

Bronchial Asthma



- **Definition:**
 - A chronic condition characterized by reversible airway inflammation, airway hyper-responsiveness, bronchoconstriction, and mucus hypersecretion.
- **Epidemiology:**
 - More common in developed countries.
 - Approximately 300 million people worldwide have asthma and the number is expected to rise to 400 million by 2025.
 - The overall prevalence of asthma in Saudi children ranges between 8-25%.

Remodeling is a prominent feature of chronic asthma.

- **Classification of asthma in general (overlapping):**

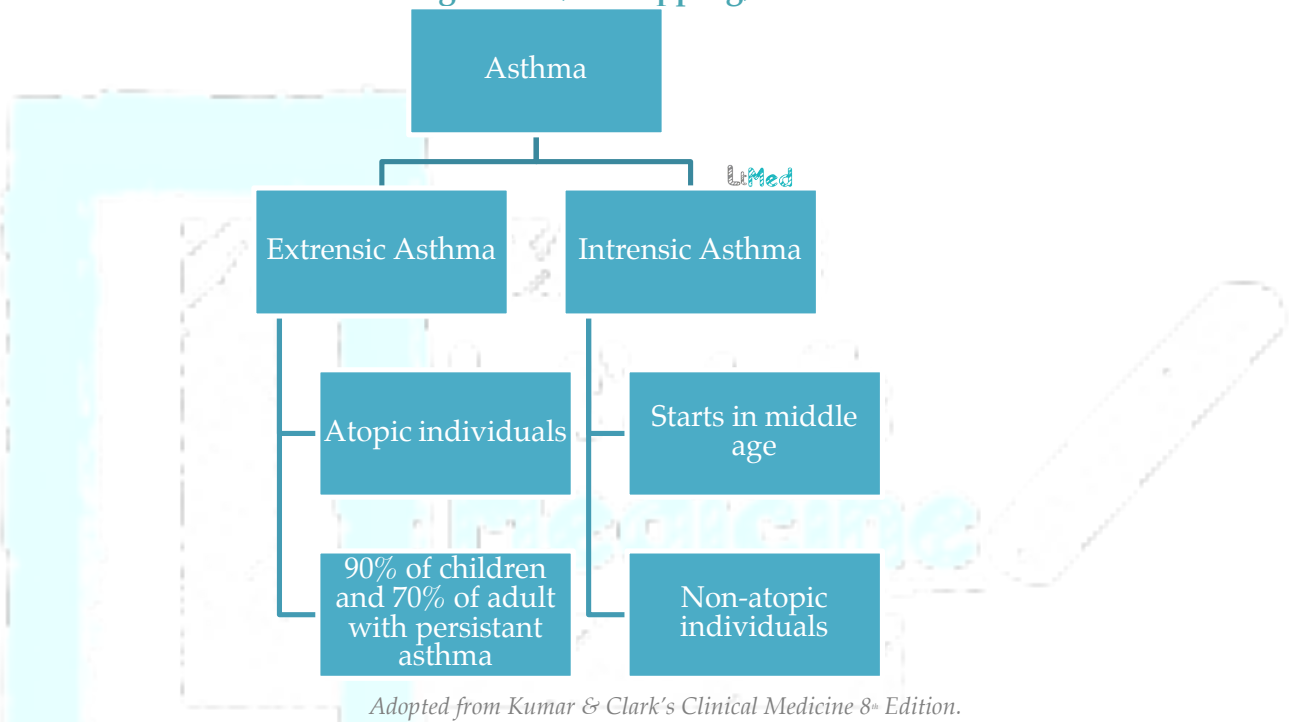
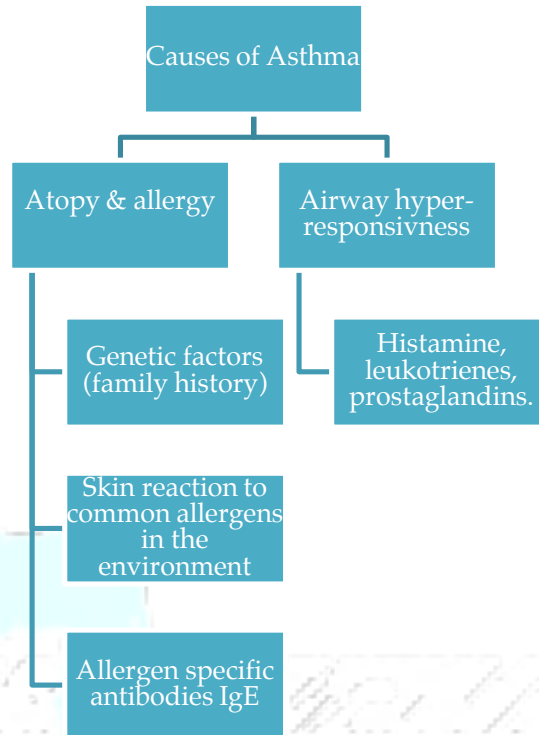


Figure 1: Asthma triggers.

• Causes & Risk Factors:



Adopted from Kumar & Clark's Clinical Medicine 8th Edition.

• Pathophysiology:

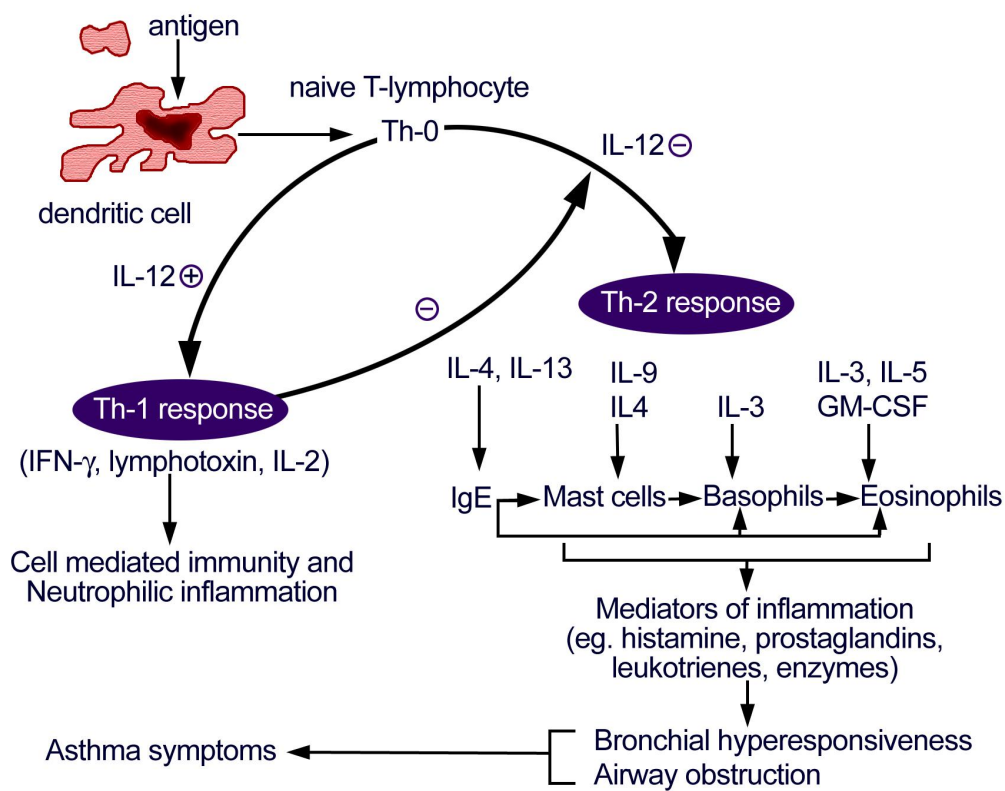


Figure 2: Pathophysiology of Asthma

- **Clinical Presentation:**

- Asthma Patients usually complain of episodic attacks of three cardinal symptoms (it is not necessary for all the symptoms to be present):
 - Wheezing
 - Shortness of breath
 - Cough:
 - Nocturnal cough might be the prominent presenting symptom in children.
- Various triggers precipitate attacks:
 - Smoking
 - Dust
 - Cold Air
 - Exercise
 - Viral infections

Aspirin-induced asthma should be suspected in patients with asthma & nasal polyps.

- **Diagnosis & Investigations:**

- **History & physical examination.**
 - PE: is usually normal (except for wheezing on auscultation.)
- **Lung function test:**
 - Spirometry:
 - ✓ The Gold Standard method for diagnosis.
 - ✓ Very helpful in assessing the reversibility of asthma.
 - ✓ Requires a cooperative patient which is usually > 6Y/O.
 - ✓ Diagnosis is made when there is >12% improvement in the FEV1 after the inhalation of bronchodilators (e.g.: beta 2 agonist).
 - Peak Expiratory Flow Rate (PEFR):
 - ✓ Very helpful in assessing the patient's asthma activity, and long-term assessment
- **Exercise tests:**
 - Two methods (one of the following):
 - ✓ The patient should run for 6 min on a treadmill while increasing the heart rate to > 160 beats/min.
 - ✓ Cold air challenge, isocapnic hyperventilation, or aerosol challenge with hypertonic saline.
 - Negative test does not rule out asthma.
- **Histamine or methacoline bronchial provocation test:**
 - Proves the presence of airway hyper-responsiveness.
 - Useful in assessing patients with cough as a prominent feature.
 - Should not be used with poor lung function FEV1<1.5 L.
- **Chest X-ray:**
 - Not diagnostic, but hyperinflation might be noted.
 - To exclude:
 - ✓ Pneumothorax as it can be as complication.
 - ✓ Pulmonary infiltrates as it might cause acute asthma exacerbation.

Carbon monoxide transfer test is normal in asthmatic patients.

- **Sputum test:**
 - Charcot Leiden crystals: eosinophilic inclusions.
 - Curschmann's spirals: spiral plug of mucus.

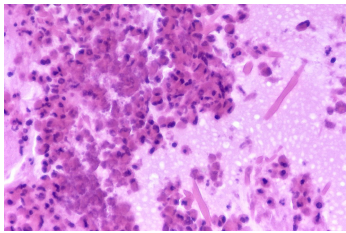


Figure 3: Charcot Leiden Crystals.

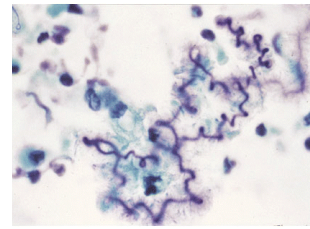


Figure 4: Curschmann's spirals.

- **Management:**

- **Goals:**
 - Aborting the symptoms of asthma.
 - Maintain a normal or near normal lung function.
 - Reduce the risk of severe acute attacks.
 - Allow normal growth for children.
 - Minimize the school absence and maintaining normal physical activity.

Most common side effect of SABA is tremors.

- First step in the management is identification and elimination of the extrinsic causes of asthma (allergens).
- Pharmacological treatment:
 - According to the severity of the clinical symptoms of asthma:

Most common side effects of inhaled steroids are oral thrush, hoarseness, and sore throat

Severity	Symptoms	Night Symptoms	Treatment
Mild intermittent	≤2 symptoms/ week	≤2 symptoms/ month	Short acting Beta 2 agonist (SABA) only
Mild persistent	> 2 symptoms/ week	>2 symptoms/ month	Beta 2 agonist + low dose of inhaled steroids
Moderate persistent	Daily symptoms	Frequent exacerbation >1 episode/week	Beta 2 agonist + medium dose of inhaled steroids+ long acting bronchodilator (LABA) If no response: give high dose of inhaled steroids
Severe persistent	Continual symptoms, marked limitation of physical activity, and frequent exacerbations	Frequent exacerbation	Beta 2 agonist+ High dose of inhaled steroids+ LABA+ Lowest dose of oral steroids

Adopted from Step Up to Medicine 3rd edition & Kumar & Clark's Clinical Medicine 8th Edition. Modified by Lets Talk Medicine.

- **Complications:**
 - Status asthmaticus:
 - Acute respiratory failure:
 - Due to respiratory muscles fatigue.
 - Pneumothorax, pneumomediastinum, and atelectasis.
- **Acute Severe Asthma (Status Asthmaticus):**
 - **Definition:** exacerbation of the asthma that is not responding to usual medications.
 - **Signs & symptoms:**
 - Inability to complete a whole sentence.
 - Respiratory rate ≥ 25 breath/min.
 - Tachycardia ≥ 110 bpm.
 - **Investigations:**
 - Peak flow meter $< 60\%$ of predicted normal.
 - Pulse oximetry to monitor oxygen saturation in the blood.
 - ABGs:
 - Increased A-a gradient.
 - Low pH.
 - Chest X-ray:
 - To rule out pneumonia, or pneumothorax.
 - **Management:**

Avoid the use of beta-blockers in asthmatic patients.

Life threatening asthma attacks usually present with:

1. Silent chest
2. Confusion or coma
3. Bradycardia or hypotension

- Supplemental O₂.
 - Inhaled SABA (salbutamol) nebulizer 2-6 puffs once, twice, and three-times/20 min.
 - Ipratropium bromide
 - Systemic steroids (oral or IV)

• If no response

- IV SABA
 - IV Magnesium sulphate
 - Subcutaneous epinephrine

• If no response

Intubation and mechanical ventilation with careful intensive care monitoring.

References:

1. Agabegi S, Agabegi E, Ring A. Step-up to medicine. Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins; 2013.
2. Kumar P, Clark M. Kumar & Clark's clinical medicine.
3. Walker B, Colledge N, Ralston S, Penman I. Davidson's principles and practice of medicine.
4. Fischer C. Master the boards.
5. Uptodate.com. Treatment of acute exacerbations of asthma in adults [Internet]. 2016 [cited 11 January 2016]. Available from: <http://www.uptodate.com/contents/treatment-of-acute-exacerbations-of-asthma-in-adults>
6. Visual.ly. Asthma Triggers | Visual.ly [Internet]. 2016 [cited 11 January 2016]. Available from: <http://visual.ly/asthma-triggers-0> (Figure 1).
7. Emedicine.medscape.com. Asthma: Practice Essentials, Background, Anatomy [Internet]. 2016 [cited 11 January 2016]. Available from: <http://emedicine.medscape.com/article/296301-overview> (Figure 2).
8. Commons.wikimedia.org. File:Charcot-Leyden crystals in airway- Asthma.jpg - Wikimedia Commons [Internet]. 2016 [cited 11 January 2016]. Available from: https://commons.wikimedia.org/wiki/File:Charcot-Leyden_crystals_in_airway-Asthma.jpg (Figure 3).
9. New England Journal of Medicine. Curschmann's Spirals — NEJM [Internet]. 2016 [cited 11 January 2016]. Available from: <http://www.nejm.org/doi/full/10.1056/NEJM199810083391505> (Figure 4).

First author: Roaa Amer
 Second author: Raed Rayani
 Format editor: Roaa Amer

Reviewed by: Musab Al Shareef
 Haifa Al Issa