Management of Bronchial Asthma in Children

Pages with reference to book, From 46 To 50

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Asthma affects 5-10% of children in developed countries. Despite the new insights into the diagnosis and management of asthma, the morbidity and mortality have shown an increase over the last decade. This is largely attributed to the delay in recognising the severity of the illness and prompt alterations in therapeutic regimen[1]. There is no data available on the incidence of asthma in Pakistani children. However, 4% of all the children with acute respiratory tract illness, attending the outpatient department of Children Hospital, Pakistan Institute of Medical Sciences (PIMS) suffer fmm asthma[2]. It is presumed that this figure more or less reflects the overall trend in the country, but obviously needs more substantiating evidence. Over the last decade, our understanding of the pathogenesis of asthma has undergone important changes. The concept of asthma as an inflammatory disease of the airway has gained considerable support. The association between allergy and asthma has also become increasingly clear[3]. Moreover, asthma management has undergone drastic changes with the advent of inhaled beta-agonists and steroids. As a result, the use of conventional drugs like theophylline has declined considerably. There is increasing emphasis on the shared management with patient and the family. Home management currently forms the cornerstone of asthma management as more and more children are regulating their own dosages according to their disease severity. Simple inexpensive peak-flow meters, metered dose inhalers and spacer devices have brought the management of asthma to the door-step. The ambulatory management has very clearly shifted the emphasis fmm the treatment of acute attacks to the achievement of normal activity levels, including strenuous physical exercise. There is greater focus on discouraging the dependence on the physician and to minimize the number of hospital visits for exacerbations. Whereas most of the developed countries have been able to streamline their asthma management and have evolved standard management protocols[4], there seems to be little uniformity in asthma management practices in most of the developing countries including Pakistan. The national ARI programme of the Ministry of Health lays the emphasis on treating young children with acute respiratory tract infections. especially pneumonia with appropriate antibiotics. However, a number of children with ART may have a wheeze. The W.H.O. guidelines recommend that children with or without pneumonia, presenting with first episode of wheeze should be given a rapid acting bronchodilator and referred to a hospital if there is accompanying distress. In the absence of accompanying respiratory distress, oral salbutamol for five days is recommended. Similarly, all children having recurrent wheeze should be given oral salbutamol, whether or not their wheezing episode is accompanied by fast breathing[5].

Though very useful, these are only general guidelines forthe management of children with asthma. There is aneedto clearly outline a more comprehensive protocol for the management of children with asthma. We reviewed the literature to evolve such a guideline for paediatricians and general practitioners involved in the care of children suffering from asthma, with the hope that a more uniform practice will eventually emerge among the health personnel involved in the management of this chronic problem.

Classification

The traditional classification of asthma according to etiology described patients as ‘Extrinsic’

or \'Atopic\' and ‘Intrinsic’ or ‘Non-atopic’. This has been challengedby recent epidemiological studies in which an association was found between serum IgE and indices of asthma in all age groups including individuals who are ‘not atopic’. It raises the possibility that all forms of this disease relate to mucosal inflammatory response to environmental or endogenous antigens[6]. The classification based on the severity of the disease is useful because asthma therapy has a stepwise approach in which the level of therapy is increased according to the increasing severity of the disease. Description of levels of disease seventy which is based on a combination of clinical criteria such as symptoms, treatment requirements as well as objective measurements has the advantage that it differs little among countries that have developed asthma management guidelines. Mild asthma may be classified as low grade symptoms that do not interfere with sleep and lifestyle, or episodes of cough and wheeze occurring less than once per month. All such episodes should be responsive to bronchodilators taken no more frequently than two orthree times perweek. Moderate asthma is either discrete attacks occurring no more frequently than once a week or more chronic symptoms not affecting growth or development, in which case sodium cromoglycate prophylaxis is indicated. In severe asthma the symptoms are continuous and there are frequent exacerbations with nocturnal asthma symptoms. Physical activities are limited by the disease. Such patients are less likely to respond to sodium cromoglycate and will often require inhaled steroids as prophylaxis.

Management

The goals of successful asthma management are to: (a) achieve and maintaincontrol of symptoms, (b) prevent asthma exacerbations, (c) maintain normal activity levels, including exercise, (d) maintain pulmonary function as close to normal levels as possible, (e) avoid adverse effects from asthma medications, (f) prevent development of irreversible airway obstruction and (g) prevent asthma mortality.

The following guidelines are useful in the successful management of an asthma patient:

1. Educate patients to develop a partnership in asthma management

It should be appreciated that the responsibility of day to day management of asthma falls upon the patient and the family and not the physician alone. We, therefore, need to tailor the educational packages and co-management programmes according to the needs of the individual patient and family. Education should proceed in a stepwise manner and patient’s understanding of the information and management skills should be assessed periodically so that educational steps may be repeated or added as appropriate.

2. Assess and monitor asthma severity with objective measures of lung function

Pulmonary function tests provide an objective and reproducible method to evaluate lung disease and follow the response to therapy. These have become an important tool in the diagnosis and management of asthma. The routine use of pulmonary function testing is analogous to following blood pressure in hypertension or blood glucose levels in diabetes[7] (Figure 1).

Figure 1. Use of peak flow meter.

For practical purposes, a simple peak flow meter is sufficient for management of asthma patient. PEF rate measurements are simple to do. The equipment is relatively inexpensive and portable and it provides an objective assessment of lung function in children with asthma, especially in those unable to complete a satisfactory forced vital capacity maneuver[8].

3. Environmental Control Measures

Environmental control measures are an important prevention strategy. Appropriate avoidance of triggers may reduce symptoms, the need for medication and levels of non-specific airway hyper-responsiveness.

Food allergy is a rare trigger of asthma and occurs primarily inyoung children. However, food avoidance should not be recommended before a positive double-blind food challenge has been made. Avoiding indoor irritants such as tobacco smoke, wood smoke, household sprays, volatile organic compounds (e.g., cooking oils and polishes), pets and air pollutants is important because these components may aggravate asthma[9,10].

Drugs such as aspirin and other non-steroidal anti-inflammatoiy agents can cause severe exacerbations and should be avoided in sensitive individuals[11]. Beta blockers administeredorally orby eye drops may exacerbatebronchospasmand should in general be avoided by asthma patients. Before radio-contrast media studies it is advisable to use premedication such as steroids and Hi blockers. Reducing house dust mite exposure remains extremely difficult, though there are good controlled trials which have now shown that if mite levels can be significantly reduced, symptoms also improve[12]. This unfortunately, is still not practical in many circumstances.

4. Immunotherapy

The role of specific immunotherapy in asthma is under continual investigation. Currently available asthma management strategies with patient education, avoidance measures and pharmacological treatment usually provide good control of asthma. Immunotherapy may be considered when avoiding allergens is not possible, when appropriate medications fail to control symptoms and where an effective specific immunotherapy is available. Itis essential to consider several factors in order to appreciate the respective values of allergen avoidance and specific immunotherapy in comparison with other available therapeutic methods[13].

- Potential severity of the allergy to be treated;
- Efficacy of available immunotherapy;
- Cost and duration of each type of treatment;
- Risk incurred by the patient due to the allergic disease
- The treatment.

5. Inhalation Systems

Asthma is a disease of the airways and therefore, treatment via inhalation is generally preferable to systemic or oral treatment. The advantage of delivering drugs directly into the airways is that high concentrations of drug canbe delivered more effectively to the airways and systemic side effects are usually minimized. The major dis-advantage of this mode of drug delivery is that training and skill arc required to coordinate activation of the drug through inhalation. For the patient who has difficulty in using a metered dose inhaler, a spacer device improves delivery of the drugs. The inclusion of a spacer device with a valve system such as the Nebuhaler, Volumatic, FISONair, Inspirese or Aerochamber allows children as young as 2 to 3 years to use them after effective training, for all anti-asthma inhaled medications[14,15]. Some younger infants may be able to use a spacer with face mask[16]. Further, the use of spacers for the delivery of inhaled steroids has been shown to decrease the systemic bioavailability of steroids and the risk of systemic side effects[17-20] (Figures 2 and 3).

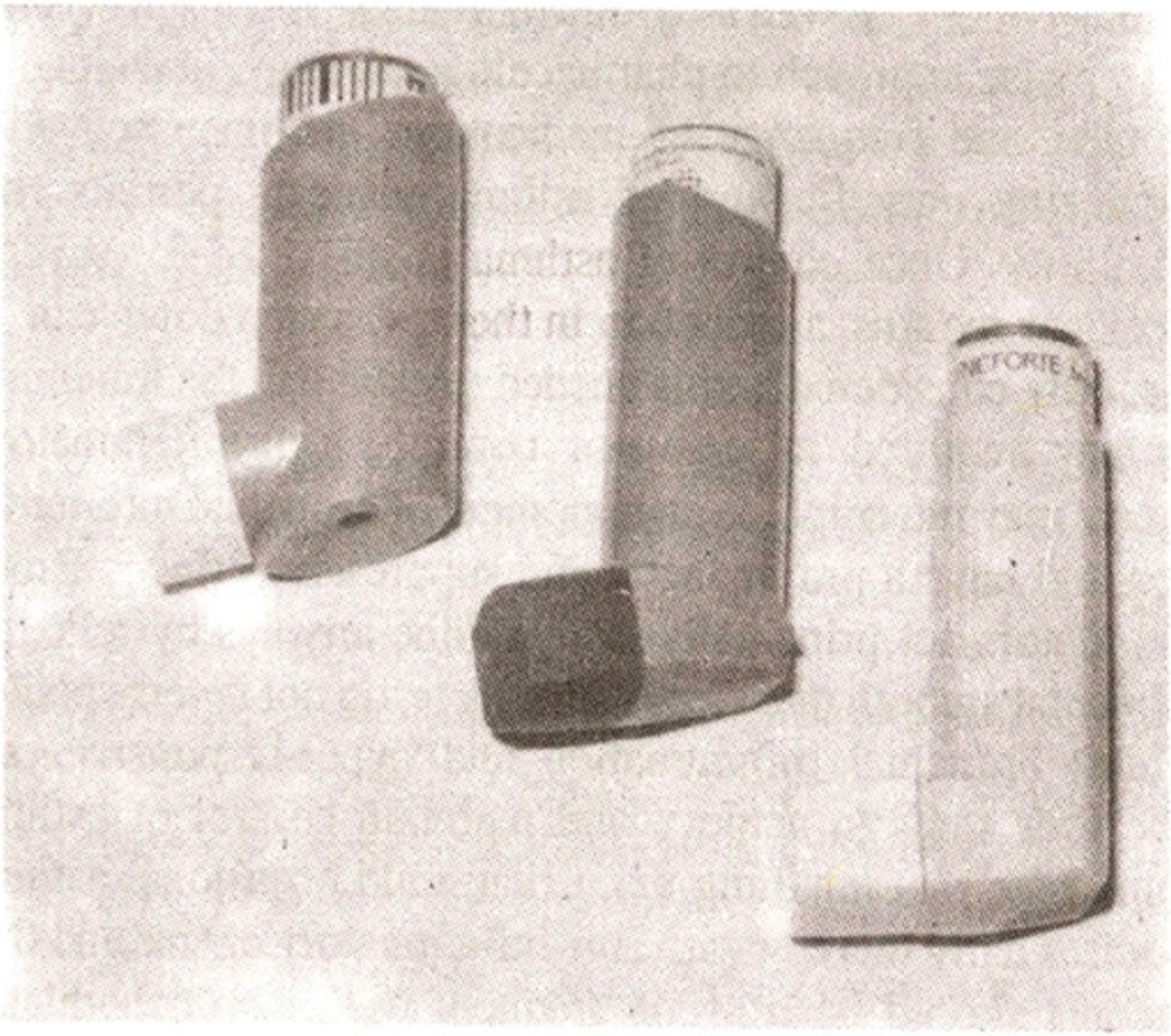

Figure 2. Different inhalers.

Figure 1. Use of peak flow meter.

During acute exacerbations, young children may have particular difficulty using metered dose inhaler (MDI), with or without a spacer device; under such circumstances nebulizers are of value particularly for children under 2 years of age.

Following groups of drugs are the currently recommended therapy for the management of asthma:

(a) Anti-inflammatory agents
(1) Corticosteroids
(2) Sodium cromoglycate
(3) Nedocrornil sodium
(b) Bronchodicators
(1) Beta2.agonists
(2) Methylxanthines
(3) Theophylline
(c) Anticholinergics
(d) Other medications
(1) Ketotifen

Stepwise Approach to Asthma Management

Because asthma is a dynamic as well as a chronic condition, medication plans need to accommodate variability among patients as well as within individual patients overtime. A stepwise approach to pharmacologic therapy, in which the number and frequency of medications are increased with increasing classification of asthma severity, permits this flexibility.

Classification of asthma severity.

	Mild	Moderate	Severe
Clinical features	Intermittent, brief symptoms <2 times a week	Exacerbations >1-2 times a week	Frequent exacerbations continuous symptoms
	Nocturnal asthma symptoms <2 times a month	Nocturnal asthma symptoms >2 times a month	Frequent nocturnal asthma symptoms
	Asymptomatic between exacerbations	Symptoms requiring inhaled B_2-agonist almost daily	Physical activities limited by asthma Hospitalization for asthma in previous year. Previous life threatening exacerbations

Once control of asthma is sustained for several weeks or months, a reduction in therapy, a step down can be carefully considered and is needed to establish the minimum therapy required to maintain control. Anti-inflamniatoiy agents may interrupt the development of bronchial inflammation and have a prophylactic and suppressive effects. Bronchodilators act principally to dilate the airways by relaxing bronchial smooth muscle and therefore, do not reverse and/or inhibit bronchial inflammation and hyper-responsiveness. The four steps to achieve and maintain control of asthma emphasize that anything more than mild occasional asthma requires daily therapy with anti-inflammatory agents and that patients should not rely on frequent use of bronchodilator agents to control their asthma.

Table. Classification of asthma severity.

Asthma severity	Clinical features before treatment	Lung function	Regular medication usually required to maintain control
Mild	Intermittent, brief symptoms<1-2 times a week	PEF >80% predicted at baseline	Intermittent inhaled short acting beta$_2$-agonist (taken as needed) only
	Nocturnal asthma symptoms <2 times a month	PEF variability <20%	
	Asymptomatic between exacerbations	PEF normal after bronchodilator	
Moderate	Exacerbations >1-2 times a week	PEF 60-80% predicted at baseline	Daily inhaled anti-inflammatory agent
	Nocturnal asthma symptoms >2 times a month	PEF variability acting 20-30%	Possibly a daily long bronchodilator, especially for nocturnal symptoms
	Symptoms requiring inhaled beta$_2$ -agonist almost daily	PEF normal after bronchodilator	
Severe	Frequent exacerbation	PEF <60% predicted at baseline	Daily inhaled anti-inflammatory agent at high doses
	Continuous symptoms	PEF variability 30%	Daily long acting bronchodilator, especially for nocturnal symptoms
	Frequent nocturnal asthma symptoms	PEF below normal despite optimal therapy	
	Physical activities limited by asthma		Frequent use of systemic corticosteroids
	Hospitalization for asthma in previous year		
	Previous life-threatening exacerbation		

Table illustrates a stepwise approach in which the number and frequency of medications are increased with increasing asthma severity. The aim is to accomplish the goals of the therapy with the least possible medication. Thus mild asthma is treated with intermittent beta2stimulants preferably used by inhalation. Once such treatment is required more than three times a week in episodic asthma or where a more severe attack has occurred, there should be a very low threshold forintroducing sodium

cromoglycate. This should be administered three or four times daily and given a trial of atleast six weeks before considering alternative therapeutic agents. Once control is achieved, it may be possible to reduce the dose frequency to twice daily. If sodium cromoglycate fails to control the condition and bronchodilators are still required more frequently than three times a week, inhaled corticosteroids should be started.

Inhaled corticosteroids are usually effective in low doses (beclomethasone and budesonide 400 micro-gram/day), though in severe cases higher doses may be necessary. In very severe disease it will be necessary to increase the dose of inhaled corticosteroid and even to use oral corticosteroids. Under such circumstances the potential dangers of uncontrolled asthma are far greater than any possible side effects that might be produced by the medication.

Management of Acute Severe Asthma

Exacerbations are characterized by worsening shortness of breath, cough, wheezing or chest tightness, but objective measures like decreases in PEF and FEV are more reliable indicators of the severity of airflow obstructionthanthe degree of symptoms.

Exacerbations usually reflect either a failure of long term management or exposure to a noxious agent. The seventy of exacerbations may range from mild to life threatening. The primaiy therapies for exacerbations are the repetitive administration of inhaled beta2-agonist and early introduction of corticosteroids.

The aims of treatment are to: (a) relieve airway obstruction as quickly as possible, (b) relieve hypoxemia, (c) restore lung function to normal as soon as possible, (d) plan avoidance of future relapses and (e) develop a written action plan in case of a further exacerbation.

Initiation of anti-asthma therapy at the earliest possible sign of deteriorating control of asthma is important in successful management of exacerbations. Patients should be able to begin treatment at home to avoid delays in treatment. Ideally, a patient should have a written action planthat outlines hoivto: (a) recognize signs ofdetenoration, (b) start treatment and (c) get to medical care.

Severe exacerbations of asthma are potentially life threatening. Treatment is most safely undertaken in a hospital based emergency department. After the initial assessment of the severity of acute attack initial treatment should include:

- Inhaled short acting beta2-agonists, usually be nebulization one dose every 20 minutes for 1 hour.
- Oxygen should be given to achieve 02 saturation of more than 90%.
- Systemic corticosteroids should be given if there is no immediate response or if the patient has recently taken oral steroids, or if episode is severe.
- Sedation is contraindicated in the treatment of exacerbation.
- Antibiotics are not a direct part of treating exacerbations, but they are indicated for patients with fever and purulent sputum.
- Hydration with large volumes of fluids does not play a role in the management of severe exacerbation in adults and older children but rehydration may be necessary in infants and young children who may become dehydrated as a result of increased respiratory rates and decreased oral intakes.

Patients with a good response to emergency department therapy require atleasta6O minutes period of observation after the last dose of bronchodilator to ensure stability of response before discharge to home.

Factors favouring hospitalization include: (a) inadequate response to therapy within ito 2 hours of treatment, (b) persisting severe airflow limitation (PEF2 less than 40% of predicted or personal best), (c) past history of severe asthma, particularly if hospitalization was required, (d) presence of high risk factors, (e) prolonged symptoms before the current emergency department visit, (f) inadequate access at home to medical care and medications, (g) difficult home condition and (h)difficulty obtaining transport to hospital in the event of furtherdeterioration.

Follow-up

Once control is established, regular follow-up visits (at one to 6 month intervals as appropriate)

continue to be essential. Clinicians need to monitor and review the treatment plans, the medications, patient's management techniques and the level of asthma control.

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