

Pneumonia

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Pneumonia: is defined as an acute lower respiratory tract parenchyma infection by agents such as bacteria, viruses, fungi, or even parasite, usually by bacteria .It associated with recently developed radiological pulmonary shadowing, which may be segmental, lobar or multilobar. It should be distinguished from pneumonitis, which is an inflammation of the lungs from a variety of noninfectious causes, including chemicals, radiation, and autoimmune processes. pneumonias are usually classified as community or hospital-acquired, or those occurring in immunocompromised hosts .

Lobar pneumonia: is a radiological and pathological term referring to homogeneous consolidation of one or more lung lobes often with associated pleural inflammation.

Bronchopneumonia: refers to more patchy alveolar consolidation associated with bronchial and bronchiolar inflammation, often affecting both lower lobes.

Community-Acquired Pneumonia (CAP):

CAP may affect all age groups but is particularly common at the extremes of age; for example, worldwide, CAP continues to kill more children than any other illness and the effected of the debilitated elderly patients ,Most cases are spread by droplet infection, occurs twice as frequently during winter and . CAP may occur in previously healthy individuals. Streptococcus pneumoniae is the most common causative agent.

Several factors may impair the effectiveness of local defenses and predispose to CAP:

- Upper respiratory tract infections
- Alcohol
- Glucocorticoid therapy
- Old age
- Recent influenza infection
- Pre-existing lung disease
- HIV
- Indoor air pollution

Microbiology:

Typical bacterial pathogens include *S. pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus*, and gram-negative bacteria such as *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*.

Staphylococcus aureus or Klebsiella pneumonia : theses serious M.O .Suggested by multilobar shadowing, cavitation, pneumatoceles and abscesses.

Pseudomonas aeruginosa is of considerable significance in patients with cystic fibrosis, since it correlates with a worsening clinical condition and mortality. It is also seen in patients with neutropenia following cytotoxic chemotherapy.

Atypical Pneumonias:

Organisms include *Mycoplasma pneumoniae*, *Legionella* species, *Chlamydia pneumoniae* . in

Mycoplasma pneumonia: Cough may not be obvious initially physical signs in the chest may be absent .and characterized by gastrointestinal symptoms as diarrhea , in addition to fever, headache, and myalgias, hemolytic anemia , hepatitis, erythema multiforme, hyponatremia, myocarditis , pericarditis , and neurologic abnormalities.

On chest X-ray, usually one lobe is involved and there is no correlation between the X-ray appearances and the clinical state of the patient (less respiratory symptoms).

Legionella pneumonia: occurs in Summer due to exposure to contaminated construction site, water source, air conditioner. patient comes with malaise, myalgia, headache and a fever with rigors and a pyrexia of up to 40°C. Half of the patients have gastrointestinal symptoms, with nausea, vomiting, diarrhoea and abdominal pain. Patients may be acutely ill, with mental confusion. and other neurological signs. Hematuria occurs and occasionally renal failure.

Chlamydia pneumoniae : either due to exposed to infected birds, especially parrots, causes Chlamydia psittaci comes with illness presents with a high fever and sweating with photophobia and neck stiffness that can be confused with meningitis. or due to other Chlamydia person-to-person spread without any avian or animal reservoir.

Viral Pneumonias:

Viral causes may include up to 65% of cases of community acquired pneumonia in infants and preschool-age children (<5years). The most common causes include rhinovirus, influenza, parainfluenza virus, adenovirus, enterovirus, coronavirus and respiratory syncytial virus (RSV). It is common in late winter and early spring, when RSV is common, and co-infection with RSV causes severe pneumonia. A novel virus was isolated from a man in Saudi Arabia. This Middle East respiratory syndrome coronavirus (MERS-CoV) causes severe acute pneumonia, acute respiratory distress syndrome (ARDS), and acute kidney injury.

Pneumonias due to opportunistic infections:

Immunocompromised patients develop pneumonia with all the usual organisms and with a number of organisms which do not normally cause illness in healthy hosts.

Pneumocystis Jiroveci:

This is the most common opportunistic fungus infection, accounting for 50% of the cases of pneumonia in patients with acquired immunodeficiency syndrome (AIDS), particularly when the CD4 lymphocyte count is < 200/mm³. It is also seen in patients receiving immunosuppressive therapy.

Clinically the pneumonia is associated with a high fever, breathlessness and dry cough.

radiographic appearance of PCP is of a diffuse bilateral alveolar and interstitial shadowing beginning in the perihilar regions and spreading out in a butterfly pattern.

Treatment of PCP is with high-dose co-trimoxazole, and as prophylaxis aerosolized pentamidine

Clinical Manifestation of CAP:

Patients frequently have fever, chills, sweats, cough (either nonproductive or productive of mucoid, purulent, or blood-tinged sputum-rusty color sputum is common), pleuritic chest pain, and dyspnea. Other common symptoms include nausea, vomiting, diarrhea, fatigue, headache, myalgias, and arthralgias. Elderly patients may present atypically, with confusion.

Physical examination:

On examination, patient feverish, the respiratory and pulse rate may be raised and the blood pressure low, while an assessment of the mental state may reveal a delirium. often reveals dyspneic, limitation of chest expansion in affected area, increased or decreased tactile fremitus; dull percussion reflecting consolidation crackles, bronchial breath sounds and a pleural friction rub if pleural membrane involved in inflammation.

Investigations for pneumonia :

Investigations for pneumonia is to confirm the diagnosis, assess the severity and identify the development of complications. While many cases of mild to moderate CAP can be successfully managed without identification of the organism.

Chest X-ray:

Lobar pneumonia:

Patchy opacification evolves into homogeneous consolidation of affected lobe. Air bronchogram (air-filled bronchi appear lucent against consolidated lung tissue) may be present.

Bronchopneumonia: Typically patchy and segmental shadowing usually bilateral.

Blood tests :

Full blood count Very high WBC ($> 20 \times 10^9/L$) or low ($< 4 \times 10^9/L$) white cell count: marker of severity, Neutrophil leucocytosis $> 15 \times 10^9/L$: suggests bacterial aetiology. Hemolytic anaemia: occasional complication of Mycoplasma.

Urea and electrolytes: Urea > 7 mmol, and hyponatremia indicate severity of pneumonia

Liver function tests Abnormal if basal pneumonia inflames liver and in atypical pneumonia, Hypoalbuminaemia marker of severity

ESR/C-reactive protein, non-specifically elevated

• **Blood culture**, Bacteraemia: marker of severity

• **Serology**

Acute and convalescent titres for Mycoplasma, Chlamydia, Legionella and viral infections

Cold agglutinins Positive in 50% of patients with Mycoplasma

Arterial blood gases: Measure when $SaO_2 < 93\%$ or when severe clinical features to assess ventilatory failure or acidosis.

Sputum: Sputum samples: Gram stain, culture and antimicrobial sensitivity testing

Oropharynx swab: PCR for Mycoplasma pneumoniae, viral pneumonia and other atypical pathogens

Urine examination : Pneumococcal and/or Legionella antigen.

Pleural fluid: Always aspirate and culture when present, preferably with ultrasound guidance.

CURB65 Score for the severity of Pneumonia :

- ❖ Confusion
- ❖ Urea > 7 mmol/L
- ❖ Respiratory rate $> 30/min$
- ❖ Blood pressure (systolic < 90 mmHg or diastolic < 60 mmHg)
- ❖ Age > 65 years

(0-1) → Likely to be suitable for home treatment.

(2) → Consider Short-stay inpatient hospitalization

(3 or more) → Manage in hospital as severe

Indications for referral to ICU:

CURB score of 4–5, failing to respond rapidly to initial management

- Persisting hypoxia ($\text{PaO}_2 < 8 \text{ kPa (60 mmHg)}$), despite high concentrations of oxygen
- Progressive hypercapnia
- Severe acidosis
- Circulatory shock
- Reduced conscious level

Treatment: Community-Acquired Pneumonia:

An important decision in the care of community-acquired pneumonia is whether the patient requires hospital admission. Antimicrobial therapy should be initiated promptly after the diagnosis of pneumonia is established.

Oxygen:

Supplemental oxygen should be administered to maintain saturations between 94% and 98% provided the patient is not at risk of carbon dioxide retention, due to loss of hypoxic drive in COPD.

Intravenous fluid :required in hypotensive patients showing any evidence of volume depletion.

Antibiotic Treatment for CAP:

Uncomplicated CAP:

1- Amoxicillin 500 mg 3 times daily orally

2-If patient is allergic to penicillin

Clarithromycin 500 mg twice daily orally or Erythromycin 500 mg 4 times daily orally

3-If Staphylococcus is cultured or suspected: Flucloxacillin 1–2 g 4 times daily IV plus Clarithromycin 500 mg twice daily IV.

4-If Mycoplasma or Legionella is suspected: Clarithromycin 500 mg twice daily orally or IV or Erythromycin 500mg 4 times daily orally plus Rifampicin 600 mg twice daily orally or IV in severe cases.

Severe CAP:

-Clarithromycin 500 mg twice daily IV or Erythromycin 500 mg 4 times daily IV plus Co-amoxiclav 1.2 g 3 times daily IV or

Ceftriaxone 1–2 g daily IV or

Cefuroxime 1.5 g 3 times daily IV or

Amoxicillin 1 g 4 times daily IV plus flucloxacillin 2 g 4 times daily IV.

The recommended treatment duration for community-acquired pneumonia is a 7- to 10-day course of antibiotics .

It is important to relieve pleural pain, as it may prevent the patient from breathing normally and coughing efficiently. For the majority, simple analgesia with paracetamol, co-codamol or NSAIDs is sufficient.

Delayed recovery suggests either that a complication has occurred ,that the diagnosis is incorrect or alternatively ,that the pneumonia may be secondary to a proximal bronchial obstruction or recurrent aspiration.

Complications of pneumonia:

-Para-pneumonic effusion – common

-Empyema

- Retention of sputum causing lobar collapse .
- Pneumothorax, particularly with Staph. Aureus.
- Suppurative pneumonia/lung abscess.
- Acute Respiratory Distress Syndrome (ARDS), renal failure, multi-organ failure.
- Hepatitis, pericarditis, myocarditis, meningoencephalitis.
- Arrhythmias (e.g. atrial fibrillation).
- Pyrexia due to drug hypersensitivity.
- Deep vein thrombosis and pulmonary embolism.

Pneumonia prevention:

Reduce exposure to indoor air pollution

Improve housing conditions

Immunization

Avoid smoking near children

Adequate nutrition

Nosocomial Pneumonia:

(Pneumonias related to Hospitalized patients)

Refers to a new episode of pneumonia occurring at least 2 days after admission to hospital, Nosocomial pneumonia is the second most common infection among hospitalized patients and the most common infection in the intensive care unit.

there are 3 terms of nosocomial pneumonia:

Hospital-acquired pneumonia (HAP); It is the second most common hospital acquired infection .

Ventilator-associated pneumonia (VAP); patients in intensive care units, with mechanically ventilation .

Health care-associated pneumonia (HCAP). Patients resident in hemodialysis unit, a nursing home or other long-term care facility.

The factors predisposing to the development of pneumonia in a hospitalized patient are:

- ❖ Reduced host defences against bacteria
- ❖ Reduced immune defences (e.g. corticosteroid treatment, diabetes, malignancy)
- ❖ Reduced cough reflex (e.g. post-operative)
- ❖ Disordered mucociliary clearance (e.g. anaesthetic agents)
- ❖ Bulbar or vocal cord palsy

The organisms implicated in early-onset HAP are similar to those involved in CAP. Late onset HAP is associated with a different range of pathogens to CAP, with more Gram-negative bacteria (e.g. Escherichia, Pseudomonas), Staph. aureus and anaerobes.

Clinical features:

The diagnosis should be considered in any hospitalized or ventilated patient who develops

- purulent sputum (or endotracheal secretions),
- new radiological infiltrates, an otherwise unexplained increase in oxygen requirement,
- Acore temperature of more than 38.3°C, and a leukocytosis or leucopenia.

Investigations :

- Microbiological confirmation should be sought whenever possible.
- The full blood count (FBC).

- Urea and electrolytes (U&E).
- Erythrocyte sedimentation rate (ESR) .
- C-reactive protein (CRP).
- Arterial blood gas samples .
- Chest X-ray performed.

Management:

In early-onset HAP, patients who have received no previous antibiotics can be treated with co-amoxiclav or cefuroxime.

If the patient has received a course of recent antibiotics, then piperacillin/tazobactam or a third generation cephalosporin should be considered.

In late-onset HAP, the choice of antibiotics must cover the Gram-negative bacteria , Staph. aureus (including MRSA) and anaerobes. Antipseudomonal cover may be provided by a carbapenem (meropenem) or a third-generation cephalosporin combined with an aminoglycoside.

Prevention:

The mortality from HAP is approximately 30%, so prevention is very important. Good hygiene particularly with regard to hand washing and any equipment used. The risk of aspiration should be minimized, and the use of stress ulcer prophylaxis with proton pump inhibitors limited, as they may increase the risk of ventilator associated pneumonia.

Lung Abscess and Suppurative pneumonia :

often develop after the inhalation of septic material during operations on the nose, mouth or throat under general anesthesia, or of vomitus during anesthesia or coma, particularly if oral hygiene is poor.

Clinical features of suppurative pneumonia:

Symptoms

- Cough with large amounts of sputum, sometimes fetid and blood-stained
- Pleural pain common
- Sudden expectoration of copious amounts of foul sputum if abscess ruptures into a bronchus.

Clinical signs:

- High remittent pyrexia
- Profound systemic upset
- Digital clubbing may develop quickly (10–14 days)
- Consolidation on chest examination; signs of cavitation rarely Found
- Pleural rub common
- Rapid deterioration in general health, with marked weight loss if not adequately treated.

Investigations:

Radiological features of lung abscess include homogeneous lobar or segmental opacity consistent with consolidation or collapse. Abscesses are characterized by cavitation and fluid level. appears as a thick-walled solitary cavity surrounded by consolidation An air-fluid level is usually present. Other causes of cavitory lung disease (tuberculosis, lung cancer, infarction, Wegener granulomatosis) should be excluded.

Management

Aspiration pneumonia can be treated with intravenous co-amoxiclav 1.2 g 3 times daily.

If an anaerobic bacterial infection is suspected ,oral metronidazole 400 mg 3 times daily should be added.

community-acquired MRSA (CA-MRSA) is usually susceptible to a variety of oral non- β -lactam antibiotics, such as trimethoprim /sulfamethoxazole, **clindamycin**, **tetracyclines** and **linezolid**. Antibiotics should be continued for 6 weeks, and drainage should be reserved for very large abscesses or failure to resolve with antibiotics.

Differential diagnosis of pneumonia:

- Pulmonary infarction
- Pulmonary/pleural TB
- Pulmonary oedema (can be unilateral)
 - Pulmonary eosinophilia .
 - Malignancy: bronchoalveolar cell carcinoma
- Rare disorders: cryptogenic organising pneumonia/bronchiolitis obliterans organising pneumonia (COP/BOOP)