

KEYWORDS: Asthma, Children, Medicines, Persistant Symptoms, Pharmacological.

1. INTRODUCTION

Asthma affects approximately 5 million children in the United States, accounting for more than 5% of the population under the age of 18. Between 1980 and 1994, the incidence of asthma in children aged four and under rose by 160 percent, and the mortality rate from asthma almost doubled among those aged five to 24 years. Asthma is 26 percent more common in black children than in white children, resulting in more severe impairment and hospital stays, and black children are four to six times more likely to die from asthma. Asthma causes 3 million physician visits, 570,000 emergency department visits, 164,000 hospital stays, 8.7 million prescriptions, and 10 million lost school years per year in children under the age of 15[1].

Asthma is a chronic inflammatory disease characterized by airway hyperresponsiveness, restricted airflow, and chronic respiratory symptoms such as wheezing, coughing, tightness of the chest, and breathlessness. Acute bronchoconstriction, airway edema, mucous plug development, and airway remodeling all cause airflow restriction. Inflammatory reactions in asthma are both immediate and delayed. Mast cells produce mediators (such as histamine, leukotrienes, prostaglandins, and thromboxanes) that cause vasodilation, edema, and bronchospasm in the early stages. Leukotrienes, which have just lately been identified as a major cause of asthma, are 1,000 times more powerful than histamines[2].

The inflammatory response is boosted by their strong chemotactic impact on neutrophils, monocytes, and lymphocytes. During the late phase, cytokines are produced, causing eosinophils, basophils, lymphocytes, and mast cells to become more active and prolong the inflammation. Chronic inflammation may lead to smooth muscle hyperplasia, bronchial hyper reactivity, and

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increased collagen deposition under the basement membrane, narrowing the airway even further[3].

2. DISCUSSION

1. *Diagnosis:*

Asthma symptoms appear in 50 to 80 percent of children before they reach the age of five. Asthma symptoms vary considerably and may be confused with those of other pediatric illnesses (e.g., upper respira- tory infections). When parents describe episodic or chronic coughing, wheezing, shortness of breath, fast breathing, or chest tightness, and these symptoms are worse at night or early in the morning, or are linked to triggers (e.g., exercise, allergen exposure), the physician should suspect asthma.

Alternative diagnosis must be ruled out. Wheezing is not present in all asthma patients, and it is not an asthma symptom. Respiratory infections, rhinitis, sinusitis, and vocal cord dysfunction may all produce wheezing. Other causes, such as foreign body aspiration, or other illnesses, such as cystic fibrosis or heart disease, should be considered before a definite diagnosis of asthma is made[4].

Obtaining a medical history is critical for determining an asthma diagnosis. Allergies, family history of asthma or allergy, perinatal exposure to cigarette smoke, viral respiratory infections, male gender, and low birth weight are all linked to the development of asthma symptoms. Increased serum IgE levels at nine months of age, atopic dermatitis and rhinitis (unrelated to upper respiratory infection) during the first year, severe lower respiratory infections requiring hospitalization, and diminished airway function by six years of age are all common in young children who develop persistent asthma.

Immediate hypersensitivity skin tests (IgE) are positive in a large proportion of asthma patients (75 to 85 percent), indicating the importance of allergy in juvenile asthma. Because atopy is the most important predictor of wheeze escalating to asthma, a history of allergies is important[5].

2. *Treatment:*

Patient education, trigger avoidance, and medication therapy regimens that help patients to operate without being limited by asthma symptoms should all be part of the treatment plan. The usual diagnostic and treatment criteria are summarized in Table 118, along with a list of frequently used medicines[6].

2.1 Education:

The identification and avoidance of triggers, understanding the uses of prescription medicines and the significance of compliance and monitoring, as well as the appropriate use of inhalation devices, should all be included in patient and caregiver education. Patients may use daily self-management regimens for peak flow monitoring, medication use, and symptom reporting. Emergency action plans assist in identifying an exacerbation and determining the appropriate course of action. These plans should be created in collaboration with caregivers and patients, and written instructions should be given to them. The National Asthma Education and Prevention Program of the National Heart, Lung, and Blood Institute provides excellent examples of these programs in its asthma recommendations[7].

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2.2 Triggers and Environmental controls:

Allergens from dust mites or mold spores, animal dander, and cockroaches are all asthma trigger such as pollen, indoor and outdoor pollutants, irritants (e.g., tobacco smoke, smoke from wood-burning stoves or fireplaces, fumes, cleaning agents), pharmacologic triggers (e.g., aspirin or other nonsteroidal anti-inflammatory drugs, beta blockers, and sulfites), physical triggers (e.g., exercise, hyperventilation, cold air), and physiologic factors (e.g., stress, gastroesophageal reflux, respiratory infection [viral, bacterial] and rhinitis).

Removing carpets from the patient's bedroom and living areas, washing bedding and clothing weekly in hotter than 55° C (130°F), using specially designed mattress and pillow covers, removing stuffed animals and similar objects that are likely to harbor allergens, keeping pets outside, and using special furnace filters to remove airborne allergens are all examples of environmental control measures. The American Academy of Allergy, Asthma, and Immunology's website is a great source of useful, scientifically based information and asthma-specific goods[8].

Allergy rhinitis affects up to 80% of asthmatic children. The triggers to avoid may be defined if particular IgE hypersensitivities have been detected by radio allegro sorbent test (RAST) or skin testing. An allergist can help you choose the best treatment plan for reducing sensitivity to particular allergens. Because tobacco smoking exposure is a leading cause of respiratory difficulties in children who are susceptible to or already have asthma, it should be avoided at all costs.

2.3 Compliance:

Poor compliance is a significant issue in the treatment of pediatric asthma, and many variables contribute to this. The route of administration (oral therapy is preferred over inhaled medication), the frequency of dosing (once- or twice-daily regimens are preferred), the medication effects (slow onset of action and long duration of discontinuance have poor adherence rates), and the risk or concern of side effects are all factors to consider. Even after repeated instruction, many youngsters are unable to grasp appropriate MDI usage, and even when they do, only 10 to 15% of the medication enters the lungs. MDI spacers make it simpler to utilize MDIs and are required for many children under the age of six. In children under the age of five, MDIs with face masks or nebulizers may be required, especially in an asthma emergency. Children may utilize dry powder inhalers (DPIs) if they can show sufficient inhalation velocity using a training whistle.

2.4 Pharmacologic therapy:

According to the severity of the asthma, it is divided into four categories: mild intermittent, mild persistent, moderate persistent, and severe persistent. The frequency and severity of exacerbations, as well as the degree of lung function deterioration, are determined by the variability in objective measures such as FEV1 and PEF. According to the National Asthma Education and Prevention Program guidelines. A progressive strategy to pharmacologic treatment, beginning with the most vigorous treatment required to establish control and then "stepping down" to the bare minimum of treatment required to maintain control. The objectives of pharmacologic treatment are to reduce daytime and nocturnal symptoms, the frequency of asthma episodes, and the usage of short-acting beta agonists, improve PEF to 80% or more of personal best, and enable the kid to continue regular activities without experiencing drug side effects.

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2.5 Medications for quick relief:

Short-acting inhaled or oral beta2 agonists, short-course oral corticosteroids, or ipratropium (Atrovent) are used as required for rapid treatment of acute symptoms and to prevent exercise-induced bronchospasm. Short-acting beta agonists relax bronchial smooth muscle quickly and are the preferred treatment for acute symptoms and exercise-induced bronchospasm prevention. Beta2 agonists alleviate symptoms but have little effect on the illness itself. These agents have an excellent safety record, although they are prone to abuse because to their quick alleviation and brief duration of action. Overuse decreases their effectiveness and has been linked to increased bronchial hyperreactivity, overstimulation of the central nervous system, severe asthma, and mortality.

Overuse of anti-inflammatories implies that asthma is uncontrolled and needs more anti-inflammatories. As a result, refills of pain relievers should be carefully managed. When used four times daily, most MDIs contain 120 two-spray doses and should last a month. One inhaler should ideally last a year in those with well-controlled asthma. Oral corticosteroids have a wide anti-inflammatory impact and may be utilized in a limited number of situations. PEF (percentage of personal earnings Ited, short term (three to ten days) to achieve initial asthma control and accelerate resolution of moderate- to severe-persistent exacerbations[9].

2.5 Long term control medication:

Long-term control medications should be used on a regular basis to keep asthma under control and avoid exacerbations. The most powerful and effective long-term anti-inflammatory medicines are inhaled corticosteroids. They decrease airway inflammation, enhance pulmonary function more than any other drug, reduce bronchial hyper responsiveness, and may slow disease progression by reducing certain elements of airway remodeling. Some corticosteroids work well in once- or twice-daily dosage regimens and can be used in all patient categories and for all conditions.

Fear of negative side effects from inhaled corticosteroids (such as oropharyngeal candidiasis or stunted development) may deter compliance. To alleviate these concerns, patients should be educated, and alternative treatments should be provided for patients who are resistant to inhaled corticosteroids or who are unable to learn the appropriate use of inhaler devices.

Inhaled corticosteroids are more effective than long-acting beta agonists in decreasing airway hyperresponsiveness and managing asthma inflammation. Long-acting beta agonists, on the other hand, are efficient bronchodilators and may be taken in combination with inhaled corticosteroids to alleviate nighttime asthma symptoms and avoid exercise-induced bronchospasm. They should not be used to treat individuals with acute symptoms or exacerbations and should not be used as a substitute for anti-inflammatory medicines. Salmeterol (Serevent), a long-acting beta agonist, has been approved by the FDA for the treatment of asthma in children aged 12 and above. With twice-daily dosage, it may offer 24-hour bronchodilation, decrease nighttime asthma symptoms, and avoid exercise-induced bronchospasm. Long-acting beta agonists have been shown to have synergistic effects when taken with inhaled corticosteroids. The FDA authorized a combination of almeterol and fluticasone (Advair diskus) in August of 2000, and it should be available in the United States in April of 2001 in a formulation for children aged 12 and above. One inhalation twice day is the recommended dose.

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To counteract the effects of leukotrienes, antileukotriene agents were created. This is the first time in 25 years that a novel strategy to asthma treatment has been developed. Montelukast (Singulair) and zafirlukast (Accolate), as well as the 5-lipoxygenase inhibitor zileuton (Zyflo), are the only leukotriene receptor antagonists and 5-lipoxygenase inhibitors that may target specific components of asthmatic inflammation. Montelukast is a medication used to treat asthma in children aged six to fourteen years old. It is taken once daily before night at a dose of 5 mg. A 10-mg chewable tablet is authorized for children aged 15 and up, and the FDA recently approved a 4- or 5-mg chewable tablet for children aged two to five. Zafirlukast is also FDA-approved for the treatment of asthma in children over the age of seven, at a dose of 10 mg twice day. Despite the fact that zileuton is FDA-approved for pediatric therapy, it is often recommended due to its four-times-daily dosing schedule and the risk of hepatotoxicity, which need monitoring.

Although the antileukotrienes' role in the treatment of patients with symptomatic, moderate asthma who are taking maintenance inhaled corticosteroids is still evolving, they have shown efficacy against exercise- and allergen-induced bronchoconstriction, as well as an additive benefit in the treatment of patients with symptomatic, moderate asthma who are taking maintenance inhaled corticosteroids. 32,33 They decrease the requirement for rescue medicine in individuals with mild asthma and are suitable as long-term therapy in people who need more than ad hoc beta2-agonist bronchodilator treatment. Montelukast and zafirlukast have good safety data, with an adverse event profile that is comparable to that of placebo. 31,32 Churg-Strauss syndrome (an eosinophil-associated vasculitis) has been linked to corticosteroid discontinuation (occasionally) and may indicate the emergence of a previously undiagnosed disease[10].

3. CONCLUSION

Many outcome measures, including lung function, self-efficacy, absenteeism from school, number of days of restricted activity, number of visits to an emergency department, and possibly nights disturbed by asthma, were associated with modest to moderate improvement in educational programs for the self-management of asthma in children and adolescents. Education seemed to be as beneficial in trials of mild-moderate asthma as in studies of moderate-severe asthma; however, the benefits of education were greatest in studies involving patients with more severe asthma for several morbidity outcomes. The greatest benefits on morbidity indicators were shown in programs using peak flow methods, as well as programs with personalized interventions. Given the absence of direct comparisons in primary research, these findings should be taken with caution. The primary conclusions were largely confirmed by the results obtained from higher-quality research.

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