

Asthma:-



* lung dz → restrictive → extrapulmonary [Ankylosis spondylitis - Kyphoscoliosis - Muscle mov. dz; Guillain barre \$]...
obstructive → COPD - asthma - cystic fibrosis - Bronchiectasis - Aspergillosis...
irreversible dz vs reversible dz

* Notes:-

① Hypersensitivity reactions:-

→ type I immune modulate by the mast cell which release histamine → bronchoconst. with hours → reverse by bronchodilators...
→ type IV immune modulate by the eosinophilic cells release proteins → bronchoconst. + airway infl. + hyper responsiveness + edema. [less response to bronchodilators]...

asthma: - chronic reversible inflammation and hyper activity in the airways to various stimuli lead to narrowing it [difficulty in breathing]...

so there is recurrent attacks of cough, dyspnea, wheezing [1st presentation]...

combination of:- ① mucosal chronic infl... we give for it steroids...

② Bronchial spasm... we give for it Bronchodilator [B2 agonist]

③ excessive secretion of viscous mucus causing mucous plugs → bronchial obstruction → stasis [but in COPD there is more stasis]...

changing in the lung with asthma

airway infl → non specific airway hyperresponsiveness → airway edema + broncho constriction...

* Persistent airway infl. → remodeling of the airways + fibrosis + muscular hypertrophy → continuous non responsive airflow obst.

asthma causes :- [asthma develop early in life] complex interaction between 3 factors:-

① extrinsic [host] Factor:- most common 60-70%

allergens trigger the attack → pollens - dust - isocyanate - Atopy [IgE mediated] - aspirin sensitivity...

has asthma triad → aspirin sensitivity → nasal polyposis...
aspirin sensitivity → asthma...
aspirin sensitivity → nasal polyposis...

* Atopy:- predisposition toward developing certain hypersensitivity [allergic dz] as:- allergic asthma - allergic rhinitis - food or drug allergy - eczema [atopic dermatitis]...

* asthma:- allergic ↑ IgE due to response to environmental allergens [pollen - house dust mite - moulds]...

non-allergic triggered by factors as:- anxiety - stress - exercise - cold air - infection...

② environmental factor:- allergens - irritant - chemicals - resp. infection - physical stress - emotional stress...

note:- the allergen and the resp. infection is the mce...

early ↓ IgE dependent

The occupational asthma:- bronchial reaction occurs 2ry to airborne agent and it's limited to the work place and usually due to single sub. not found outside the work space... [as:- isocyanates found in paints - varnishes - insulation material]... [atopy - smoking history & cox2 rx]

[late] IgE independent

irritate the mucous memb. in the eye + GIT + skin + resp. tract...

③ Comorbid Condition:- exacerbate by comorbid conditions:- 1- allergic broncho pulmonary aspergillosis... 5- stress

2- obst. sleep apnea - hypopnea \$ 6- allergic rhinitis

3- smoking, tobacco, heroin, cocaine... 7- obesity

4- GERD

causes acute exacerbation of asthma ① infection [viral] → rhino virus in the adult...

مريض الربو؟
Chronic cough
cough attacks
cough...
variant asthma
hyperresponsive or
with HHT

aspirin sensitivity from NSAID and technique does but not to NSA or choline SAHcates...

very bad

* asthma classification

* near fatal asthma:-
 ↳ attack with 4 paco₂
 need intubation if the
 pt not respond to max
 medical ttt...

mild-intermittent asthma	mild-persistent asthma	moderate-persistent asthma	severe-persistent asthma	severe asthma
- < weekly - normal or near normal lung fx between the episodes!	- > weekly - < daily - normal or near normal lung fx between the episodes!	- daily - mild-moderate variable airflow limitation...	- daily + interfere with normal activity... - frequent nocturnal waking + moderate-severe variable airflow limitation...	- severe distressing symptom prevent sleeping... - severe airflow limitation + poor response to to the inhaled bronchodilators [life threatening]..

presentation :- ① mild-moderate:- tachypnea [lung hyperinflated & hyperinflated]

- Diffusion - gas exchange...
- prolonged expiration...
- mild-diffuse wheezing [partial obstruction]...

complete obs. ← acute, severe asthma [resp failure] & jō jō silent - لا شيء

* the poor prognosis factor:- Fatigue - diaphoresis - inaudible breath sound.

- ↓ wheeze to silent chest - cyanosis - bradycardia...

② severe acute attack:- hypoxia + Resp. failure. Use accessory muscle at resp → muscle fatigue [diminished breath sound]
↓
↓ gas exchange] Apnea.

- loud wheezing..

- hyper-resonance

- unable to speak full sentence. Dyspnoea in exp. at beginning then become biphasic
 - ↳ in insp. due to muscle fatigue.
 - ↳ in exp. due to obstruction.

notes:-

notes:-
① residual volume [RV]:- remain inside the lung after forced expiration ≈ 1.2 L [increased in asthma and COPD].
↳ fx:- 1. prevent the lung collapse. 2. ↓ resistance of airflow. 3. active blood gas exchange during exp.

② Tidal volume [TV]:- volume during normal insp. and exp. [at rest] ≈ 500 mL.

③ exp. reserve volume [ERV]:- volume exp. after TV in forced exp. $\approx 1L$

④ insp. reserve volume [IRV].- volume insp after TV in forced exp. $\approx 3.3\text{L}$.

⑤ inspiratory capacity [IC]:- $TV + IRV..$

⑥ functional residual capacity [FRC] $RV + ERV..$

... أمثلة (7) vital capacity [VC] $IRV + TV + ERV$.

⑧ Total lung capacity [TLC]: $RV + ERV + TV + IRV..$

do spirometry ← intermediate probability

Start \$\$\$ \leftarrow \uparrow \text{probability of asthma}

➤ Diagnosis of asthma

- History - clinical symptom... [cough - wheeze - dyspnea - chest tightness]...
- physical finding.
- spirometric finding..

x if the symptoms improved with bronchodilator or corticosteroids this strongly suggest the diagnosis of asthma...

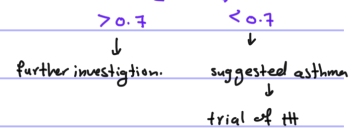
Features which make a diagnosis of asthma <u>more likely</u>	Features which make a diagnosis of asthma <u>less likely</u>
- More than one of the following symptoms: wheeze, breathlessness, chest tightness and cough, particularly if: - symptoms worse at night and in the early morning - symptoms in response to exercise, allergen exposure and cold air - symptoms after taking aspirin or beta blockers - History of atopic disorder - Family history of asthma and/or atopic disorder - Widespread wheeze heard on auscultation of the chest - Otherwise unexplained low FEV₁ or PEF (historical or serial readings) - Otherwise unexplained peripheral blood eosinophilia	- Prominent dizziness, light-headedness, peripheral tingling CNS - Chronic productive cough in the absence of wheeze or breathlessness - Repeatedly normal physical examination of chest when symptomatic - Voice disturbance - Symptoms with colds only - Significant smoking history (ie >20 pack years) Cardiac disease - Normal PEF or spirometry when symptomatic

① High probability of asthma:- we start **tt**
 ↳ good response to **tt** → **ve** test of reversibility.
 ↳ poor response to **tt** → need further investigation

② low probability:- need further investigation and think of alternative diagnosis:-

③ intermediate probability:- spirometry → initial test + further investigation with trial of **tt** for a specific period before confirming dx and establish maintenance **tt**.

→ The **tt** guided by the **FEV₁ / FVC ratio**:-



* **Spirometer**:- we can measure $\begin{matrix} VC \\ ERV \\ IRV \\ TLC \\ TV \end{matrix}$ [FRC, TLC, 1st Lst capacity, 1st TV, 1st Lst volume, 1st VC]
 ↳ at rest
 ↳ the most accurate breathing test for asthma...
 ↳ we do it before and after using **tt** → **ve**:- there is improvement in **FVE₁ ≥ 12%** in response to **tt** + 1 volume ≥ 200ml

* **PFT** [diagnostic test] → as spirometry:- $\frac{FEV_1}{FVC}$ [normally 75-80%] 6sec in 1st sec.
 ↳ in obstructive lung dz the ratio decreased [دخول كذا في كذا كذا OLD 1st Lst out]
 if the **FEV₁ ≥ 12%** + 200ml after use **albuterol** ← bronchodilator [دخول كذا في كذا كذا asthma 1st Lst out]

* **FVC**:- volume of forced exp.
 * **FEV₁**:- the exp. in first second.

diurnal variation% = $\frac{\text{highest} - \text{lowest PEF}}{\text{highest PEF}} \times 100\%$

* **peak flow meter**:- measure the rate at which air is forced out of the lung. Knows **peak expiratory flow [PEF]**...
 ↳ >20% diurnal variation → significant.
 ↳ >25% diurnal variation [pre- post bronchodilator] → support dx of asthma.
 * the assessment should be made over 2 week...

in restrictive lung dz the ratio between $\frac{FEV_1}{FVC}$ ≤ 80%

* **Objective tests for dx asthma**:- ① **airway infl. measures** → Fractional exhaled nitric oxide [FeNO] test...
 ↳ air tract 1st Lst infl. or irritation...
 ↳ +ve if the level ≥ 40 part / billion ppb → eosinophilic induced asthma
 ↳ the smoking lower the FeNO level...

② **lung fx test** → spirometer :- **FEV₁ / FVC < 70%** **ve** → indicate the obst. lung dz.
 ↳ **Bronchodilator reversibility [BDR]** → if +ve spirometry we give them **tt** to see peak exp. flow rate
 ↳ if the **FEV₁ ≥ 12%** and 200ml → +ve test → asthma.
 ↳ **peak exp flow variability**:- +ve if the value ≥ 20% variability.

normal spirometry → uncertain dx after initial assessment and **FeNO +ve** → we use it in:-
 ↳ +ve BDR but **FeNO ≤ 39 ppb** → or
 ↳ **FeNO ≥ 25** + -ve BDR + ④ve spirometry + uncertain dx after initial assessment → ↳ monitor it for 2 to 4 weeks...

③ **airway hyper reactivity measures**:- direct bronchial challenge tests + histamine or methacholine

FeNO ≥ 40 + no peak flow variability → uncertain dx after normal spirometry → indication

FeNO ≤ 39 + peak flow variability →

there is obst. spirometry without BDR + **FeNO ≥ 25 ppb** + no peak flow variability →

PC20 value ≤ 8 mg/mL → +ve test

③ CHF as a cause of exacerbation...

② Charcot-Leyden crystals... Eosinophilia - associated allergic inf. dz formed as break down of eosinophils in sputum and crystallization of major basic proteins...

* IgE level:- we use IgE Ab [omalizumab]

④ any activity limitation due to asthma...

3-4:- with uncontrolled asthmatic..

COPD = chronic obstructive pulmonary disease; **DLCO** = diffusion capacity of the lung for carbon monoxide

SABA = short-acting beta-2 agonist.



→ side effects - [hepatotoxic - associated with churg strauss \$]..

- effective as doubling the

side effect of Ipratropium-

Tachycardia [↓ systole - diastole]

↑ risk of coronary perfusion ↓

of IHD-

The disadvantages of ipratropium-

need 90 min. to achieve max.

broncho dilator-

- very effective in COPD

- Broncho dilator - secretion

⑤ LABA:- ^{lead to paradoxical bronchospasm} Salmeterol - formoterol...

⑥ oral corticosteroid:- prednisone...

⑦ we give for all asthmatic pt → influenza + pneumococcal vaccine to ↓ risk of pneumonia...

⑧ omalizumab:- monoclonal Ab bind to IgE [indicated in severe persistent allergic IgE mediated asthma] [SQ every 2-4 week]...
 ↳ side effect:- injection site pain - swelling - erythema - pruritus - headaches...

NON-PHARMACOLOGICAL MANAGEMENT (British guideline on the management of asthma 2016)

- stop smoking.
- **Weight-loss** interventions (including dietary and exercise-based programmes) can be considered for overweight and obese with asthma to improve asthma control.
- **Breathing exercise** programmes (including physiotherapist-taught methods) can be offered to people with asthma as an adjuvant to pharmacological treatment to improve quality of life and reduce symptoms.

* Systemic corticosteroids side effect:-

- ① osteoporosis..
- ② Cataract..
- ③ adrenal suppression, fat redistribution..
- ④ hyperlipidemia..
- ⑤ hyperglycemia..
- ⑥ Acne..
- ⑦ hirsutism..
- ⑧ thinning of skin..
- ⑨ striae..
- ⑩ easy bruising..

* variants of asthma:

① Acute severe asthma-

Patients with acute severe asthma are stratified into moderate, severe or life-threatening

Moderate	Severe	Life-threatening ^{as pt has life threatening attack}
• PEFR 50-75% best or predicted • Speech normal • RR < 25 / min • Pulse < 110 bpm	• PEFR 33-50% best or predicted • Can't complete sentences • RR > 25/min • Pulse > 110 bpm	• PEFR < 33% best or predicted • Oxygen sats < 92% • PaO₂ < 8 kPa • Normal PaCO₂ (4.6-6.0 kPa) • Silent chest, cyanosis or feeble (Poor) respiratory effort • Bradycardia, dysrhythmia or hypotension • Exhaustion, confusion or coma

Clinical signs, symptoms in resp. failure:-
 1- markedly ↓ breath sound
 2- absent wheeze..
 3- ↓ mental state..
 4- marked hypoxia + cyanosis..

* tired pt + normal or elevated paco₂ → poor prognosis → respiratory failure (due to muscle fatigue) → may need ventilation..
 ↳ most worrying result for li^o

* in acute asthma attack there is:- ↑RV, ↑TLC, ↑RV/TLC

* Ht:- ① see O₂ saturation
 ↳ >90% no need for O₂ therapy
 ↳ <90% give O₂..

② B₂ agonists inhaler as ^{urgent} albuterol but in cardiac pt we give ipratropium..
 ↳ nebulizer:- [in 15 min onset]..
 ↳ side effect:- tremor - headache - palpitation - hypokalemia → arrhythmia - ECG changes.

③ Steroids:- 200mg hydrocortisone IV...

* The best initial Ht:- O₂ + SABA inhaler + bolus of steroids..

④ magnesium sulfate: if not respond to previous drug..
 ↳ 2gm in 200 cc normal saline

⑤ endotracheal intubation, mechanical ventilation, ICU:- if not respond + resp. acidosis...

② Asthma in pregnancy:

* SABA - LABA - ICS → safe during pregnancy..

* theophylline - inhaled drugs - prednisolone → safe in pregnancy and breast feeding..

* any pregnant female take prednisolone 7.5mg daily for ≥ 2week should receive parental hydrocortisone 100mg 6-8 hours during labour..

* the PG F_{2α} lead to broncho constriction..

drugs not effective in acute exacerbation of asthma:-

- ① Theo hyline..
- ② Cromolyn and nedocromil..
- ③ omalizumab
- ④ LABA.
- ⑤ leukotriens modifiers..



Ca²⁺ antagonist

⑤ E theophiline / IV SABA

③ exercise induced asthma- diagnosed with spirometry before and after exercise...

↳ typical obstructive pattern follow the exercise...

④ cough variant asthma:- there is airway inflam. but minimal bronchoconstriction..

↳ respond to Steroids [diagnosis method]..

* no Hx of asthma but the cough worse in the mornings, cold air, after exercise..

* Ht:- high dose of ICS for at least 2 month or short course of oral steroids...

⑤ difficult asthma:-

Difficult asthma → persisting asthma, despite prescription of high-dose asthma therapy.

- Always consider poor adherence to maintenance therapy.
- Consider monitoring induced sputum eosinophil counts to guide steroid treatment.
- Dysfunctional breathing should be considered as part of a difficult asthma assessment.
- allergen testing to moulds should be performed.
- Commonly associated with co-existent psychological
- differential diagnosis in difficult asthma clinic:

➤ **Subglottic stenosis**

- defined as a narrowing of the airway below the vocal cords (subglottis) and above the trachea. It may be congenital or acquired.
- can occur from birth, idiopathically and in patients who have been intubated.
- predominance of inspiratory rather expiratory wheeze

* asthma complication. ① pneumonia...

② Bronchoectasis due to recurrent pneumonia...

③ pneumothorax...

④ acute severe asthma [resp. failure type II]

⑤ arrythmia..

⑥ Atelectasis → collapse of part or whole lung...

Done ☒