Review Article

Asthma in Children: Management Issues for Family Doctors

Shakeel Ahmed, Rehan Ali, Maqbool Qadir, Khadija Humayun

Abstract

Asthma is still one of the leading causes of morbidity in children. Despite the improved understanding in the disease pathogenesis and availability of the different classes of drugs, the incidence of emergency visits due to acute exacerbations and admission rates due to frequent and uncontrolled disease is fairly high. Management of bronchial asthma in children is quite different to that of adults. Although there are universal guidelines available for the management of childhood asthma, there is still confusion especially among the family physicians who are largely involved in the management of the children, both in acute exacerbations as well as in long term prevention. This article aims to simplify all the management issues for family physicians in concurrence with the available asthma management guidelines.

From the Department of Pediatrics and Child Health, The Aga Khan University Hospital, Stadium Road, 74800, Karachi Pakistan.

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Address correspondence and reprint request to: Dr. Shakeel Ahmed, Department of Pediatrics, The Aga Khan University Hospital, Stadium Road, 74800, Karachi Pakistan.
E-mail: shakeel.shaikh@aku.edu

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Introduction

Asthma and wheezing in children is a common problem and the last 20 years has seen its prevalence rise from 5% to almost 20% of the pediatric population in Pakistan.[1] Hospitalizations have increased eightfold in that time despite increasing use of inhalers and better delivery of medications via spacers and aerochambers. Whether the increased prevalence of asthma relates to environmental factors (as seems likely), the most likely trigger for individual attacks is a viral infection.[2] Parental perception that various allergens account for asthma symptoms, the role of RAST testing, IgE, and skin testing to pinpoint a particular avoidable allergen is at best disappointing. House dust mite is the usual offender and it is practically possible to eradicate it from our houses by getting rid of carpets and by plastic covering of beddings and pillows.[3]

The diagnosis of asthma in under 2 year olds with persistent or recurrent wheezing and cough is difficult and the term "post-bronchiolitis wheezing" or "wheezy bronchitis" is often used. If there are prolonged wheezy symptoms following viral infections, and an evidence of atopy or a family history of atopy, then one should consider asthma in this age group.[4]

Asthma in older children is evidenced by a characteristic history of viral upper respiratory tract infection (URTI) induced coughing with or without wheeze with the coughing being nocturnal or exercise-induced and non-productive in nature. Early morning coughing is also characteristic. Other symptoms of atopy such as eczema or allergic rhinitis frequently coexist. Chest tightness or chest pain may also occur.[5]

Differential Diagnosis of Asthma

Because of its increasing prevalence, it is important to consider differential diagnosis that may mimic asthma or may coexist in asthmatic children.[6] Inhaled foreign bodies (usually peanuts or beatlenuts) may present with acute shortness of breath or wheeze in a previously well toddler. Gastroesophageal reflux may present with repeated respiratory symptoms.[7]

Cystic fibrosis may have associated wheeze (up to 40%) and if there are any suggestive features (nasal polyps, steatorrhea, failure to thrive or failure to respond to routine asthma medication) it should be considered. Tuberculosis needs to be considered and excluded. Habit or psychogenic cough is quite common and presents with a barking, seal-like cough which is very disruptive to school and family life.[8]

The adage "all that wheeze is not asthma" is most certainly true but if you find that your treatment strategy is not working, you need to consider the above differential diagnosis. The vast majority of asthma in the community is diagnosed and correctly managed by family doctors and most referrals to Pediatricians are to reassure parents that the diagnosis is asthma and to perhaps add a little in terms of an asthma plan.

Treatment of Acute Asthma

Recent guidelines (GINA) are very helpful and provide up to date consensus guidelines. This report focuses on some perhaps controversial aspects of asthma management.[9]

Beta 2 agonists: Randomized controlled trials have proven that these are both safe and efficacious. Inhalation of short-acting beta

agonists leads to a very rapid response, generally within minutes and the effects last for 3-4 hours.[10] Only about 10-15% actually enters the lungs with much of the remainder being swallowed. Use of aerochamber is recommended for up to 3 years of age with the large volume spacer being used in the 3-5 yrs age groups. It has been shown that large volume spacers are as effective as nebulizers in moderate acute asthma if used correctly.

However, we feel that oral salbutamol or terbutaline should be avoided because of its very limited efficacy and in terms of age, appropriate use of aerochambers and volumatics to deliver beta 2 agents gives excellent drug delivery to the airways. Also, prescribing a home nebulizer for beta 2 agonist use should only be done in exceptional circumstances (e.g. previous life-threatening asthma). Thus, large volume spacers are as effective as nebulizers in treating acute moderate asthma and if a parent requires giving more than 4 hourly beta 2 agents in an acute asthma attack, the patient should be reviewed and referral to hospital should be considered.

Anticholinergics: These are not the first line bronchodilators but may provide additive benefit when combined with beta 2 agonists. Ipratropium bromide (atrovent) is the most commonly used anticholinergic in clinical practice and its onset is slower (30-60 minutes) but the duration of its effects is longer (>4 hours). It is remarkably free of unwanted side effects.[10]

However, it can be proposed that Ipratropium may be added to salbutamol in moderate/severe acute asthma with beneficial effect. Although frequently given, there is no proven benefit of using ipratropium in acute bronchiolitis. Hence, it is a very safe medication, virtually free of side effects because of its local action

Corticosteroids: Inflammation has a major role in the pathophysiology of acute asthma and thus steroid use can be justified.[11] Oral or intravenous corticosteroids take over 4 hours to become effective and short courses of corticosteroids are recommended for acute asthma episodes.[10] The administration of corticosteroids by the oral route is as efficacious as the intravenous route and oral prednisolone 1 mg/kg/day for 5 days given as a single daily dose is recommended. Hence, no tail off in steroid dose is required for children in short term use. Inhaled or nebulized steroids use is justified in acute moderate asthma.

Theophyllines: Theophylline has a narrow therapeutic index and adverse effects such as tremor, nausea, vomiting, tachycardia, headaches and abdominal pain occur frequently in patients treated for acute asthma exacerbations.[6] Oral slow release theophyllines are occasionally beneficial in children with troublesome nocturnal cough. Moreover, intravenous aminophylline in acute severe asthma has a sustained benefit on oxygenation but at a cost of frequent side effects. The narrow therapeutic index precludes the widespread use of theophylline derivatives.

Long Term Asthma Treatment in the Community

The great majority of asthmatics (over 80%) have infrequent episodic asthma (less than 4 attacks per year) and require only beta 2 agents +/- steroids for acute exacerbations. Those with frequent episodes (>4 episodes per year) and persistent asthma do require preventative treatment. The goalposts have changed recently with the addition of long-acting beta 2 agents such as salmeterol and the recent advent of leukotriene modifiers.[6] This review highlights the update on their use.

Sodium cromoglycate: Sodium cromoglycate inhibits mast cell degranulation and its primary advantages are its minimal side effects and the fact that it is well known, having been on the market for over 30 years. It has been sidelined of late and is now infrequently prescribed.[12] Recommendations to set up therapy with the addition of sodium cromoglycate to intermittent beta 2 agonists for children with frequent episodic asthma and then to replace cromoglycate with low dose steroids if no response within 6 weeks is evidence-based.[12] Perhaps parents of today are unwilling to wait 6 weeks for an anticipated response!

In pre-school children, there is less clear supportive evidence for the effectiveness of sodium cromoglycate, and in this situation it would seem preferable to use inhaled corticosteroids.[4]

Parents are anxious about potential side effects of inhaled steroids and their concerns need to be addressed by using the lowest dose possible and stepping up or down treatment as required. Inhaled moderate dose (i.e less than 600 micrograms/day) beclamethasone dipropionate is unlikely to have a clinically significant effect on linear growth and this dose should be considered safe.[13] Growth restriction has not been found in three long term studies of fluticasone dipropionate and several studies have shown that, in school-aged children who require inhaled steroids to control their asthma symptoms, growth restriction was more often associated with beclamethasone and budesonide then with fluticasone.[14]

Long acting beta agonists **(salmeterol):** The bronchodilator activity of salmeterol lasts for up to 12 hours, as compared with 4 to 5 hours for short-acting beta agonists. Although salmeterol 50 micrograms twice daily provides significant improvement in lung function compared with placebo or 'as needed' salbutamol,

beclamethasone 400 micrograms per day is more effective than salmeterol.[15] We feel one should consider salmeterol for children receiving optimal inhaled corticosteroid therapy who continue to experience symptoms requiring frequent bronchodilator therapy. Salmeterol should not be used as a rescue medication and its role in long term monotherapy is controversial and unproven.

Leukotriene modifiers: Leukotrienes are potent broncho-constrictors and antileukotriene drugs are either receptor antagonists or enzyme inhibitors. Early studies of leukotriene receptor antagonists (e.g. montelukast) have shown improvement in lung function, decreased frequency of asthma exacerbations and improved quality of life.

Montelukast has a rapid onset of action (1 day) and adverse effects seen include headache, pharyngitis and abdominal pain. It is taken as a single dose at bedtime. The safety profile is not as yet well-established and whether compliance is improved with oral therapy, as compared to inhaled therapy, is not yet known.[16]

We would suggest that leukotriene receptor antagonists be used in situations where one wishes to avoid the use of high dose inhaled steroids to control symptoms and in this instance, they would be used in addition to low dose inhaled steroids.[17]

Conclusion

The marked increase in the prevalence of asthma, increased hospitalizations and the soaring drug budget for anti-asthma medications all point to a condition that we do not truly understand. It is tempting to state that children grow out of asthma but the evidence shows that the majority remain asthmatic into adulthood. The epidemiology is poorly understood in the developing world and new treatment regimens are coming into the market.[18] The aim of 'primum no nocere' ('first do not harm') is apt and one should always aim for relief of symptoms with minimum medication.

Asthma control should ensure those troublesome symptoms are prevented both night and day and serious attacks are prevented. Patients require less quick-relief beta 2 agonist medication and to have (near) normal lung function, but most importantly, to be able to lead productive, physically active lives.

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References

1. Masoli M, Fabian D, Holt S, Beasley R; Global Initiative for Asthma (GINA) program: the global burden of asthma: executive summary of the GINA Dissemination Committee report. Allergy 2004 May;59(5):469-478.
2. Lai CK, De Guia TS, Kim YY, Kuo SH, Mukhopadhyay A, Soriano JB, et al; Asthma Insights and Reality in Asia-Pacific Steering Committee. Asthma control in the Asia-Pacific region: the Asthma Insights and Reality in Asia-Pacific Study. J Allergy Clin Immunol 2003 Feb;111(2):263-268.
3. The International Study of Asthma and Allergies in Childhood (ISAAC) Steering Committee. Worldwide variations in the prevalence of asthma symptoms: the International Study of Asthma and Allergies in Childhood (ISAAC). Eur Respir J 1998 Aug;12(2):315-335.
4. Martinez FD. Development of wheezing disorders and asthma in preschool children. Pediatrics 2002 Feb;109(2)(Suppl):362-367.
5. Cockcroft DW, Swystun VA. Asthma control versus asthma severity. J Allergy Clin Immunol 1996 Dec;98(6):1016-1018.
6. National Institutes of Health. Expert Panel Report 2: Guidelines for the diagnosis and management of asthma. NIH publication no. 97-4051Bethesda, National Institutes of Health/National Heart, Lung and Blood Institute, 1997.
7. Krawiec ME, Westcott JY, Chu HW, Balzar S, Trudeau JB, Schwartz LB, et al. Persistent wheezing in very young children is associated with lower respiratory inflammation. Am J Respir Crit Care Med 2001 May;163(6):1338-1343.
8. Martinez FD, Wright AL, Taussig LM, Holberg CJ, Halonen M, Morgan WJ; The Group Health Medical Associates. Asthma and wheezing in the first six years of life. N Engl J Med 1995 Jan;332(3):133-138.
9. Global Initiative for Asthma. GINA workshop report: global strategy for asthma management and prevention. Available at: http://www.ginasthma.com/wr_clean.pdf.
10. British guidelines on the management of Asthma. Thorax 2003;58 (suppl.1)
11. Høst A, Halken S. The role of allergy in childhood asthma. Allergy 2000 Jul;55(7):600-608.
12. Tasche MJ, Uijen JH, Bernsen RM, de Jongste JC, van der Wouden JC. Inhaled disodium cromoglycate (DSCG) as maintenance therapy in children with asthma: a systematic review. Thorax 2000 Nov;55(11):913-920.
13. Baker JW, Mellon M, Wald J, Welch M, Cruz-Rivera M, Walton-Bowen K. A multiple-dosing, placebo-controlled study of budesonide inhalation suspension given once or twice daily for treatment of persistent asthma in young children and infants. Pediatrics 1999 Feb;103(2):414-421.
14. The Childhood Asthma Management Program Research Group. Long-term effects of budesonide or nedocromil in children with asthma. N Engl J Med 2000 Oct;343(15):1054-1063.
15. Byrnes C, Shrewsbury S, Barnes PJ, Bush A. Salmeterol in paediatric asthma. Thorax 2000 Sep;55(9):780-784.
16. Drazen JM, Israel E, O'Byrne PM. Treatment of asthma with drugs modifying the leukotriene pathway. N Engl J Med 1999 Jan;340(3):197-206.
17. Ducharme FM. Inhaled glucocorticoids versus leukotriene receptor antagonists as single agent asthma treatment: systematic review of current evidence. BMJ 2003 Mar;326(7390):621.
18. International Classification of Diseases. Ninth Revision 1987 World Health Organization. Geneva, Switzerland.