PNEUMONIA IN CHILDREN
INTRODUCTION

• 156 million new episodes / yr. - worldwide
• 151 million episodes - developing world
• 95% in developing countries
• 19% of all deaths in children <5 years
• 4 million worldwide death
TYPES

• Community acquired (CAP)

• Hospital acquired (Nosocomial)

• Aspiration

• Opportunistic

• Ventilator associated
PROTECTIVE MECHANISMS AGAINST PNEUMONIA

- Nasopharyngeal anatomy
- Bronchial division (dichotomous)
- Reflex bronchoconstriction
- Coughing, sneezing
- Mucociliary escalator
- Innate immunity
- Adaptive immunity (humoral, cell-mediated)
COMMUNITY ACQUIRED PNEUMONIA

- Community acquired pneumonia is an acute infection of the pulmonary parenchyma in a previously healthy child, acquired outside of a hospital setting.

- The patient should not have been hospitalized within 14 days prior to the onset of symptoms.
RISK FACTORS

- Rampant use of antibiotics
  Particularly B-lactames in viral URTIs
- Socio Economic Status
- Immunosuppressed conditions
- URTIs
- Comorbid Pulm. Illnesses
- Comorbid extra pulm. conditions
- Low Birth Weight
- Lack of Breast Feeding
- Malnutrition, Vit A, D & Zinc
- Pollution

CAP
HISTORY

• Fever, coryza
• Difficulty in breathing
• Feeding
• Activity
• h/o immunization
• h/o antibiotic use
• h/o hospitalization
• h/o pyoderma/ measles
• Recurrent episodes of breathlessness
• Family h/o asthma
CLINICAL FEATURES

- Tachypnea
- Chest retractions
- IC, SC, sternal
- Poor feeding,
- Pleural /abdominal pain
- Rales, wheeze, grunt
- Thoracoabdominal asynchrony
- Irritability drowsy, cyanosis
DIAGNOSIS

• Tachypnea (fast breathing) is the simplest tool to diagnose pneumonia

• Tachypnea with accessory muscles working = severe pneumonia

sensitivity and specificity (74% and 67% respectively)
<table>
<thead>
<tr>
<th>Age</th>
<th>Respiratory rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 2 months</td>
<td>60 or more</td>
</tr>
<tr>
<td>2 mo up to 12 mo</td>
<td>50 or more</td>
</tr>
<tr>
<td>12 mo up to 5 yrs.</td>
<td>40 or more</td>
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**Tachypnea is the simplest tool to diagnose Community acquired pneumonia than chest radiography**
• Chest radiography
• WBC count
• Acute phase reactants
• Sputum
• Blood culture
• Pleural fluid analysis
• Serology/PCR
• Antigen detection
• Broncho alveolar lavage (BAL)
• Transthoracic puncture
DIFFERENTIAL DIAGNOSIS

• Bronchiolitis
• WALRI
• Asthma
• Metabolic acidosis (DKA, CRF)
• Congestive heart failure
CHEST RADIOGRAPHY

• Symptoms are present before radiographic findings
• Poor indicators of aetiology
• Too insensitive to differentiate - *bacterial* and non-bacterial
• Inter observer variation
• Useful in exclusion of other diagnoses, complications
• Follow up chest radiography – persistent pneumonia
Consolidation - right upper zone
Staphylococcal Pneumonia
HEMATOLOGICAL TESTS

• Complete blood count - information about the current infection.

• Leukocytosis (WBC above 16000/µL) and leucopenia (WBC below 4000/µL) - acute infection.

• CRP - do not help in the diagnosis; useful in monitoring the disease
NEWER MICROBIOLOGICAL INVESTIGATIONS

• Acute and convalescent sample - where a microbiological diagnosis was not reached

• Nasopharyngeal aspirates <18 mo for viral antigen detection in nasopharyngeal aspirates

• Viral antigen detection by immunofluorescence is highly specific for respiratory syncytial virus, parainfluenza virus, influenza virus, and adenovirus.
## CLUES TO ETIOLOGY OF PNEUMONIA

<table>
<thead>
<tr>
<th>Predisposing Factor</th>
<th>Organism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyoderma, Measles</td>
<td>Staphylococcus</td>
</tr>
<tr>
<td>HIV</td>
<td>Pneumocystis, Tuberculosis</td>
</tr>
<tr>
<td>Neutropenia</td>
<td>Gram Negative, Aspergillus</td>
</tr>
<tr>
<td>Cystic Fibrosis</td>
<td>Pseudomonas, Staphylococcus</td>
</tr>
</tbody>
</table>
CLINICAL/INVESTIGATION CLUES FOR ETIOLOGY

- Preceding coryza- ? Viral

- Young infant with neonatal conjunctivitis- ? Chlamydia

- Multisystem involvement (rash, anemia, hepatitis, CNS) – ? Mycoplasma

- No leukocytosis – viral/ mycoplasma

- Pneumatoceles – Staphylococcus
PLEURAL FLUID ANALYSIS

Exudative fluid will be:

- Purulent
- pH < 7.1
- Glucose < 40
- Proteins > 3g/dl,
- LDH > 1000 IU/L
COMMON ETIOLOGICAL AGENTS

• Viruses- 35%
• Bacteria- 60% (H influenzae, S pneumonia, Staph)
• Mycoplasma – 24-30% (more in above 5 years)
• Chlamydia- 6-11%
• Mixed infections- 9%
VIRUSES
- Respiratory Syncytial
- Influenza
- Parainfluenza
- Adenovirus
- Rhinovirus
- Corona Virus
- Human Metapneumovirus

BACTERIA
- Streptococcus Pneumonia
- Haemophilus Influenza
- Group A Streptococcus
- Staphylococcus Aureus
## COMMON AGE RELATED PATHOGENS IN CAP

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3 months</td>
<td>Gram Negative (E. coli, Klebsiella)</td>
</tr>
<tr>
<td></td>
<td>Chlamydia trachomatis</td>
</tr>
<tr>
<td></td>
<td>Viruses</td>
</tr>
<tr>
<td></td>
<td>S. Pneumoniae</td>
</tr>
<tr>
<td>3 months - 5 years</td>
<td>Viruses</td>
</tr>
<tr>
<td></td>
<td>S. pneumoniae</td>
</tr>
<tr>
<td></td>
<td>H. influenzae</td>
</tr>
<tr>
<td></td>
<td>Staphylococcus</td>
</tr>
<tr>
<td></td>
<td>Mycoplasma pneumoniaiae</td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>S. pneumoniae</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>Staphylococcus</td>
</tr>
<tr>
<td></td>
<td>Viruses</td>
</tr>
<tr>
<td></td>
<td>S. pyogenes</td>
</tr>
</tbody>
</table>
ANTIBIOTICS

• All pneumonias deserve antibiotics
• Differentiation between viral & bacterial difficult
• Identification of causative organism usually not possible
• Choice of antibiotics is empirical
• Antibiotics depends on –
  • Age, Severity, Predisposing conditions
<table>
<thead>
<tr>
<th>Age</th>
<th>First Line</th>
<th>Second line</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 mo- 5 yrs.</td>
<td>Amoxicillin (30-50 mg/kg/day)</td>
<td>Coamoxiclav/Chloramphenicol</td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>Amoxicillin</td>
<td>Macrolide/coamoxyclav/chloramphenicol</td>
</tr>
</tbody>
</table>
## ANTIBIOTICS FOR INPATIENTS (IM/IV)

<table>
<thead>
<tr>
<th>Age</th>
<th>First Line</th>
<th>Second line</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 3 months</td>
<td>Cefotaxime/ Ceftriaxone +/- aminogly</td>
<td></td>
</tr>
<tr>
<td>3 months- 5 years</td>
<td>Coamoxyclov OR Amp + Chloro</td>
<td>Coamoxyclov/ Ceftriax/ Cefotax</td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>Ampicillin/ Chloramphenicol/ Coamoxyclov/ Macrolide (if mycoplasma suspected)</td>
<td>Coamoxiclav/ Ceftriaxone/ Cefotax AND Macrolides</td>
</tr>
</tbody>
</table>
SUSPECTED STAPHYLOCOCCAL PNEUMONIA

• Inj 3rd Gen Cephalosporins: Cefotaxime/Ceftriaxone
  • + Cloxacillin
    • OR
  • Inj Cefuroxime
    • OR
  • Inj Co-amoxyclovulinic acid

• Second line: Vancomycin/ Teicoplanin
  • +
  • Inj 3rd Gen Cephalosporins
Thank You