

## INTRODUCTION

Affecting 1 in 5 children, asthma is one of the commonest childhood disorders. This is a chronic inflammatory disease, which presents typically with recurrent cough and wheezing.

Population based survey have shown that asthma is under treated and disease burden is high.<sup>1,2</sup> Asthma Insights and Reality in Asia Pacific (AIRIAP) Study showed that in Singapore, 34% of adults and children with asthma have symptoms at least once in a week. Thirty-five (35%) needed urgent acute care and 9% have been hospitalized for asthma. 23% of children have missed school because of asthma.

What are the issues that resulted in high disease burden in asthma and can asthma care in children be optimized?

## DIAGNOSIS

The first problem encountered in children is making a diagnosis. Does the child have asthma? This is often the first issue confronting the doctor.

If the child presents with a typical history of wheeze, cough and breathlessness, is it always due to asthma? Wheezing is a common complaint in early childhood. In a longitudinal study, 48.5% of children below age of 6 years have at least one wheeze<sup>3</sup>. Majority were transient wheezers.

What are the other causes of wheezing which may mimic asthma?

- 1) Recurrent viral-associated wheezing
- 2) Recurrent aspiration or gastro-esophageal reflux
- 3) Congenital airway anomalies e.g. tracheobronchomalacia
- 4) Infections: mycoplasma infection, PTB
- 5) Others: immunodeficiency, cystic fibrosis, cardiac causes, interstitial lung disease.

Whilst it is important to recognize that not all children presenting with wheezing have asthma, one also needs to be aware of atypical presentation. Not all children with asthma present with the hallmark wheezing, about 5% have chronic cough without wheezing.

What are the atypical presentation of childhood asthma?<sup>4,5</sup>

- 1) Chronic cough
- 2) Recurrent bronchitis
- 3) Recurrent pneumonia/chest infection
- 4) Chest pain/chest tightness after exercise.

Objective measurements are feasible in older children. Peak Expiratory Flow (PEF) monitoring and spirometry can be useful to provide objective evidence of reversible airway obstruction and hence, supports the diagnosis of asthma. They can be particularly useful in diagnosis of children with atypical presentation.

In younger children, it is difficult to differentiate between early asthma and recurrent viral associated wheezing without asthma. Children who continue to wheeze after the age of 7 years is likely to continue wheezing<sup>6,7,8</sup>. In the past, the approach has been to adopt a wait-and-see attitude and only intervene when an older child remained symptomatic. However, longitudinal study in children had shown that delay in intervention may have long term sequelae on lung development and somatic growth<sup>9</sup>. Therefore, there is urgency for early intervention. But who or when should one intervene?

Long term studies have thrown light on some of the predictors for persistent wheezing in children<sup>3,10,11</sup>. These factors may be helpful in making a decision as to who should receive early anti-inflammatory treatment.

Predictors of persistent wheezing

- 1) Parental history of asthma (4 x increase)
- 2) Personal history of eczema (2 x increase)
- 3) Elevated total IgE
- 4) Severe or frequent wheezing.

In clinical practice, a child with recurrent wheezing with the any of the above risk factors should be treated as early asthma, if other causes which mimic asthma has been excluded.

## ASSESSING THE CHILD WITH ASTHMA

It is prudent to take a detailed history and conduct a careful examination. The purpose is:

1. to ensure that the child does not have a disease other than asthma
2. to look for concomitant illness which may have contributed to the symptoms e.g. allergic rhinitis
3. to assess the severity of asthma – it may be necessary to do a re-evaluation after treating the concomitant illness thus removing the confounding factor which may have interfered with an accurate assessment of the disease severity.

Practical pointers in the assessment of a child with asthma

1. History : careful inquiries into the following:-
  - κ Day and night symptoms
  - κ Exercise limitation e.g. the inability to participate in PE
  - κ Trigger factors, particularly environmental factors which can be controlled e.g. household smoking, carpets etc
  - κ School absenteeism
  - κ Current medication and compliance

2. Examination : Careful examination to exclude a cardiac cause, fixed airway obstruction, chronic infection e.g. PTB.

Features such as hyperinflated (barrel) chest indicate chronic persistent disease. Presence of eczema, allergic rhinitis helps in the diagnosis of asthma in child with recurrent viral associated wheezing.

3. Assessment of level of severity:

Assessment of severity of asthma is an inherent part of good asthma care. Management of asthma is based on the level of severity of the disease. In young children, the classification is based primarily on symptoms but whenever possible, objective measurement such as Peak Expiratory Flow (PEF) and spirometric measurements should be taken (Table I).

Objective assessment is important because of the tendency for underestimation of the symptoms by the children and their caregivers. In chronic illness, adaptation of lifestyle occurs, resulting in the apparent lack of symptoms. A typical example is a child with persistent asthma who does not engage in any physical activities because of exercise-induced asthma symptoms. When asked if a child has problems with exercise, parents are likely to report that the child has no problem. However, should the doctor ask in another way about the physical activities the child is engaged in, then it will become clear that the child does not do any physical exercise at all, that is why he did not encounter any problems.

Investigation, PEF and spirometric measurements are also good objective ways for parents to track improvement. This in turn helps to improve compliance.

## SPECIAL CONSIDERATIONS IN THE MANAGEMENT OF CHILDHOOD ASTHMA

The emphasis of asthma management is on early anti-inflammatory therapy for all but the mild intermittent asthma. This is important for the optimal long-term outcome<sup>9</sup>. The Clinical Practice Guidelines for management of childhood asthma is based on the step approach pending on the level of severity of asthma. Practical approach is as shown in Table 2.

### What are the special issues in children?

- 1) Outcome measure is difficult to define in children

Children, particularly young ones, have difficulty in verbalizing their problems and describing their symptoms clearly. The doctor is left with second-hand information based on the caregiver's observation and is subjected to the caregiver's own interpretation of the symptoms. Nocturnal cough as a result of post nasal drip from allergic rhinitis may be attributed to nocturnal asthma or vice versa.

Whenever possible, objective measures such as PEF & spirometric measurement should be used in the initial and follow-up assessment.

For a particular difficult period or for obtaining an accurate diagnosis, daily symptom diary recording together with PEF monitoring may shed light on the severity and frequency of symptoms. However, PEF is only possible on older children.

For younger children, the symptom diary can be used in initial assessment period to avoid recall bias.

- 2) Choice of therapy

Anti-inflammatory is essential and effective in reducing symptoms and the need for acute care<sup>12</sup>. Regular use of inhaled corticosteroid was associated with reduction of 31% of hospital admissions for asthma<sup>13</sup>.

Making a choice can be difficult in young children as many factors influenced the option.

#### (a) Steroidal agents

The best anti-inflammatory agent is undoubtedly inhaled corticosteroid<sup>14,15</sup>. Steroid phobia is heightened in children, especially the fear of retardation of height growth. However, the impact of chronic illness on height velocity is greater than the use of inhaled steroids<sup>17</sup>. Assurance from the doctor is very important to allay the fear and anxiety of parents.

It is also important for the medical practitioner to be acutely aware of the risk-benefit ratio of the treatment. There is little clinical evidence to support the efficacy of doses greater than Budesonide 400mcg or equivalent. The risk/benefit-ratio increases with higher doses of inhaled steroids<sup>18,19</sup>. Adding a long acting beta<sub>2</sub>-agonist is more effective than increasing the dose of inhaled corticosteroid<sup>20</sup>.

Children who require moderate to high doses should be assessed and if necessary, monitored closely at a specialist unit.

#### (b) Non-steroidal agents

Montelukast, a non-steroid anti-inflammatory which is given orally is an attractive option to parents (except for the high cost). However, more information is needed to position its use as a monotherapy in chronic asthma. Adding a long acting beta<sub>2</sub>-agonist to inhaled steroid is more effective than adding Montelukast in children whose asthma is not controlled on inhaled corticosteroid<sup>21</sup>.

Other non steroidal anti-inflammatory agents such as sodium cromoglycate and nedocromil sodium have less clinical efficacy and require multiple dosings in a day<sup>14,15</sup>. They are not main players as anti inflammatory agents except for the mild asthmatics and for patients who refused inhaled steroid.

Theophylline has limited anti-inflammatory properties but in view of the wide range of adverse effects and narrow therapeutic index, it is not recommended for long term use in children, except as an adjuvant for control of severe chronic asthma.

Table 1

**Management of Childhood Asthma - Severity Classification**

Severity	Symptoms	Night time symptoms	PEF (for children $\geq$ 5yrs)	Step
Intermittent	I 1 x/wk L 1 x/mo	I 2 x/mo	L 80% pred, Variability I 20%	Step 1
Mild persistent	L 1 x/wk I 1 x/day	L 2 x/mo	L 80% pred, Variability 20-30%	Step 2
Moderate persistent	Daily use of $\beta_2$ -agonist, daily attacks affect activity	L 1 x/wk	L 60%<80% Variability L 30%	Step 3
Severe persistent	Continuous, limited physical & physical activity	frequent	I 60% pred, Variability L 30%	Step 4

**3) Delivery Device**

Inhaled route is the best form of delivery for both children and adults. It is important to take into consideration the ability of the child or caregiver to handle the device. Older children are comfortable with the use of breathe actuated device such as a turbuhaler, accuhaler or autohaler. In very young children, a spacer device with a facemask is essential. A device which the child and caregiver is happy with will be the best option because it is likely to be used and compliance improves.

Delivery via a spacer device is as effective as using a nebuliser but without the additional cost and the hassle of using a nebuliser<sup>22</sup>.

**4) Compliance to therapy**

This is the greatest challenge! Parental concerns about side effects in young children often result in poor adherence to therapy. Young children need constant supervision and monitoring and busy parents are often unable to do so. They delegate the job to the child or another caregiver. This is far from ideal. Therefore, it is prudent to prescribe simple regime, preferably once daily treatment to facilitate easy administration and supervision and hence compliance to treatment.

Reinforcement education on the need for early intervention, addressing and revisiting the safety issues with parents helps in improving compliance. In a busy clinic where time is a great constraint, nursing aides can be taught to carry out simple asthma education with the help of teaching aids.

**5) Inter current infection**

Young children may suffer 6-9 viral infections in a year. This may trigger or exacerbate asthma symptoms, especially in the early stage of treatment<sup>23</sup>. To assist the family in coping with the inter current infection, it is important to provide a clear action plan. This prevents or reduces asthma exacerbation and the need for acute care, and also helps to boost the confidence of parents in home management.

Table 2

**Management of Childhood Asthma****Practical approach to Pharmacotherapy**

- κ Step 1 Intermittent short acting bronchodilators
- κ Step 2 Daily anti-inflammatory agents  
Seretide (25/50 or 50/100 mcg)/Symbicort (4.5/160) mcg then low dose inhaled steroid (ICS) or cromoglycate, nedocromil, or consider leukotriene modifiers (Montelukast)
- κ Step 3 Daily and inflammatory agents  
Seretide 50/250 then 50/100 mcg/Symbicort (9/320)mcg the (4.5/160)mcg medium dose ICS with leukotriene modifiers (Montelukast) or medium dose ICS/long acting theophylline.
- κ Step 4 Daily anti-inflammatory agents  
Seretide 50/250 mcg BD/Symbicort 9/320 and add on leukotriene modifier high dose ICS/sustained release theophylline or consider oral steroid

For most children with mild asthma, intermittent use of  $\beta_2$ -agonist is sufficient but for there may be some where, an increase in dose of inhaled corticosteroid may be necessary.

**6) Physical Exercises (PE) and Physical Fitness Test**

Parents are deeply concerned about exercise-induced symptoms and frequently ask for their child to be exempted from PE and physical fitness test.

However, the goal of therapy is to achieve normal lifestyle with normal physical activities for the children. It is thus prudent to explain that good control will abolish exercise-induced asthma (EIA) and that asthmatic children should be able to exercise as much as they want. Adequate physical exercise is the key to good physical health and psychological well-being.

For children with EIA, inhaled beta<sub>2</sub>-agonist, 15 minutes before exercise, is helpful to ablate symptoms.

For children with activities throughout the day, a long acting beta<sub>2</sub>-agonist (Formoterol/Salmeterol) may be a better alternative.

## 7) Alternative/complementary therapy

About 42% of children with asthma are on some form of herbal therapy and most parents will not use herbal therapy and "western" machine concurrently<sup>24</sup>. Majority will stop the prescribed medicine without informing the doctor. Realization of this is important. As doctors, we will have to actively engage parents in a discussion of complementary therapy the child may be on. When unexpected adverse effect is noted or when the progress is not as expected, it is important to ask about alternative therapy. Poor compliance rather than poor efficacy of anti-inflammatory agent may be the cause of poor control of asthma.

## 8) Allergen Avoidance

House dust mites is one of the commonest trigger in childhood asthma. Children spend relatively longer hours in bedroom at night and therefore controlling house dust mites in the bedroom is an important element in improving asthma control. Washing of linen in hot water (L 60°C) and keeping the room well-ventilated helps in reducing house dust mite population in the bedroom. Cigarette smoke is another important risk factor for wheezing in children. Household smoking should be strongly discouraged, not just because of passive smoking but also the act itself serves as a poor role model to the impressionable child.

Family with asthma children should also avoid fur/feathered pets at home.

## CONCLUSION

Bronchial Asthma is a chronic inflammatory airway disease. The origin often begins in childhood. Optimal management in early childhood not only reduces symptoms, enables an active lifestyle and reduces health economic burden but also has a long-term impact on health in adulthood.

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