PNEUMONIA A DREADFUL DISEASE

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Summary

Pneumonia is an inflammatory condition of the lung, especially of the alveoli, associated with fever, chest symptoms, and consolidation on a chest radiograph. Pneumonia is typically caused by an infection but there are a number of non infectious causes. Infectious agents include: bacteria, viruses, fungi, and parasites. Pneumonia can be regarded as a most fatal disease in the 20 th century for the children's. In 2010 pneumonia occurred in approximately 166 million children 161 million in the developing world and 10 million in the developed world. It resulted in 2.6 million deaths, or 29-35 % of all deaths in those under five years of age, of which 95% occurred in the developing world. It is the leading cause of death among children in low income countries. Many of these deaths occur in the newborn period. The World Health Organization estimates that one in three newborn infant deaths are due to pneumonia. Approximately half of these deaths are theoretically preventable, as they are caused by the bacteria for which an effective vaccine is available. Thus there is a need to develop new vaccines which will proved as a fruitful for the treatment of pneumonia in upcoming era. The present article is directed to provide fruitful information for the researchers in this field.

Key words: Pneumonia, disease, dreadful, types of pneumonia.

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Introduction

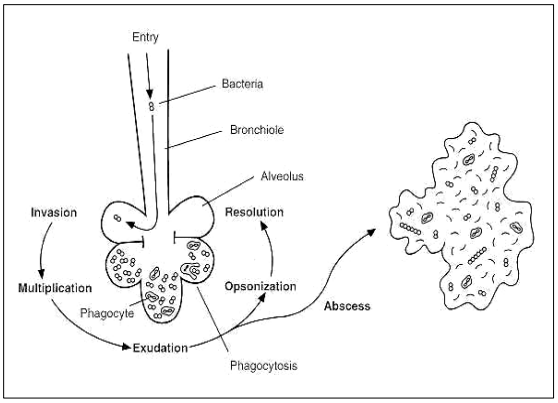
Pneumonia is defined as inflammation of lung parenchyma. The term pneumonitis is synonymous but is best avoided during the process of inflammation of alveoli there occurs inflammatory exudates that fills up air spaces and result in consolidation of lung.[1,2]

Primary Pneumonia
There is no pre-existing abnormality of respiratory system.

Secondary Pneumonia
Absence of specific pathogenic organism in the sputum and presence of some pre-existing abnormality of respiratory system.
Examples are

1. Aspiration of pus from any foci, vomitus, gastric contents.
2. Inhalation of septic matter during tonsilectomy, dental procedures.
3. Ineffective coughing as in post-traumatic, post-operative, paralysis laryngeal or pharyngeal.
4. Partial bronchial obstruction.

Fig. 1: Diagrammatic pathogenesis:-[3.4]



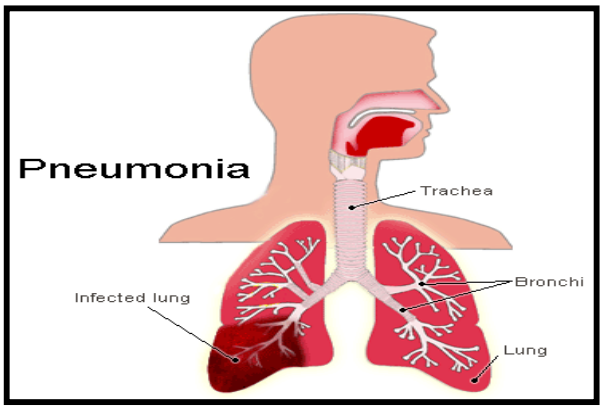
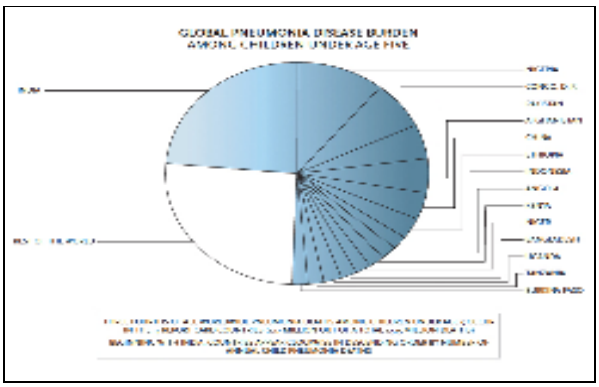
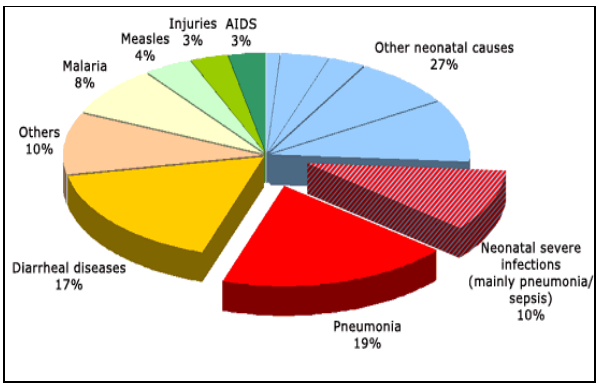


Fig.2: Global pneumonia disease burden among the children under age five.





Classifications by (causative agents) Pneumonia:-

1. Viral pneumonia

Features of viral Pneumonias:-

- The clinical features differ from that of bacterial pneumonia.
- Symptoms are more than the chest signs and x-ray signs
- Course is mild and self limiting and resolves by 7-10 days time.
- It usually starts with a dry (nonproductive) cough
- Characteristic features or constitutional symptoms like fever ,headache, sore throat, dry cough,malaise,running nose, common cold, aches and pains precedes several days before viral pneumonia occurs than in bacterial pneumonia which is more abrupt in onset.
- Strikes primarily in the fall and winter and tends to be more serious in people with cardiovascular or lungs diseases.
- Leukocyte count is usually normal or low
- On x ray may show features of interstitial or of atypical pneumonia
- Viral pneumonia often goes unrecognized because the person may not appear very ill. The symptoms vary with age and whether the person has other health problems.

Diagnosis confirmed by isolation of virus and serological tests

Treatment for viral infections:-[5]

- Acyclovir
- The duration of intravenous therapy with Acyclovir is usually 5 days.
- The doses recommended above (5 or 10mg/kg bodyweight or 500mg/m2) should be given every 12 hours.
- Adults: 5 mg/kg infused at a constant rate over at least 1 hour, every 8 hours for 7 days in adult patients with normal renal function.
- oral dose
- 800mg 4 hrly x7-10days
- Chronic Suppressive Therapy for Recurrent Disease: 400 mg 2 times daily for up to 12 months

2. Bacterial Pneumonia

Features of Bacterial Pneumonias

- In fact, the preceding viral infection may predispose to bacterial pneumonia, by damaging some of the lung's defenses against infection or may occur without preceding viral infection. One important clue to this diagnosis is deterioration after initial improvement.

Signs of Pneumonia

- Decreased chest movements
- Dull on percussion
- VF/VR increased
- Bronchial breathing
- Bronchophoney,aegophony and whispering pectoriloquy may be present
- Crepitations

Treatment of Gram negative Bacterial Pneumonia:-

In multiresistant cases

Gram negative infection can give multiresistant strains,

- Vancomycin 500mg to 1 gram I/V twice daily

For klebsiella, legionella, actinomycosis

- Gentamycin, ceftriaxone for two weeks even Azithromycin.
- Rifampicin be given in legionella also

For actinomycosis

Benzyl penicillin 10-20 million units IV 6 hrly day.

- In severe cases piperacillin plus tazobactam or Meropenem.
- Clindamycin 800mg 8 hrly followed by 300 mg orally 8hrly in aspiration pneumonia.

3. Fungal pneumonia

Clinical features of fungal Pneumonia

- Occurs in a particular setting
- History of immunosupression like in AIDS, malignancy, Corticosteroid therapy, radiation therapy, antimalignant drugs.
- Debilitated bed ridden people, malnutrition.
- Has chronic serious pre-existing disease.
- People working in agriculture lands, caves, old buildings, places of bird droppings, soil.
- The disease runs a chronic course.

Treatment for fungal infections [6]

- First give test dose as follows: 1 mg in 20 ml of D5W over 30 minutes to 1 hour; monitor vital signs every 30 minutes for next 2 hours. If no untoward reaction occurs then do as follows.
- Amphotericin B comes in a vial that contains 50mg of powder. Each vial needs to be mixed with 10ml of Water for Injection. The dose is then drawn up and again mixed with 500mL of dextrose and shaken.
- Then give 0.25 to 0.5 mg/kg daily by slow I.V. infusion (0.1 mg/ml over 2 to 6 hours) or 1mg/10mL. With or without flu cytosine for two weeks to several months. Even on alternate days.
- Fatal infections may require higher dosages (1 to 1.5 mg/kg daily).
- The Amphotericin B should NEVER be mixed with Normal Saline or Half Normal Saline as it will precipitate.

4. Rickettsial pneumonia [7]

Features of Rickettsial infection

- Scrub typhus occurs over a wide area of Asia and Pacific region. Chiggers (larval-stage of trombiculid mites) are vectors for scrub typhus. Chiggers prefer warm, moist, and shady places.
- In Hong Kong, majority of the reported cases contracted the diseases locally, in which half of the spotted fever and scrub typhus cases were related to outdoor activities, such as hiking or camping in rural areas. Poor environmental hygiene conditions
- Such as inadequately managed rubbish collection points and wet markets was a risk factor for contracting murine typhus.

- At the site of entry commonly skin the organisms localize in endothelial cells and enter into the cells. It proliferates intracellular. A papule may be formed that later ulcerates in the central. It is called eschar. The organisms released from the infected cells can infect endothelial cells in the blood vessels throughout the body via lymphatic vessels. The rickettsemia causes generalized vasculitis affecting every organ in the body.[8]

Treatment for rickettsial infection

- Rickettsial infections respond promptly to early treatment with the antibiotics like
- Doxycycline
- Chloramphenicol
- Tetracycline

5. Protozoal pneumonia [9]

Four drugs currently available for therapy of *P carinii* pneumonitis are:

- Pentamidine isethionate
- Trimethoprim-Sulfamethoxazole
- atovaquone
- trimetrevate

Trimethoprim-sulfamethoxazole is preferred because of its low toxicity and greater efficacy.

- Bactrim DS tablet contains. 160 mg of trimethoprim and 800 mg of Sulfamethoxazole.
- 21 days course
- **Prednisolone** 40 mg bid x 5 days, then 40 mg/day x 5 days, then 20 mg/day to completion of treatment
- Alternative Treatments:
  - **TMP** 15 mg/kg/day PO + **dapsone** 100 mg/day x 21 days
  - **Pentamidine** 4 mg/kg/day IV x 21 days
  - **Atovaquone** 750 mg PO bid with meal x 21 days

PCP is the most frequently identified serious in HIV disease

6. Radiation pneumonia
7. Chemical pneumonia
8. Aspiration pneumonia

Risk Factors [10]

- Asplenia
- HIV/AIDS
- Elderly
- Defective Clearing mechanism
- Cough/gag Reflex – Coma, paralysis, sick.
- Mucosal Injury – smoking, toxin aspiration
- Low Alveolar defense - Immunodeficiency
- Pulmonary edema – Cardiac failure, emboli
- Hypogammaglubolinemia
- Sever Neutrogena
- Corticosteroid therapy
- Environmental risk factors.

9. **Hypostatic pneumonia** [11]

Classification of Pneumonias by site:-

1. Lobar pneumonia
2. Bronchopneumonia
3. Interstitial or atypical pneumonia

1. Lobar Pneumonia

- Consolidation or pneumonia of whole lobe of lung is called lobar pneumonia.

2. Broncho-Pneumonia

- Lesions may be more extensive that often fuses together resembling lobar pneumonia (confluent bronchopneumonia).
    - Bronchopneumonia is characterized first by inflammation of small bronchioles then of alveoli there by resulting in patchy bilateral consolidation of lung.

Atypical or Interstitial or viral Pneumonia [12]

- Atypical pneumonia as already said is caused by atypical bacteria that do not gram stain or do not fit in any category like in virus or bacteria. Most of viruses produce this type of pneumonia also. The inflammation is confined to interalveolar septa or interstitial spaces between alveoli and radiologically gives appearance of reticulonodular pattern. Linear thread like opacities here and there in lungs.
- In the next slide you will see white spaces that are alveolar spaces and are empty and clear. But surrounded by swollen interstitial tissue infiltrated with inflammatory cells, typical of interstitial pneumonia.

Development of vaccines for the treatment of Pneumonia. [13-18]

Pneumonia vaccines below age five

Several effective vaccines are available for the prevention of childhood pneumonia, including two vaccines provided in immunization programmes in all countries, Bordetella pertussis and measles vaccines, and two relatively new vaccines, Hib conjugate vaccine (HibCV) and pneumococcal conjugate vaccines (PCVs).

HibCV and PCV effectiveness

Since 1996, the effectiveness of HibCV and PCVs for the prevention of childhood pneumonia has been established through eight clinical trials and three case–control studies, and is backed by numerous surveillance assessments

HibCV

The first studies to show the effectiveness of HibCV for prevention of pneumonia were the randomized controlled trials from Chile and the Gambia.12,13 Both studies showed significant protection against bacteraemic Hib pneumonia (80–100%) and radiologically confirmed pneumonia (about 22%). These studies also showed that the incidence of culture-negative pneumonia cases prevented was 5 to 10 times greater than the incidence of culture-confirmed cases prevented, supporting the observations that most bacterial pneumonia goes undetected by routine diagnostic methods and that vaccine trials are the most robust approach to the estimation of the burden of bacterial pneumonia. More recently, additional clinical trials and case–control studies with HibCV have extended our knowledge to other geographic regions. A randomized controlled trial from Lombok in Indonesia helped to uncover the burden of Hib disease in Asia. However, this study showed a significant reduction in the risk of clinical pneumonia but no reduction in the risk of radiologically confirmed pneumonia among vaccinated compared with unvaccinated children. Rates of clinical meningitis preventable by the vaccine were similar to

rates observed in Africa and other high-risk areas. Consistent with the other studies, the burden of pneumonia prevented was about 10 times greater than the burden of meningitis prevented.

PCVs

PCVs provide another effective method for pneumonia prevention in children and their families. Data are currently available from five randomized controlled trials of PCVs for prevention of pneumonia in children.15–18; the comparison of studies is facilitated by the fact that each study used a standard interpretation of chest radiographs. All children in each study received HibCV so the proportionate reductions in radiologically confirmed pneumonia were in addition to prevention due to HibCV. The two studies in the United States of America (USA) used seven-valent vaccine, and the two in Africa used a nine-valent vaccine and an 11-valent formulation was used in the Philippines. The studies represent a diverse range of epidemiological settings including rural Africa with a high infant mortality rate, urban Africa with a high HIV prevalence, per urban Asia with a high rate of antibiotic use, a Native American and a typical American health-maintenance-organization population. These studies found reductions (20–37%) of radiologically confirmed pneumonia that confirmed the importance of the pneumococcal vaccine serotypes as a cause of pneumonia.15–17, Like HibCV, the large fraction of preventable disease is undetected by routine diagnostic methods. The efficacy of PCVs against vaccine-serotype bacteraemic pneumonia is high (67–87%), but comparisons to the incidence of X-ray confirmed pneumonia or clinical pneumonia show that up to 20 times more culture-negative cases are prevented compared with culture positive cases. The use of a case-definition that is not specific for vaccine serotype disease (e.g. radiologically confirmed pneumonia, which can also be due to non-vaccine serotype pneumococci or other pathogens) will provide a more accurate estimate of the number of cases prevented, but may underestimate the proportionate reduction in vaccine-type pneumococcal pneumonia. Radiologically confirmed pneumonia, although consistently used as an outcome measure to assess PCV efficacy, [19] may nevertheless vary in its sensitivity (76.5% in the Gambia versus 58.1% in South Africa) across diverse settings. In the USA, 3 years after PCV introduction, a 39% (95% confidence interval, CI: 22–52) reduction in pneumonia hospitalizations among children less than 2 years old was observed. The absolute rate reduction for clinical pneumonia was 30 times greater than the reduction in pneumococcal pneumonia (506 versus 17 episodes prevented per 100 000 child-years) as per physician discharge diagnosis, again highlighting the difficulties in the diagnosis of pneumococcal pneumonia, even in industrialized countries, and the substantial effect of vaccination that can be missed by culture-based diagnoses. The higher than expected decline in clinical pneumonia in the USA, after the introduction of PCV, may have been due to PCV preventing the complication of a superimposed pneumococcal infection in children who had been infected by respiratory viruses. Such superimposed pneumococcal disease in children with respiratory viral infections was prevalent in almost a third of children hospitalized with severe pneumonia in the prevaccine era. The important role of pneumococcus in children with viral pneumonia was demonstrated in the South African vaccine efficacy trial, in which children vaccinated with nine-valent PCV were 31% (95% CI: 15–43) less likely to be hospitalized for pneumonia in which a respiratory virus was identified, including 45% (95% CI: 14–64) less likely to be hospitalized with pneumonia associated with influenza type A/B viruses.28 Vaccination of children with PCV may play an important part in reducing the severity of respiratory viral associated pneumonia morbidity as well as in preparedness for a future influenza pandemic, because pneumococcal pneumonia commonly follows influenza illness. Unlike Hib disease, which affects mainly children less than 2 years of age, pneumococcal disease also occurs among older children and adults. As a

consequence, PCV immunization of children may confer protection to unvaccinated populations through herd protection. The most robust evidence of the value of PCVs for improving child survival comes from a trial in the Gambia in which nine-valent PCV reduced all-cause mortality by 16% (95% CI: 3–28) in vaccine recipients – an absolute reduction of 7.4 deaths prevented per 1000 vaccinated children. On the basis of disease burden and the proven effectiveness of HibCV and PCV in diverse settings, WHO recommends the inclusion of both of these vaccines in routine immunization programmes. Together, HibCV and PCV, if applied everywhere, are expected to prevent at least 1 075 000 child deaths each year predominantly in developing countries, and with herd protection additional cases and deaths in older age groups.[20]

Conclusion

Pneumonia is inflammation of lung parenchyma, due to various causative agents produces viral, bacterial, fungal, rickettsial, protozoal, radiation, chemical, aspiration, hypostatic, and atypical pneumonia. Atypical are organisms that do not fit in virus, bacteria or fungus produces mycoplasma, legionella, chlamydia trachomatis, chlamydia psittaci, chlamydia pneumoniae, Q-fever, tularemia, anthrax, viruses, fungi, and others like histoplasmosis, coccidiodomycosis pneumonia. Pneumonia can produces severe infection in respiratory systems and affects different parts of body. Prevalence of disease is highest 19%of total diseases and disorders. Global disease burden of mortality due to pneumonia under age of five is upto ¼ th only in India. Precaution, awareness about this disease, right treatments and vaccination as part of below age five year children are important keys to prevent this major disease.

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