TUBERCULOSIS

By

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Tuberculosis

- Infectious, Systemic, Chronic granulomatous disease caused by mycobacterium tuberculosis
DEFINITION

- **Latent Tuberculosis infection**
  - No sign & symptoms
  - +ve tuberculin skin test
  - Normal chest X-Ray

- **Tuberculosis disease**
  - Apparent Clinical Manifestations
  - Findings on chest X-Rays
ETIOLOGY

- Mycobacterium Tuberculosis
- Non-Spore Forming
- Non-Motile
- Acid fast
- Weakly Gm + ve curved Rods
- Lipid Rich Cell Wall
- Take 3-6 wks to isolate from clinical specimens & additional 4 wks for drug susceptibility
EPIDEMIOLOGY

- **WHO Estimates**
  - 2.0 Billion -------- Infected
  - > 8.0 Million ------ New Cases / year
  - 3.0 Million -------- Deaths worldwide

- **In Children**
  - 1.3 Million ------ New Cases / year
  - 450,000 -------- Deaths / year

- Untreated infected Child has 40% likelihood of developing tuberculosis
ENVIRONMENTAL FACTORS

- Poor Socio-Economic Status
- Overcrowding
- Poor Nutrition
- Inadequate health coverage
- Ineffective TB control programs
• Age
  • < 5-years and Adults

• Transmission
  ▪ Airborne Mucus Droplet Nuclei
  ▪ +ve Sputum Smear for AFB
  ▪ Extensive Upper Lobe Infiltrates or Cavity
  ▪ Copious amount of Thin Sputum
  ▪ Forceful Cough
  ▪ Rarely by direct contact with infected discharge
  ▪ Children……Non infectious

• Non Infectious within 2-Weeks of Treatment
Pathogenesis

- Primary Complex
- In-Alveoli & Alveolar ducts
- Survive within Non-Activated Macrophages
Fate of Primary Complex

- Heal
- Calcify
- Caseous Necrosis
- If continue to enlarge
  - Fibrosis & Encapsulation
  - Incomplete Healing
Time Interval b/w Infection & Disease

- Disseminated and Meningeal
  - 2 – 6 Months
- Lymph Node & Endobronchial
  - 3 – 9 Months
- Bones & Joints
  - Years
- Renal
  - Decades
IMMUNITY

- Cell-Mediated Immunity ---- 2-12 Weeks
- Macrophages, Lymphocytes → Lymphokines → Chemotaxis
- Helper T-Cells & Suppressor
- Balance Among Mycobacterium Antigen Load , Cell Mediated Immunity & tissue Hypersensitivity
The natural course of tuberculosis

A child becomes infected by inhaling infecting particles from a coughing adult with active pulmonary tuberculosis.

After 4-8 weeks
PRIMARY
COMPLEX
The inhaled TB bacilli multiply and form the primary complex. This consists of a lung focus (2-15 mm³) and a focus in the neighbouring lymph nodes.
Clinical features:
- Unspecific febrile illness
- Phlyctenular conjunctivitis
- Erythema nodosum

Lymph node focus
Lung focus

OUTCOME
depends on immunity
The child's immunity determines the outcome after primary infection

VERY STRONG IMMUNITY
All bacilli are killed, no progression to disease

STRONG IMMUNITY
The infection is controlled but some bacteria remain alive. These may later cause disease when immunity weakens (for example, after measles)

WEAK IMMUNITY
Progression of the lung or lymph node focus
Pleural effusion (rupture of lung focus into pleural space)

VERY WEAK IMMUNITY
Progression to acute severe disease:
- TB meningitis
- Miliary TB

End of first year after infection

After several years
Examples of late TB disease:
- Reactivation of lung focus
- Bone TB
- TB adenitis
- Abdominal TB

Figure 6-1 The natural course of tuberculosis.
CLINICAL FEATURES

- Primary Pulmonary Disease
  - Hilar LN $\rightarrow$ Hyper Inflation $\rightarrow$ Atelectasis
  - $\rightarrow$ Collapse, Consolidation Lesion
  - Endobronchial, Fistula
  - Lobar Pneumonia
  - Pneumothorax
  - Miliary
Contd...

- Infants are more likely to express sign & symptoms
  - Non-Productive Cough
  - Dyspnea
  - Localized Wheeze

- Less Frequent
  - Fever
  - Malaise
  - Anorexia
PROGRESSIVE PRIMARY PULMONARY DISEASE

- High fever
- Severe productive cough
- Weight loss
- Night sweats
- On examination
  - Signs of consolidation & collapse
PLEURAL EFFUSION

- Usually Unilateral
- Caseating Lymphnode or Subpleural Focus
- Symptoms
  - Cough
  - Pleuritic Pain
  - Shortness of Breath
- Signs
REACTIVATION OR POST PRIMARY TB

- Cavity Formation
- Pneumothorax
- Empyema
- Broncheactasis
PERICARDIAL DISEASE

- Direct Invasion or Lymphatics
- Serofibrineous

Signs
- Distant Heart Sounds
- Pulses Paradoxus
- Frictional Rub
LYMPHOHEMATOGENOUS (DISSEMINATED) DISEASE

- Distant Site
- Low Grade Fever, Wt Loss, Anorexia
- High Spiking Fever
- Hepatosplenomegaly, Generalized Lymphadenopathy
- Chest Involvement
- Headache → Meningitis
- Abdominal Pain → Peritonitis
ABDOMINAL TUBERCULOSIS

- Swallowed Sputum
- Hematogenous
- Forms
  - Tuberculous Enteritis
  - Mesenteric Adenitis
  - Generalized Peritonitis
SUPERFICIAL LYMPHNODE TUBERCULOSIS

- Submendibular, Tonsillar, Anterior Cervical, Axillary
- Low Grade Fever
- Firm
- Matted
- Non-tander
- Fluctuant

Figure 6-2 TB adenitis.
RENAL

- Sterile Pyuria
- Hematuria
- Dysuria
- Flank Pain
SKELETAL

- Pott’s Disease
  - Vertebral Body Involvement
  - Gibbus formation
- Paravertebral Abscess
- Process begins in metaphysis
- Joint involvement
- Low grade fever
- Abnormal posturing or gait
Collapse of vertebral bodies

Gibbus

Compression of spinal cord

X-ray signs:
- Collapse of vertebrae
- Disc space disappeared
PERINATAL

- Primary Focus in Placenta
- Liver Involvement
- Less Pulmonary Finding
DIAGNOSIS

- Contact Tracing
  - Took ATT within last 2-yrs

- Tuberculin Skin Test
  - Purified protein derivative
  - 5TU
  - 0.1 ml
+ve Skin Test

- Vaccinated Child
- Active TB
- Past Infection
- Repeated Tuberculin Tests
Contd…

-ve Skin Tests
- Not Suffered from TB
- Not Vaccinated

False –ve
- Malnourished Child
- Miliary TB
- Measles / Whooping Cough
- Steroid Therapy
- Cytotoxic Drugs
- Incubation Period
RADIOLOGICAL EVIDENCE

- Primary Focus --- Coin Shadow
- Obstructive Emphysema
- Tuberculous Bronchopneumonia
- Collapse Consolidation
- Bronchectasis
PRIMARY PULMONARY TB
PLEURAL EFFUSION
MILIARY TB
AFB SMEAR & CULTURE

- Gastric Aspirate --- 30-40 %
- Pleural Fluid --- < 30%
- Pericardial --- 30-70 %
- Peritoneal --- 30-70 %
- Spinal --- 50-70 %
NEWER TECHNIQUES

- BACTEC radiometric system
  - Selective liquid medium containing fatty acids labelled with radioactive carbon
  - Measure released CO\textsubscript{2}
- PCR
  - Results within 24-48 hrs
  - 95% sensitive & specific
- ELISA
  - 50-90% sensitive & 92-95% specific
MANAGEMENT

- General
  - Bed Rest
  - Nutrition
  - Hospital Admission
  - Steroids
1st LINE TREATMENT

- INH
- Rifampicin
- Streptomycin
- Pyrazinamide
- Ethambutol
2nd LINE TREATMENT

- Ethionamide
- Aminoglycoside
- Capreomycin
- Cycloserine
- Quinolone
Steroids
- Tuberculous Meningitis
- Endobronchial disease
- Miliary tuberculosis
- Serosal involvement
thankyou