PNEUMONIA

Introduction

- Probably one of the oldest diseases, as old as known to human kind and has always remained a subject of challenge to medical science, despite extensive research.
- Pneumonia is the no. 1 cause of under 5 childhood mortality across the globe particularly in developing countries. Unfortunately ,over the years the mortality remained almost the same and hence it is known as “forgotten killer” or “silent killer”.

Epidemiology

- Approximately 150 million episodes of childhood pneumonia are reported every year from the world, out of which 95% are from developing countries.
- The 15 countries account for nearly 75% and 6 countries including India account of 50% . India alone bears the brunt of 25% disease burden.
- Out of the 7.6% million under 5 childhood mortality over the globe, 16% deaths are due to pneumonia.
- Among these 16% pneumonia deaths > 90% deaths occur in 68 poor nations, mostly from Africa and Asia.

In India disease burden is huge. The 45 million episodes are estimated annually with 6.6 million hospitalizations which contribute 24% national disease burden and 0.37 million deaths annually.

- Definition : defined as an inflammatory process involving lung parenchyma usually due to microorganisms. It is referred as “pneumonitis” when the cause is noninfectious.
- CLASSIFICATION:

A. Community Acquired Pneumonia (CAP) : Acquired outside the hospital environment in a previously healthy immune subject. Shouldn’t hospitalized prior 14.
B. Nosocomial-Pneumonia: Acquired in the hospital setting after 48 hours of hospitalization.

- This classification doesn’t include “Recurrent Pneumonia”.

Etiology

a) Rampant use of antibiotics
b) Overcrowded & poor socioeconomic status
c) Immunosuppressed conditions
d) Viral URTI
e) Co morbid extra pulmonary conditions.
f) LBW
g) Lack of Breast feeding
h) Malnutrition vit. A ,D and zinc deficiency.

Etiology of Pneumonia

- Age group**: 0-3 months**:

i. Gram –ve Enterobacteriacae
ii. Enterococci
iii. Chlamydia trachomatis
iv. Group B streptococci
v. Hemophilus influenzae
vi. Streptococcus pneumoniae
vii. Listeria monocytogenes

- **3mo-5years**

i. Streptococcus pneumoniae
ii. Viruses
iii. Hemophilus influenzae
iv. Staphylococcus
v. Mycoplasma pneumoniae

- **>5 years** :

i. *Hemophilus influenzae*
ii. *Streptococcus pneumoniae*
iii. *viruses*
iv. *staphylococcus*

- Streptococcus pneumonia and H. Influenza- 60-70%
- Viral : 30-35%
- Atypical pneumonia : Mycobacterium pneumonia & Chlamydia- 11-13%
- Mixed infections 8 -40%
- WHO Grading

Pathogenesis

- Pneumonia is preceded by respiratory viral infection which disturbs the defense mechanism of the lungs and also disrupts the normal epithelial layer of respiratory tract and as a result there is dysfunction of ciliary brush border clearing mechanism.
- There is inhibition of phagocytosis by alveolar macrophages. Thus, bacteria and other organism invade the lung parenchyma and produce a pneumonic lesion.
- The invasion could be either direct spread from nasopharyngeal tract by respiratory droplet infection or could be by invasion through hematogenous dissemination within the lungs parenchyma.
- When the spread is hematogenous it is called “invasive or bacteremic pneumonia” and when the spread is direct it is called “nonbacteremic pneumonia”. However , the pathogenesis is still ill understood.

Clinical Features

- There is a symptoms triad of fever, cough, rapid breathing and or difficult breathing is classical clinical manifestation of pneumonia

- **WHO Clinical Grading of Pneumonia:**

Pneumonia	**Fever less than 38.5°C, no feeding difficulties, no dehydration, cough and tachypnea**
Severe pneumonia	High- grade fever more than 39°C , difficulty in feeding , tachypnea, respiratory distress with intercostal retraction(ICR) or subcostal retraction (SCR) , dehydration, grunt,bronchial breath sounds on auscultation with or without crackles, peripheral capillary oxygen saturation (SpO2) ≥92 at room air, radiological opacity on chest X-ray +/-
Very severe pneumonia	Inability to feed, altered sensorium, intermittent apneic spells, cyanosis,excessive diaphoresis, narrow pulse pressure, acidemia,and SpO2<92 at room air

Diagnosis

- Diagnosis of pneumonia is essentially clinical and seldom requires lab support. Absence of past history of recurrent cough and presence of fever with fast breathing is a hallmark presentation in clinical diagnosis of pneumonia.
- It should always be remembered that there are no definite differentiating markers between viral, bacterial and atypical pneumonia. However, there are certain clinical clues which can help to nail down on etiological diagnosis.

- Characteristics of viral pneumonia:

i. Acute –sudden onset
ii. Younger age
iii. Preceding upper respiratory catarrh
iv. Wheeze with crackles

Features	Typical pneumonia	Atypical pneumonia
age	More common in young infants,children and also in older children	School going children,adolescents and adults
Onset	Acute/sudden	Gradual/insidious
Facies	toxic	Well
Rigors	Shaking chills	Chilliness
wheeze	Rare or nil	Common
Cough	Productive	Nonproductive/paroxysmal
Sputum	Purulent / bloody	Mucoid
Temperature	High 102-104°F	Mild- moderate<102°F
Pleurisy	frequent	Frequent
Consolidation	Frequent	Frequent
Extrapulmonary manifestations	Uncommon	Common
Gram staining	Occasional growth of microbe	Rarely any growth
WBC Count	>15000/mm3;shift to left	>15000/mm3;no shift
Chest radiography	Defined density	Nondefined infiltrates

Lab Diagnosis

- Acute phase reactants: CBC, C-reactive protein, ESR have poor specificity and sensitivity. They do not distinguish between viral and bacterial etiology.
- Microbiology – sputum culture or blood culture maybe more specific but the yield is very poor(10-15%).
- Radiology : chest x-ray findings maybe suggestive of

a) Bacterial lobar consolidation
b) Bronchopneumonia
c) Interstitial pneumonia

- Invasive procedures like bronchoscopy ,bronchoalveolar lavage(BAL) and lung aspiration have high sensitivity and specificity. However they are too invasive to be advised
- Pulse oxymetry is a mandatory tool for monitoring the course of disease in all hospitalized children.

Differential diagnosis

- Though symptom complex of fever, cough and rapid /difficult breathing is classical presentation of pneumonia ; it is prudent to differentiate pneumonia from other masqueraders which may mimic with same symptomatology.

Management

- The mainstays of management are antibiotics and supportive treatment. It is imperative to understand that all pneumonias deserve antibiotics as differentiation between viral and bacterial is difficult- “Empirical antibiotics and prudent and rational in pneumonia”.
- Nonsevere pneumonia above the age of 3 months can be managed at domiciliary level with oral antibiotics. However , any pneumonia below the age of 3 months should be hospitalized and treated with parenteral antibiotics. The choice of antibiotics though empirical should be determined by age, severity, predisposing conditions if any and local epidemiology and drug resistance pattern.

- **Outpatient Management:**

for non severe pneumonias and accepting oral feeds includes:

a. Supportive care like maintenance of hydration , nutrition and antipyretics.

b. Antibiotics :

first line oral antibiotics should be given minimum for 5 days and 2nd line for 7 days. Child should be followed up after 24 hrs and if there is clinical improvement management should be continued. If the condition clinically deteriorates after 48 hrs one should revise the diagnosis, look for associated complications and co morbidities and change the antibiotics to 2nd line and if need arise

Cho

Age	First -line	Second –line
3 months-5 years	Amoxicillin	Co-amociclav/cefuroxi-me/chloramphenicol
>5 years	Amoxicillin	Macrolide /co-amoxiclav/cefuroxime

- **Indication for hospitalization**
- Infant <3 months
- Severe malnutrition
- Comorbities
- Associated complications
- Respiratory rate >70/min in infants & >50/min in older child.
- Respiratory distress – grunting, alae nasi flare,ICR,SCR
- Cyanosis (spO2 <92%)
- Poor oral intake/dehydration
- Inappropriate supervision at home

- **Inpatient management:** Management comprises of specific antimicrobial along with supportive care of nutrition, hydration, oxygen if needed, antipyretics and bronchodilators along with chest physiotherapy if needed.

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>5years	Amoxicillin	Macrolide /co-amoxiclav/

- In case of methicillin-sensitive *Staphylococcus aureus* (MSSA), the duration should be for 2 weeks and in case of methicillin-resistant *Staphylococcus aureus* (MRSA), it should be 4-6weeks.
- The duration of IV antibiotics should be for 5-7 days in uncomplicated cases, however, switch over to oral antibiotics may be considered if accepted orally.
- The switch-over therapy for injections of 3rd generation cephalosporin should be either cefpodoxime(10mg/kg/day in 2 divided doses) and should never be cefixime as it has **no activity** against *Pneumococcus* and poor activity against community pathogens responsible for pneumonia.

Complications

- These include:

a. Empyema
b. Pneumothorax
c. Bronchogenic dissemination
d. Septicemia
e. Osteomyelitis
f. Multiple systemic abscesses
g. Septic arthritis
h. Meningitis

Prognosis

- Prognosis is fairly good provided there is appropriate recognition and proper referral by the health care providers and early initiation of antibiotics.
- Unfortunately only 15-20% cases of pneumonia receive proper and adequate antibiotics, which is the main reason for high infant mortality due to pneumonias particularly in developing countries.

Prevention

A multifaceted approach is needed to prevent and control childhood pneumonia. These include:

- Exclusive breastfeeding for first 6 months of life
- Weaning to solid foods after 6 months of age, preferably with home-made foods
- Avoidance of risk factors like overcrowded environment exposure to pollution and bottle feeding
- Protection from malnutrition and supplementation of vitamin A and D
- Optimum immunization with diphtheria-pertussis-tetanus (DPT), measles, *Hemophilus influenzae b* (Hib)and pneumococcal vaccines at appropriate ages.