

ASTHMA

The International Studies on Asthma And Allergy (ISAAC) has shown that the prevalence of asthma among school age children is 10%.

Definition

Chronic airway inflammation leading to increase airway responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing particularly at night or early morning. It is often associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment.

Reversible and variable airflow limitation as evidenced by > 15% improvement in PEFR (Peak Expiratory Flow Rate), in response to administration of bronchodilator.

Table 1. Important points in history

current symptoms
 pattern of symptoms
 precipitating factors
 present treatment
 previous hospital admission
 typical exacerbations
 home/ school environment
 impact on life style
 history of atopy
 response to prior treatment
 prolonged URTI symptoms
 family history

Table 2. Physical examination

Signs of chronic illness

Harrison sulci
 hyperinflated chest
 eczema / dry skin
 hypertrophied turbinates

Signs in acute exacerbation

tachypnoea
 wheeze, rhonchi
 hyperinflated chest
 accessory muscles
 cyanosis
 drowsiness
 tachycardia

*NOTE: ABSENCE OF PHYSICAL FINDINGS
 DOES NOT EXCLUDE ASTHMA!*

Management of Chronic Asthma

Assessment of Severity

- classification based on frequency, chronicity and severity of symptoms (Table 3)

Management according to severity (GINA guidelines)

In 2006, the Global Initiatives on Asthma (GINA) has proposed the management of asthma from severity based to control based. The change is due to the fact that asthma management based on severity is on expert opinion rather than evidence based, with limitation in deciding treatment and it does not predict treatment response. Asthma assessment based on levels of control is based on symptoms and the three levels of control are well controlled, partly control and uncontrolled.

Table 4. Levels of Asthma Control (GINA 2006)

	Characteristics					
	daytime symptoms	limitation of activities	nocturnal symptoms or awakenings	need for reliever	lung function test	exacerbations
Controlled						
<i>All of the following:</i>	none	none	none	none	normal	none
Partly Controlled						
<i>Any measure present in any week:</i>	> 2 / week	any	any	2 / week	< 80% predicted or personal best	≥ 1 a year
Uncontrolled	≥ 3 features of partly controlled asthma present in any week					1 / week

Table 3. Classification of severity of childhood asthma

category	clinical parameter
Intermittent	daytime symptoms < once a week nocturnal symptoms < once a month no exercise induced symptoms brief exacerbations not affecting sleep and activity normal lung function
Persistent (Threshold for preventive treatment)	
<i>Mild persistent</i>	daytime symptoms > once a week nocturnal symptoms > twice a month exercise induced symptoms exacerbations once a month affecting sleep and activity PEFR / FEV ₁ > 80%
<i>Moderate Persistent</i>	daytime symptoms daily nocturnal symptoms > once a week exercise induced symptoms exacerbations > twice a month affecting sleep and activity PEFR / FEV ₁ 60 – 80%
<i>Severe Persistent</i>	daytime symptoms daily daily nocturnal symptoms daily exercise induced symptoms frequent exacerbations > twice a month affecting sleep and activity PEFR / FEV ₁ < 60%

Note

- This division is arbitrary, groupings may merge. An individual's classification may change from time to time.
- There are a few patients who have very infrequent but severe or life threatening attacks with completely normal lung function and no symptoms between episodes. This type of patient remains very difficult to manage.

Abbreviations. PEFR = Peak Expiratory Flow Rate; FEV₁ = Forced Expiratory Volume in One Second

Prevention

Identifying and avoiding the following common triggers may be useful

- environmental allergens

These include house dust mites, animal dander, insects like cockroach, mould and pollen.

Useful measures include damp dusting, frequent laundering of bedding with hot water, encasing pillow and mattresses with plastic/vinyl covers, removal of carpets from bed rooms, frequent vacuuming and removal of pets from the household.

- cigarette smoke
- respiratory tract infections - commonest trigger in children.
- food allergy - uncommon trigger, occurring in 1-2% of children
- exercise

Although it is a recognised trigger, activity should not be limited. Taking a β_2 -agonist prior to strenuous exercise, as well as optimizing treatment, are usually helpful.

Drug Therapy

- see Tables 5, and 6 (on next page) for drug delivery methods and dosages.

Table 5. Delivery systems available & recommendation for the different ages

Age (years)	Oral	MDI + Space + Mask	MDI + Spacer	Dry Powder Inhaler
< 5	+	+	-	-
5 - 8	-	+	-	-
> 8	-	+	+	+

Table 6. Drug dosages for asthma

Drug	Formulation	Dosage
<i>Relieving Drugs</i>		
Rapid acting β_2 -agonists		
salbutamol	oral	0.15 mg/kg/dose TDS-QID/PRN
	metered dose inhaler	100-200 mcg/dose QID/PRN
	dry powder inhaler	100-200 mcg/dose QID/PRN
terbutaline	oral	0.075 mg/kg/dose TDS-QID/PRN
	metered dose inhaler	250-500 mcg/dose QID/PRN
	dry powder inhaler	500-1000 mcg/dose QID/PRN (maximum 4000 mcg/daily)
fenoterol	metered dose inhaler	200 mcg/dose QID/PRN
Ipratropium bromide	metered dose inhaler	40-60mcg /dose TDS/QID/PRN
<i>Preventive Drugs</i>		
Corticosteroids		
prednisolone	oral	1-2 mg/kg/day in divided doses
beclomethasone dipropionate	metered dose inhaler	low dose: <400 mcg/day
	dry powder inhaler	moderate dose: 400-800 mcg/day
		high dose: 800-1200 mcg/day
budesonide	metered dose inhaler	low dose: <400 mcg/day
	dry powder inhaler	moderate dose: 400-800 mcg/day
		high dose: 800-1200 mcg/day
fluticasone propionate	metered dose inhaler	low dose: <200 mcg/day
	dry powder inhaler	moderate dose: 200-400 mcg/day
		high dose: 400-600 mcg/day
ciclesonide	metered dose inhaler	low dose: 160 mcg/day
		high dose: 320 mcg day
Sodium cromoglycate	dry powder inhaler	20mg QID
	metered dose inhaler	1-2mg QID or 5-10mg BID-QID
Theophylline	oral syrup	5 mg/kg/dose TDS/QID
	slow release	10 mg/kg/dose BD
Long acting β_2 -agonist		
salmeterol	metered dose inhaler	50-100 mcg/dose BD
	dry powder inhaler	50-100 mcg/dose BD
Combination		
salmeterol /fluticasone	metered dose inhaler	25/50mcg, 25/125mcg, 25/250mcg
	dry powder inhaler	50/100mcg, 50/250mcg, 50/500mcg
	dry powder	160/4.5mcg, 80/4.5mcg
Antileukotrienes (Leukotriene modifier)		
montelukast	oral	4 mg granules
		5mg/tablet nocte <i>chewable</i>
		10mg/tablet nocte

Note: Dry powder inhaler devices available include rothaler, diskhaler, turbohaler, accuhaler and easyhaler.

Treatment of Chronic Asthma

- asthma management based on levels of control is a step up and step down approach as shown in Figure 1.

Figure 1. Chronic asthma: management based on control

<i>Reduce</i>		<i>Increase</i>		
STEP 1	STEP 2	STEP 3	STEP 4	STEP 5
as needed rapid acting β_2 -agonist	as needed rapid acting β_2 -agonist			
<i>Controller Options</i>				
	Select one	Select one	Add one or more	Add one or both
	<ul style="list-style-type: none"> low dose ICS leukotriene modifier 	<ul style="list-style-type: none"> low dose ICS + long acting β_2-agonist medium or high dose ICS low dose ICS + leukotriene modifier Low dose ICS + SR theophylline 	<ul style="list-style-type: none"> medium / high dose ICS + long acting β_2-agonist leukotriene modifier SR theophylline 	<ul style="list-style-type: none"> oral glucocorticoids lowest dose anti-IgE

NOTE:

- Patients should commence treatment at the step most appropriate to the initial severity. A short rescue course of prednisolone may help establish control promptly.
- Explain to parents and patient about asthma and all therapy
- Ensure both compliance and inhaler technique optimal before progression to next step.
- Step-up; assess patient after 1 month of initiation of treatment and if control is not adequate, consider step-up after looking into factors as in 3.
- Step-down; review treatment every 3 months and if control sustained for at least 4-6 months, consider gradual treatment reduction.

Abbreviations. ICS, inhaled corticosteroids; SR, sustained release

Monitoring

Assessment during follow-up

- assess severity
- response to therapy
 - interval symptoms
 - frequency and severity of acute exacerbation
 - morbidity secondary to asthma
 - quality of life
 - PEF monitoring on each visit
- compliance
 - frequency and technique, reason and excuses
- education
 - technique, factual information, written action plan, PEF monitoring may not be practical for all asthmatics but is essential especially for those have poor perception of symptoms and those with life threatening attacks

MANAGEMENT OF ACUTE ASTHMA

Assessment of Severity

Initial (Acute assessment)

- Diagnosis
 - symptoms e.g. cough, wheezing, breathlessness, pneumonia
- Triggering factors
 - food, weather, exercise, infection, emotion, drugs, aeroallergens
- Severity
 - respiratory rate, colour, respiratory effort, conscious level

Table 7. The initial assessment - the first step in the management of acute asthma

	Mild <i>admission unlikely</i>	Moderate <i>(may need admission)</i>	Severe <i>(admission needed)</i>
altered consciousness	no	no	yes
physical exhaustion	no	no	yes
talks in:	sentences	phrases	words
pulsus paradoxus	not palpable	may be palpable	palpable
central cyanosis	absent	absent	present
rhonchi	present	present	silent chest
use of accessory muscle	absent	moderate	marked
sternal retraction	absent	moderate	marked
initial PEF	> 60 %	40 - 60 %	< 40 %
oxygen saturation	> 93 %	91 - 93 %	< 90 %

Note:

1. Chest X Ray is rarely helpful in the initial assessment unless complications like pneumothorax, pneumonia or lung collapse are suspected
2. Initial ABG is indicated only in acute severe asthma

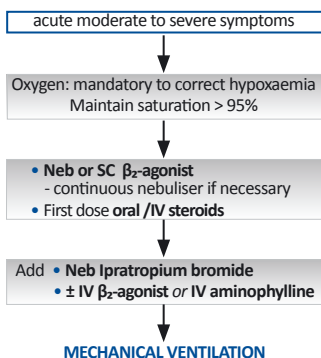
Criteria for admission

- failure to respond to standard home treatment
- failure of those with mild or moderate acute asthma to respond to nebulised β_2 -agonists
- relapse within 4 hours of nebulised β_2 -agonists
- severe acute asthma

Management considerations

- monitor pulse, colour, PEF, ABG and SpO₂. Close monitoring for at least 4 hours.
- hydration - give maintenance fluids.
- role of aminophylline debated due to its potential toxicity. To be used with caution.
- antibiotics indicated only if bacterial infection suspected.
- avoid sedatives and mucolytics.
- efficacy of prednisolone in the first year of life is poor.
- on discharge, patients must be provided with an Asthma Action Plan to assist parents or patients to prevent/terminate asthma attacks. The plan must include:
 - how to recognize worsening asthma
 - how to treat worsening asthma
 - how & when to seek medical attention

Figure 1. Algorithm for management of acute asthma



Abbreviations.
Neb, nebuliser;
SC, subcutaneous

Table 8. Drug dosages for acute asthma

Drug	Formulation	Dosage
<i>β₂-agonists</i>		
salbutamol	nebuliser solution 5 mg/ml or 2.5 mg/nebule	0.15 mg/kg/dose (max 5 mg) or < 2 years old : 2.5 mg/dose > 2 years old : 5.0 mg/dose continuous : 500 mcg/kg/hr
	intravenous	bolus: 5-10 mcg/kg over 10 min Infusion: start 0.5-1.0 mcg/kg/min increased 1.0 mcg/kg/min every 15 min to a maximum of 20 mcg/kg/min
terbutaline	nebuliser solution 10 mg/ml, 2.5 mg/ml or 5 mg/ml respule	0.2-0.3 mg/kg/dose, or < 20 kg: 2.5 mg/dose > 20 kg: 5.0 mg/dose
	parenteral	5-10 mcg/kg/dose
fenoterol	nebuliser solution	0.25-1.5 mg/dose
<i>Steroids</i>		
prednisolone	oral	1-2 mg/kg/day in divided doses (for 3-7 days)
hydrocortisone	intravenous	4-5 mg/kg/dose 6 hourly
methylprednisolone	intravenous	1-2 mg/kg/dose 6-12 hourly
<i>Ipratropium bromide</i>	nebuliser solution 250 mcg/ml	< 5 years old : 250 mcg 4-6 hourly > 5 years old : 500 mcg 4-6 hourly
	Aminophylline	intravenous

Note:

- salbutamol MDI vs nebulizer
 - < 6 year old: 6 x 100 mcg puff = 2.5 mg Salbutamol nebules
 - > 6 year old: 12 x 100 mcg puff = 5.0 mg Salbutamol nebules
- Aminophylline : No significant role but can be used in a control environment like ICU