



SNS COLLEGE OF ALLIED HEALTH SCIENCES

SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai

**DEPARTMENT OF OPERATION THEATRE AND ANESTHESIA
TECHNOLOGY**

COURSE NAME: MEDICINE

II YEAR

UNIT I

TOPIC 1:TUBERCULOSIS



CASE HISTORY

Mrs Geetha , 25 yrs female came to the hospital with the presenting complaints of cough, weight loss since 1month,her past history reveals that pt was apparently normal before 1 month back,she developed cough which is insidious in onst and gradually 5 -6 episodes in a day occasionally sputum contains blood,how to manage the case



DEFINITION

Tuberculosis (**TB**) is an infectious bacterial disease primarily affects the lung parenchyma in which formation of granulomas in an infected tissues by cell mediated immunity most often caused by Mycobacterium Tuberculosis (**MTB**).

It can also affect the other parts of the body including the abdomen, lymphnodes, bones, kidney, spine and brain.

**Tubercle – Round
Nodule/Swelling**

Osis – Condition

ETIOLOGY

ETIOLOGY

Mycobacterium Tuberculosis - **Human**

Mycobacterium Bovis - **Animals**

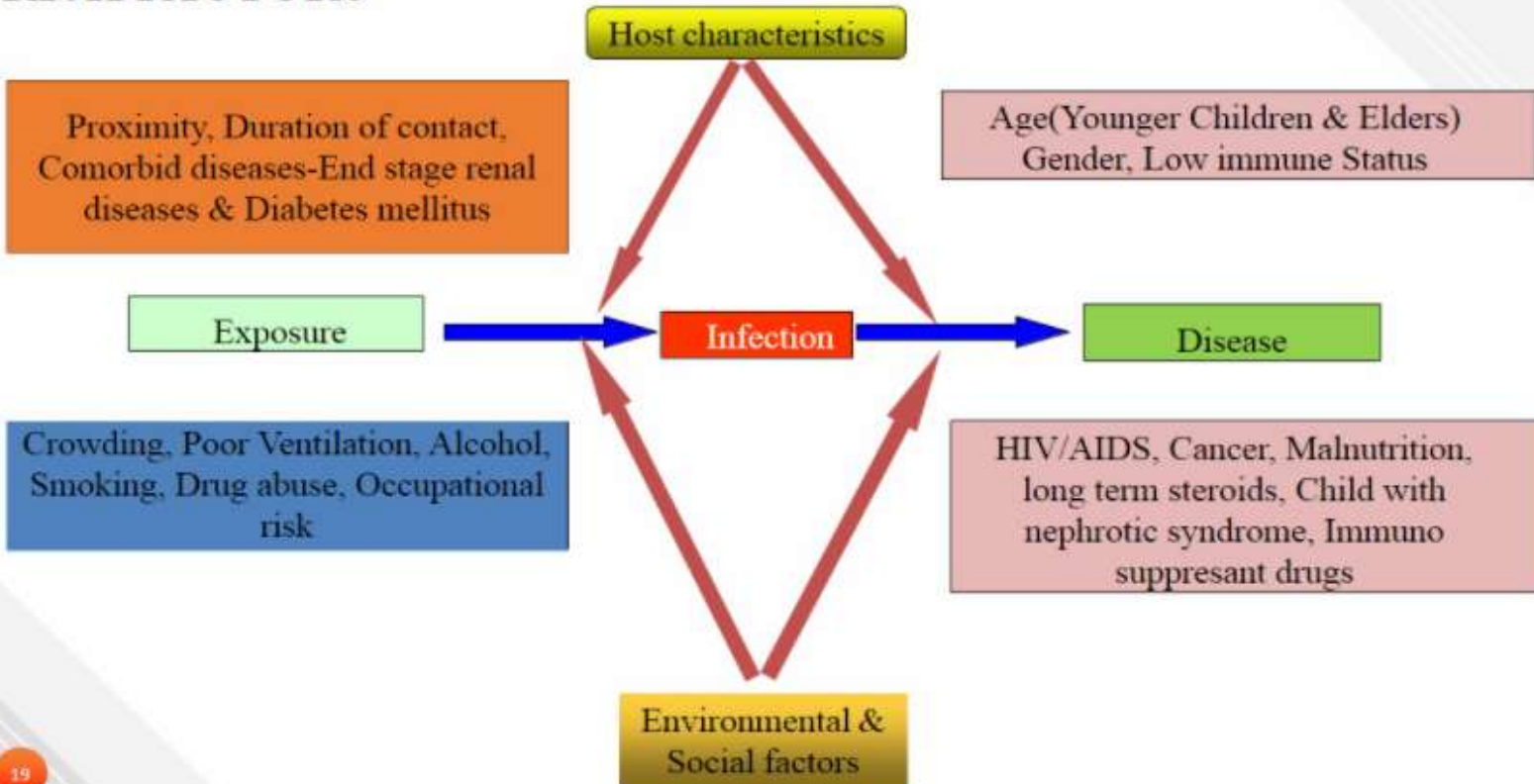
Mycobacterium Avium - **Birds**



M. tuberculi is carried airborne particles called **droplet nuclei** of 1–5 microns diameter; small rod-shaped, acid-fast bacilli, multiplies more slowly than the majority of bacteria, strictly aerobic bacterium. It therefore multiplies better in **pulmonary tissue (in particular at the apex, where oxygen concentration is higher)** than in the deeper organs. **Direct sunlight kills tubercle bacilli** But it survives in dark for **several hours.**

RISK FACTORS

RISK FACTORS



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TYPES

TYPES OF TUBERCULOSIS-ANATOMICAL SITES

TYPES	LOCATION
Pulmonary Tuberculosis <ul style="list-style-type: none">• Primary• Secondary	Lungs
Extra Pulmonary Tuberculosis	Other Than Lungs Larynx Lymph nodes (Common site) Pleura Brain & Spine Kidneys Bones & Joints
	Milliary TB - All over the blood(Rare)



PULMONARY TUBERCULOSIS

- **Primary Tuberculosis**

The infection of an individual first time infected or who has not previously infected called as **Gohn Complex or Primary or Childhood Tuberculosis**

- **Secondary Tuberculosis**

The infection who has been previously infected or sensitised called **Secondary or Post Primary or Reinfection or Chronic Tuberculosis**

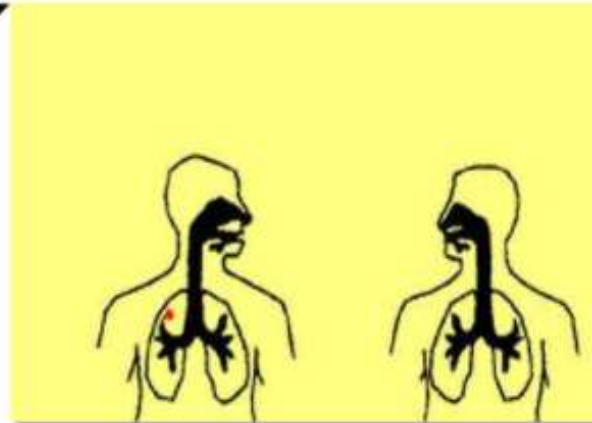
MODE OF TRANSMISSION (PULMONARY TUBERCULOSIS)



UNPROTECTED COUGH / SNEEZE
Contagious aerosols
(droplets < 5 microns)

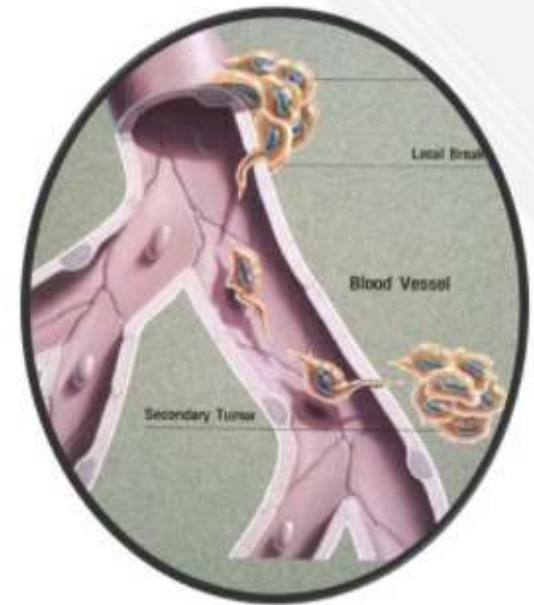


TB bacteria become **lighter** in weight due to **water loss**, the size of bacteria will be reduced in to **several microns**.



EXTRA PULMONARY TB-MODE OF TRANSMISSION

- Haematogenous & Lymphatic Spread
- Inoculation
- Ingestion-Contaminated milk from Cow (Mycobacterium Bovis)
- Transplacental - Rare Infection



INCUBATION PERIOD

Incubation period: Ranges from 3 to 6 weeks depends upon closeness of contact, extent of disease thus may extend to **weeks, months or years.**

Not everyone exposed.....
become infected Probability
of Tuberculosis That will be
transmitted depends on



Infectious of person with TB disease
Environment in which exposure occurred
Length of exposure Virulence (strength of
tubercle bacilli)



STAGES OF TUBERCULOSIS BASED ON PATHOGENESIS

- **Class 0** - There is **no exposure** or no infection.
- **Class 1** - There is an exposure but **no evidence of infection**.
- **Class 2** - There is **latent infection** but no disease.
- **Class 3** - There is a disease and is **clinically active (positive diagnostic finding)**.
- **Class 4** - There is a disease but **not clinically active (negative diagnostic finding)**.
- **Class 5** - There is a **suspected disease** but the diagnosis is pending (**Ruled out with in 3 months**)



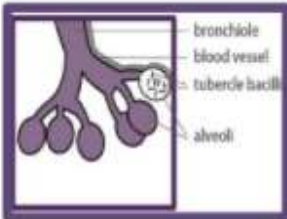
LATENT (VS) ACTIVE DISEASE

Latent TB Infection (LTBI)	TB Disease (in the lungs)
Inactive, contained tubercle bacilli in the body	Active, multiplying tubercle bacilli in the body
Tuberculin skin test or blood test results usually positive	Tuberculin skin test or blood test results usually positive
Chest x-ray usually normal	Chest x-ray usually abnormal
Sputum smears and cultures negative	Sputum smears and cultures may be positive
No symptoms	Symptoms such as cough, fever, weight loss
Not infectious	Often infectious before treatment
Not a case of Tuberculosis	A case of Tuberculosis

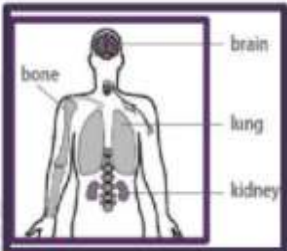
PATHOPHYSIOLOGY



Tubercle bacilli multiply in alveoli, where **Infection** begins.

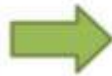
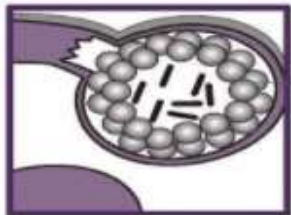


Droplet nuclei containing **tubercle bacilli** are inhaled, enter the lungs, and travel to **small air sacs (alveoli)**.

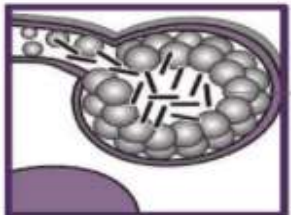


A small number of tubercle bacilli **enter bloodstream** and spread throughout body.

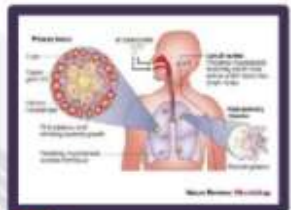
PATHOPHYSIOLOGY OF TUBERCULOSIS



Within 2 to 8 weeks the immune system produces special immune cells called **macrophages** that surround the tubercle bacilli. These cells form a **barrier shell** that keeps the bacilli contained and under control (**Latent TB**).



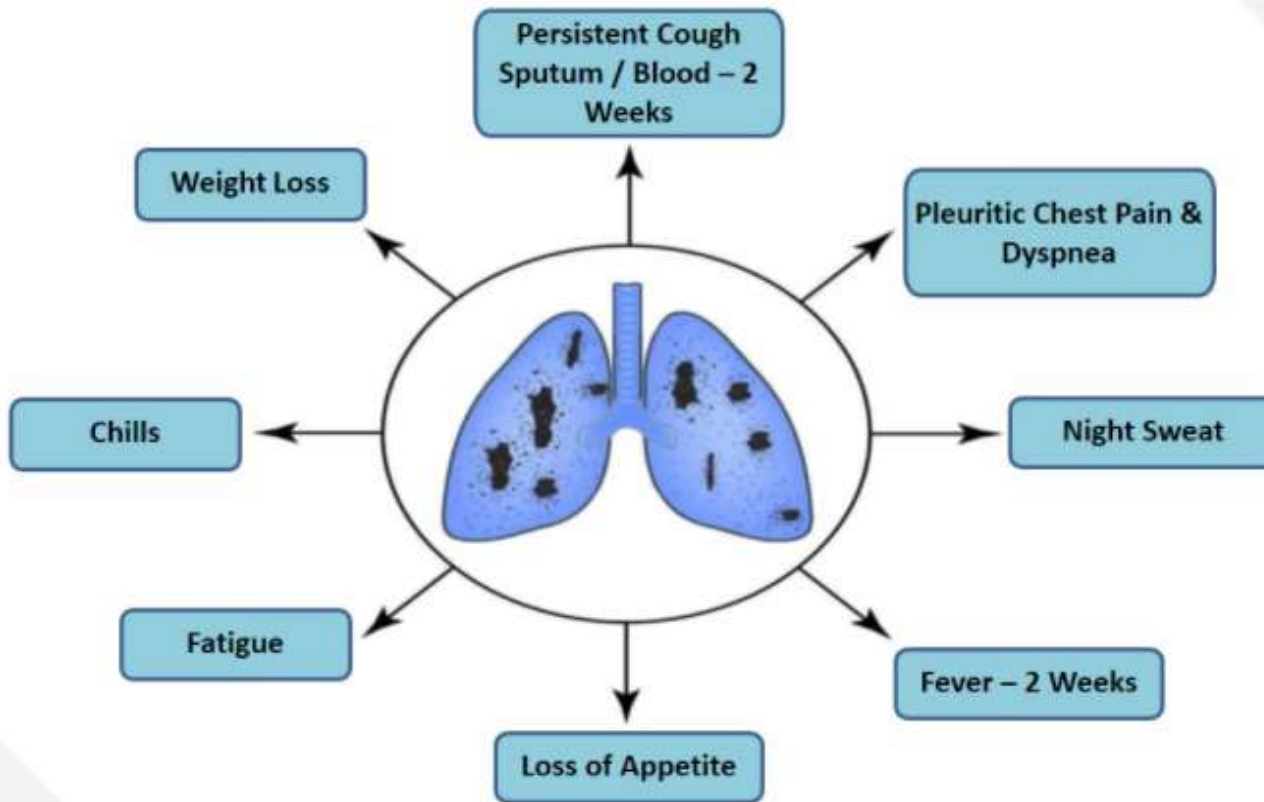
If the **immune system cannot** keep tubercle bacilli under control, bacilli begin to multiply rapidly and cause TB disease (**active**). This process can occur in different places in the body.



New tissue masses around live or dead bacilli are surrounded by macrophages which form a protective mass around **granuloma (form in the infected tissue and undergo necrosis in the centre)** which transforms to fibrous tissue mass and central portion is called **ghon tubercle**.

CLINICAL MANIFESTATION

SIGNS & SYMPTOMS OF PULMONARY TUBERCULOSIS





SIGNS & SYMPTOMS OF PULMONARY TUBERCULOSIS (Cont...)

Extra pulmonary Tuberculosis	Paediatric Tuberculosis
Presence of organ specific symptoms & signs (&/or) Constitutional symptoms Significant weight loss, Persistent fever > 2 weeks, Night sweats	Persistent fever Cough for >2 weeks Loss of weight(> 5% of highest weight recorded in past 3 months) / no weight gain (&/or) History of Contact with infectious TB cases Note: In symptomatic child, contact with a person with any form of active TB within last 2 years may be significant



DIAGNOSTIC MEASURES



DIAGNOSTIC EVALUATION

Pulmonary Tuberculosis

- **History Collection** – to rule out causes
- **Clinical Assessment** – Lymphnode swelling, Abnormal Breath Sounds
- **Microbiology** – Sputum Smear Microscopy (AFB) Culture
- Tuberculin skin test, **C-TB** Skin test
- **IGRA (Interferon Gamma Release Assay)**
- **Radiology** – X ray

Extra Pulmonary Tuberculosis

- History Collection – to rule out causes
- Clinical Assessment – Lymph node swelling and other signs and symptoms
- Microbiology – Smear, Culture
- Radiology – Xray, Ultrasound, CT, MRI, PET
- Pathology – Fine needle aspiration Cytology, Histo pathological examination
- Cytology & Biochemical – Serosal Fluid Analysis (Pleural/Ascitic/CSF/Synovial) Sugar, Protein, LDH

SPUTUM CULTURE

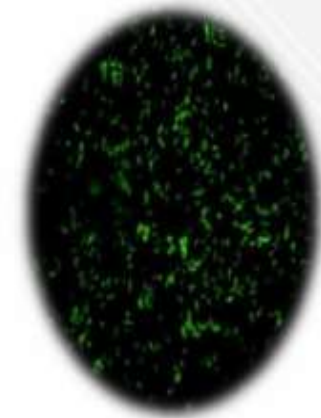
Phenotypic Culture techniques (Drug Susceptibility Test - DST)

- Solid culture: 84 days "GOLD STANDARD"
- Liquid culture (BACTEC 460): 42 days

Rapid Molecular Technique (Drug Resistance Test)

- Line Probe Assay (LPA) rapid technique based on polymerase chain reaction (Result Time: 2 days)
- CBNATT/ GENE Xpert / Xpert MTB/ Rifampicin (Result time: 2 hours)
- TruNAAT: 40 min

SPUTUM SMEAR MICROSCOPY



Note: At least **three consecutive** sputum specimens are needed, each collected in **8 to 24 hours** intervals, with at least one being an **early morning specimen**.

CB NAAT(CARTRIDGE-BASED NUCLEIC-ACID AMPLIFICATION)

Automated RT PCR based

When to Choose....

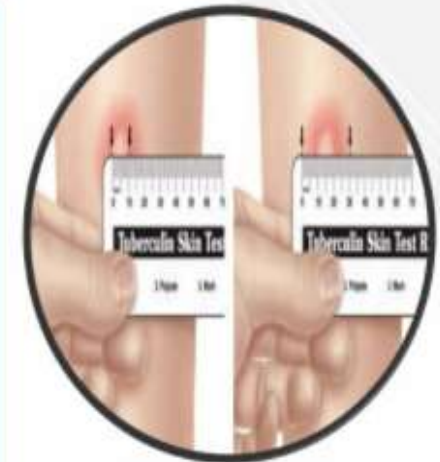
- Contact of Drug resistance - TB Patients
- Children
- People living with HIV
- Diabetes
- Extra pulmonary TB
- Key population
- Smear negative & X ray positive



Laboratory in a
Cartridge

TUBERCULIN SKIN TEST (TST) & INTERFERON GAMMA RELEASE ASSAY (IGRA)

- **Standardised TST (Tuberculin Skin Test)** may be used as a complimentary test in children". It is not confirmative test for adults.
- **Interferon Gamma Release Assay (IGRA) (or)**
 - TB QuantiFERON test
 - TB Gold test (QFT-G)
 - QuantiFERON® - TB Gold Plus
 - (QFT - Plus) QuantiFERON®
 - TB Gold In-Tube (QFT-GIT)
- **Quantiferon TB Gold assay** is used for the **diagnosis of latent TB, It is Expensive - Not commonly used.**



CHEST X RAY



Normal

In active pulmonary TB, infiltrates or consolidations and/or cavities are often seen in the upper lungs with or without mediastinal or hilar lymphadenopathy.





PHASES OF TREATMENT

Treating tuberculosis takes longer than other types of bacterial infections because the TB bacteria grow slowly, and die slowly.

The standard **six month(6-9 months)** course of treatment consists of **two phases.**

- **Intensive Phase:** The first phase of two months in total of 6 to 9 months of Tuberculosis treatment.
- **Continuation Phase:** It is a period of **4 or 7 months followed by intensive phase** in total of 6 to 9 months for treatment.

This is the preferred regimen for patients with newly diagnosed pulmonary TB.



MANAGEMENT



TYPES OF DRUG RESISTANCE

Resistance means drugs can no longer kill the bacteria

Mono resistance(MR) - Resistant to any one **First line** TB treatment drug.

Poly Drug Resistance(PDR) Resistant to at least any 2 TB First line drugs (but not both **Isoniazid** and **Rifampicin**)

Multi drug resistance(MDR) - Resistant to at least **Isoniazid** and **Rifampicin**, the 2 best first-line TB treatment drugs

Rifampicin Drug Resistance (RDR)

Rifampicin only resistant not **Isoniazide**

Extensive Drug Resistance (XDR) - Resistant to **isoniazid** and **rifampicin**, PLUS resistant to any **fluoro quinolones** and at least 1 of the 3 injectable anti-TB drugs (e.g., **Amikacin**, **Kanamycin**, or **Capriomycin**)

ANTI TUBERCULOSIS DRUGS (CONVENTIONAL)

Group I (First Line - Oral Drugs) : (RIPE)

- Rifampin(R)(150mg)
- Isoniazide(H)(75mg),
- Pyrizinamide(Z)(400mg)
- Ethambutol(E)(275mg)

Group II (Second Line - Injectable Drugs) : Amino Glycosides (ACK) (not absorbed orally)

- Amikacin
- Capriomycin
- Kanamycin

Group III (Oral Drugs) : Fluroquinolones (CLOM) Ciprofloxacin, Levofloxacin, Ofloxacin & Moxifloxacin

Group IV (Second line oral drugs) : (PP-RR-ECT)

Prothionamide, PAS, Rifabutin, Rifapenine,
Ethionamide, Cycloserine & Terizidone

Group V : Unclear Efficacy Drugs (CCC-LIB) Clarithromycin, Clofazamine, Co-Amoxiclav linezolid, Imipenam-Cilastatin & Bedaquilin



MDR/RR-TB

(Multi Drug Resistance & Rifampicin Resistance)

Shorter MDR - TB Drug Regimen

Intensive Phase (4-6 Months)

- Moxifloxacin, Kanamycin / Amikacin, Ethionamide, Clofazamine, Pyrazinamide, Isoniazid, Ethambutol

Continuation Phase (5 Months)

- Moxifloxacin, Clofazamine, Pyrazinamide, Ethambutol



MDR/RR-TB (Cont...)

(Multi Drug Resistance & Rifampicin Resistance)

**Longer Oral MDR
- TB Drug Regimen**

(18-20 Months) - Bedaquiline (6months)

• Levofloxacin, Linezolid, Clofazamine, Cycloserine.

Note:

- When the patient has defaulted from treatment before the present illness and treated tuberculosis in the past suspect the possibility of drug-resistant TB .
- If the intensive phase is prolonged, the injectable agent is only given three times a week in the extended intensive phase.
- Reduce Linezolid to 300 mg/day after 6 to 8 months.
- Pyridoxine to be given to all Drug resistance TB patients as per weight band.



SIDE EFFECTS OF ANTI TB DRUGS

- **INH** - Iron Accumulation in Mitochondria (Sideroplastic Anemia) Neuritis & Hepatitis
- **Ethambutol** - Eyes- Decreased Visual Acuity red -Green discrimination, Optic Neuritis.
- **Pyrazinamide**: Hyperuricemia (Gout), Jaundice
- **Rifampicin**: Red-Orange colored urine, saliva or tears, Jaundice, Redness and itching of the skin in sunlight.
- **Other Drugs**: Nausea, Vomiting & Head ache



PREVENTION

PREVENTION & CONTROL OF TUBERCULOSIS

Primary Prevention
Early detection &
Treatment

Secondary Prevention
Preventing TB
Disease

Tertiary Prevention
Preventing TB
Morbidity & Mortality

- **Scale up air borne infection control** measures
- **Improving ventilation in indoor spaces** so there are fewer bacteria in the air
- **Treatment of latent infection** in contacts with bacteriologically confirmed cases, before it becomes active.
- **Using directly observed therapy (DOTs)**, in which people taking medication for TB are monitored by their healthcare providers, to raise the likelihood of successful treatment.

PREVENTIVE MEASURES

PREVENTIVE MEASURES





NATIONAL TUBERCULOSIS ELIMINATION PROGRAM (NTEP)

- **RNTCP (2020)** - the central government has renamed the RNTCP as the **National Tuberculosis Elimination Program (NTEP)**. The Central TB Division developed a case based and web based system called "**Nikshay**" to monitor TB patients.
- The national goal was now the **elimination of TB in India by 2025**.
- **The NSP (National Strategic plan period 2017 – 2025** aiming for **End TB**' efforts.
- The programme expects quality improvements as well as efficiency benefits contributing to significant cost savings by taking a **Detect – Treat – Prevent – Build** approach

DIRECTLY OBSERVED TREATMENT SHORT COURSE - DOTS

Direct Observational Therapy - RNTCP Strategy

- DOT helps patients finish TB therapy as quickly as possible, without unnecessary gaps
- DOT helps prevent TB from spreading to others.
- DOT decreases the risk of drug-resistance resulting from erratic or incomplete treatment.
- DOT decreases the chances of treatment failure and relapse.



*Frequency of Dosage:
Daily (7 day/week) Single
daily dosage 4 weeks per
month, i.e.:28 doses*



DIRECTLY OBSERVED TREATMENT SHORT COURSE - DOTS (Cont...)

Role of Health Care Provider:

- delivering the prescribed medication
- checking for side effects
- watching the patient swallow the medication
- documenting the visit
- answering questions



REFERENCE



Brunner Suddarths Textbook of medical surgical
Nursing-
Harrison –Medicine.



THANKYOU