Chronic Obstructive Pulmonary Disease (COPD) Summary

1. Definition

COPD is a devastating disorder that causes airflow obstruction due to chronic bronchitis and emphysema. The airflow obstruction is generally progressive, may be accompanied by airway hyper-reactivity, and is partially reversible.

It is the **fourth** leading cause of death in the United States and the **sixth** leading cause of mortality in **low**- and **middle-income countries**.

2. Components of COPD
   - **Fixed obstruction**: Chronic bronchitis, emphysema
   - **Reversible obstruction**: Bronchial asthma

3. Definitions

Chronic Bronchitis (MRC, 1965):
Presence of a chronic productive cough for at **least 3 months** in each of **2 consecutive years**, with other causes of cough excluded.

Emphysema (ATS, 1962):
Abnormal, **permanent** enlargement of air spaces **distal** to the terminal bronchioles, with destruction of their walls and **without** fibrosis.

4. Epidemiology
   - USA: 14.2 million COPD patients
   - 12.5 million with chronic bronchitis
   - 1.7 million with emphysema
   - Increase by 41.5% since 1982
   - Prevalence: Men 8–17%, Women 10–19%
   - Jordan (2014): Prevalence 12.5%
   - Spain (age 40–69): 9.1%
   - Jordan (age 55–90): 17% (67% smokers)

5. Mortality
   - USA (1985):
   - 200 deaths per 100,000 males (55–84 years)
   - 80 per 100,000 females
   - Romania: >400 deaths per 100,000 (males 65–74)
   - Japan: <100 deaths per 100,000
   - Egypt: 257.2 per 100,000 (ages 55–64)

male > female.

6. Risk Factors

a. Age
- Increases after 45 years.
- 4–6% of white males and 1–3% of white females affected.

b. Sex
- Mortality higher in <u>men</u> but increasing in women.

c. Cigarette Smoking
- Most important risk factor.
- 15% of cigarette smokers develop COPD.
- Smoking causes 81.5% of all COPD deaths.
- Predictors of mortality:
1. Age at smoking initiation
2. Number of cigarettes smoked
3. Current smoking status
- Smokers show greater annual decline in lung function and premature lung aging.

d. Passive Smoking
- Increases risk of respiratory infections, worsens asthma, and reduces lung function.

e. Air Pollution
- Sources: Transportation, power plants, space heating, industry, refuse burning.
- Pollutants: CO, NO_2, SO_2, lead, hydrocarbons, particulates.
- Effects: Increased respiratory deaths in elderly and infants.
- More common in urban than rural areas.

• Space heating • Gases (e.g. NO2, CO) • Hydrocarbons

• Solid Waste (e.g. Refuse) • Gases • Hydrocarbons • PVC (Polyvinyl chloride, is the third-most widely produced plastic, after polyethylene and polypropylene

• Power Plants: • NO2 • SO2 • Hydrocarbons

• Transportation • CO • NO2 • SO2 • Lead

■ Industry: ■ Different particulates ■ Gases (NO2, CO, SO2) ■ Smoke

f. Socioeconomic Condition
- Low socioeconomic status → increased morbidity and mortality.

g. Familial Factors
- COPD shows familial clustering.

h. Occupation (Workplace Pollution)
- Exposure to gases, fumes, vapors, dust (e.g. welding fumes, silica, PVC, NO_2, SO_2) → "Industrial Bronchitis".

i. $α_1$-Antitrypsin (AAT) Deficiency
- Only known genetic risk factor for COPD (<1% of cases).
- AAT inhibits neutrophil elastase in lungs.
- Deficiency → premature emphysema:

- Non-smokers: ~53 years
- Smokers: ~40 years
- COPD in a young non-smoker or female suggests AAT deficiency.

7. Clinical Manifestations
- History: Most patients smoke ≥20 cigarettes/day for ≥20 years.
- Onset: Usually in the 5th decade.
- Symptoms: Cough, sputum, dyspnea.
- Cough: Worse in the morning, produces colorless sputum.
- Breathlessness: Appears in 6th decade; when FEV_1 <30%, breathless with minimal effort.
- Wheezing: May occur during exertion or exacerbations.
- Advanced disease: Frequent exacerbations, cyanosis, right heart failure, anorexia, weight loss → poor

prognosis.

8. Prevention
  • COPD is largely preventable.
Main measures:

   1. Prevent smoking
   2. Reduce air pollution
   3. Control occupational hazards
   4. Early detection (screening high-risk groups)

9. Non-Pharmacologic Therapy
  • Smoking cessation: Most effective strategy to slow or stop progression.
  • Pulmonary rehabilitation: Improves exercise tolerance and reduces dyspnea and fatigue.

10. Avoiding Lung Irritants
  • Avoid exposure to fumes, pollen, pollutants.
  • Wear a face mask if exposed to irritants at work.

11. Preventing Respiratory Infections
  • Annual flu shot and pneumonia vaccine recommended.
  • Frequent hand washing reduces infections.

12. Nutrition
  • Supplements: Vitamins A, C, E, zinc, bioflavonoids.
  • Avoid dairy, sugary foods, and eggs (increase mucus).

13. Immunization
  • Vaccines against influenza and pneumonia for young and chronic patients.

14. Goals of COPD Management
   1. Prevent disease progression
   2. Relieve symptoms
   3. Improve exercise tolerance
   4. Improve overall health
   5. Prevent/treat exacerbations
   6. Prevent/treat complications
   7. Reduce morbidity and mortality

1. **COPD is characterized by airflow obstruction due to:**
A) Bronchial asthma
B) Emphysema and chronic bronchitis ✅
C) Tuberculosis
D) Pneumonia

2. **Chronic bronchitis is clinically defined as:**
A) Cough lasting 2 months each year
B) Chronic productive cough for 3 months in each of 2 consecutive years ✅
C) Dry cough for 1 year
D) Productive cough for 1 month

3. **The hallmark of emphysema is:**
A) Fibrosis of alveoli
B) Enlargement of air spaces distal to terminal bronchioles with wall destruction ✅
C) Mucus gland hyperplasia
D) Alveolar collapse

4. **The most important risk factor for COPD is:**
A) Air pollution
B) Smoking ✅
C) Occupational exposure
D) Passive smoking

5. **Clinically significant COPD develops in approximately what percent of smokers?**
A) 5%
B) 10%
C) 15% ✅
D) 25%

6. **α_1-Antitrypsin deficiency mainly causes:**
A) Asthma
B) Chronic bronchitis
C) Premature emphysema ✅
D) Pulmonary fibrosis

7. Breathlessness usually appears when FEV_1 falls to:
A) 90% of predicted
B) 60% of predicted
C) 30% of predicted ✅
D) 10% of predicted

8. Which of the following increases COPD morbidity and mortality?
A) High socioeconomic status
B) Decreased socioeconomic condition ✅
C) Regular exercise
D) Good nutrition

9. The most effective measure to prevent COPD progression is:
A) Air filters
B) Pulmonary rehabilitation
C) Smoking cessation ✅
D) Vaccination

10. A young nonsmoker with emphysema should be evaluated for:
A) Asthma
B) α_1-Antitrypsin deficiency ✅
C) Cystic fibrosis
D) Lung cancer

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