Pediatric asthma

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Asthma is a chronic inflammatory disorder of the airways characterized by an obstruction of airflow, which may be completely or partially, reversed with or without specific therapy.

Airway inflammation may cause recurrent or persistent bronchospasm, which causes symptoms that include :

Wheezing – **breathlessness** – **chest tightness** – **cough** (particularly at night and early morning hours or after exercise)

Airway inflammation is associated with airway hyper-reactivity or bronchial hyper-responsiveness which is defined as the tendency of the airways to narrow in response to various stimuli (eg, environmental allergens and irritants).

Asthma affects an estimated 300 million individuals worldwide and The prevalence of asthma is increasing , especially in children.

Asthma

Recurrent

Reversible

Wheezing
Cough
Breathing difficulty
Chest tightness.

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Relative with atopy

- Suggestive of asthma
- Episodic
- Seasonal
- Nocturnal
- Exercise induced
- Family history of allergic diseases

HISTORY

To establish the diagnosis of asthma, the following should be confirmed:

- Episodic symptoms of airflow obstruction.
- Airway obstruction or symptoms are at least partially reversible.
- Alternative diagnoses are excluded.

Thus, obtaining a good history is crucial when diagnosing asthma and excluding other causes.

You should establish whether the patient has any of the following:

- Wheezing.
- Cough (especially at night or with exercise).
- Shortness of breath.
- Chest tightness.
- Sputum production.

You should determine the pattern of the symptoms as follows:

- Perennial, seasonal or both.
- Continuous or intermittent.
- Daytime or nighttime.
- Onset and duration.

You should check whether any of these precipitate or aggravate the symptoms:

- Viral infection.
- Environmental allergens.
- Irritants (eg, smoke exposure, chemicals, vapors, dust).
- Exercise.
- Emotions.
- Home environment (eg, pets, mold, carpets).
- Stress.
- Drugs (eg, aspirin, beta blockers)
- Foods.
- Changes in weather.

The presence of other conditions that may affect asthma should be determined, such conditions may include the following:

- Gastroesophageal reflux disease (GERD)
- Sinusitis
- Rhinitis

Questions about the development and treatment of the disease should touch on the following:

- Age at onset and diagnosis
- Progression of symptoms (better or worse)
- Improvement with bronchodilators
- Use of oral corticosteroids

Family history should include any history of asthma, allergy, sinusitis, rhinitis, eczema, nasal polyps in close relatives.

The history of exacerbation should include the rapidity of onset, associated illnesses, number in the last year, the need for hospitalization.

Wheezing

It is a musical, high-pitched, whistling sound produced by airflow turbulence and is one of the most common symptoms.

In the mildest form, wheezing is only end expiratory. As the severity increases, the wheeze lasts throughout expiration. In a more severe asthmatic episode, wheezing is also present during inspiration.

During the most severe episodes, wheezing may be absent.

Asthma can occur without wheezing when obstruction involves predominantly the small airways.

Wheezing can be associated with other causes of airway obstruction, such as cystic fibrosis and heart failure.

Coughing and chest tightness

Cough may be the only symptom of asthma, especially in cases of exercise-induced or nocturnal asthma. Usually the cough is nonproductive and nonparoxysmal.

A history of tightness or pain in the chest may be present with or without other symptoms of asthma, especially in exercise-induced or nocturnal asthma.

Approach considerations

The National Asthma Education and Prevention Program (NAEP) guidelines highlight the importance of treating the risk domains of asthma and the goals for therapy are as follows:

- Control asthma by reducing impairment through prevention of chronic and troublesome symptoms.
- Reduce the need for a short acting beat 2-agonist.
- Maintain normal activity levels .
- Maintain near-normal pulmonary function.
- Satisfy patients and families expectations for asthma care.

Differential diagnoses

- Bronchiolitis
- Airway foreign body
- Allergic rhinitis
- Gastroesophageal reflux
- Aspiration syndrome
- Aspergillosis
- bronchiectasis
- Cystic fibrosis
- Bronchopulmonary dysplasia
- Primary ciliary dyskinesia

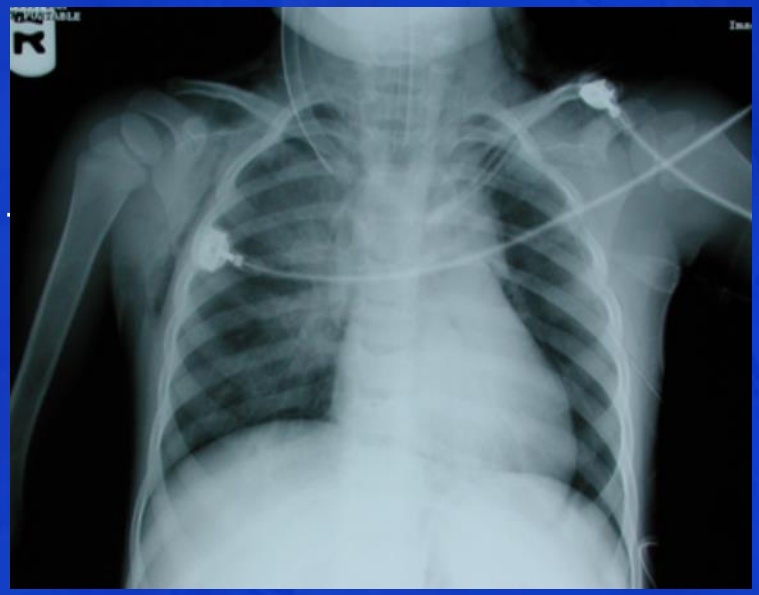
Pediatric asthma workup

Lab assessment :

- CXR
- Spirometry
- Esinophil count and IgE levels
- Bronchial provocation tests may be performed to diagnose bronchial hyperresponsiveness

Chest X-Ray

- Not routinely indicated
- Exceptions:
  - Patient is intubated/ventila
  - Suspected barotrauma
  - Suspected pneumonia
  - Other causes for wheezing



Clinical Asthma Score

Score	1.Respiratory rate (0-5)	>5 yr	2. Wheezing	3. Chest Retraction	4. Dyspnea	5.O2 sat
0	<40	<30	none	none	none	95%
1	40-60	30-40	Expiratory only	one site	mild	92 - 94%
2	>60	>40	Inspiratory & Expiratory	More than 1 site	marked	91%

MANAGEMENT

A- OXYGEN

- reducing hypoxic pulmonary vasoconstriction.
- interfering with the ventilation-perfusion mismatch.

Oxygen saturation in children should be kept above 95%

B- FLUID

the treatment should be aimed at restoring normovolemia by oral (preferably) or by intravenous fluid substitution.

C- INJECTION OF ADRENALINE

Intramuscular injection of adrenaline (0.1 ml per 10 kg body wt of adrenaline 1 mg/ml) may be given in severe bronchoconstriction during anaphylaxis.

D- NEBULIZED β2-AGONIST

Dose recommendations for Salbutamol vary between 0.5 – 1.5 mg/10 kg bodyweight, mixed in 2-5 ml NaCl 9 mg/ml.

E- NEBULIZED ADRENALINE

The recommended dose is racemic adrenaline 2 mg in children < 6 months of age and 4 mg in older children, inhaled in 3-5 ml NaCl 9 mg/ml.

Alternatively, adrenaline (1 mg/ml) may be inhaled in a dose of 1.5 mg/10 kg bodyweight.

F- INHALED ANTICHOLINERGICS

Ipratropium bromide as add-on therapy to β2-agonist.

G- STEROIDS

Guidelines recommend that all children with moderate to severe asthma should receive systemic steroids as a part of the initial treatment to:

- reduces the need for hospitalization
- Reduce the risk or relapse
- Facilitate earlier discharge from the hospital

Intravenous hydrocortisone of 4 mg/kg or methylprednisolone 0.5-1.0 mg/kg every 4-6 hours are alternatives to oral steroids.

Additional medications

A- THEOPHYLLINE: May be considered in children with a poor response to other treatment measures.

B- INTRAVENOUS β2-AGONIST: used in severe asthma that does not respond to other treatments, side effects are:

Dysrythmias – tachycardia – hypertension – severe hypokalemia which may also aggravate possible dysrythmia

C- MAGNESIUM SULPHATE: the benefit is via smooth muscle relaxation secondary to inhibition of calcium uptake. The dose is 25-100 mg/kg given over 20 minutes

D- HELIUM OXYGEN THERAPY OR LEUKOTRIENE MODIFIERS IN TREATMENT OF ACUTE ASTHMA