



Tuberculosis


Major global health threat

DR. Afrin Ahmed Clara (AfC)

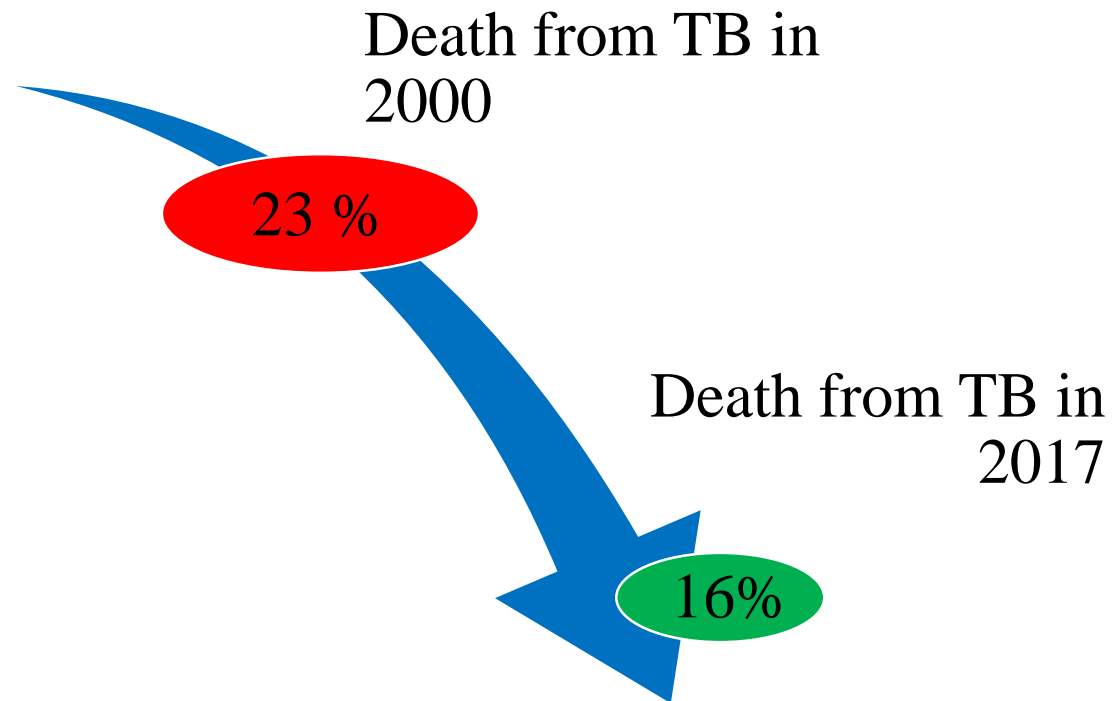
**SENIOR LECTURER,
DEPARTMENT OF PUBLIC HEALTH
SCHOOL OF HEALTH AND LIFE SCIENCE
NORTH SOUTH UNIVERSITY**

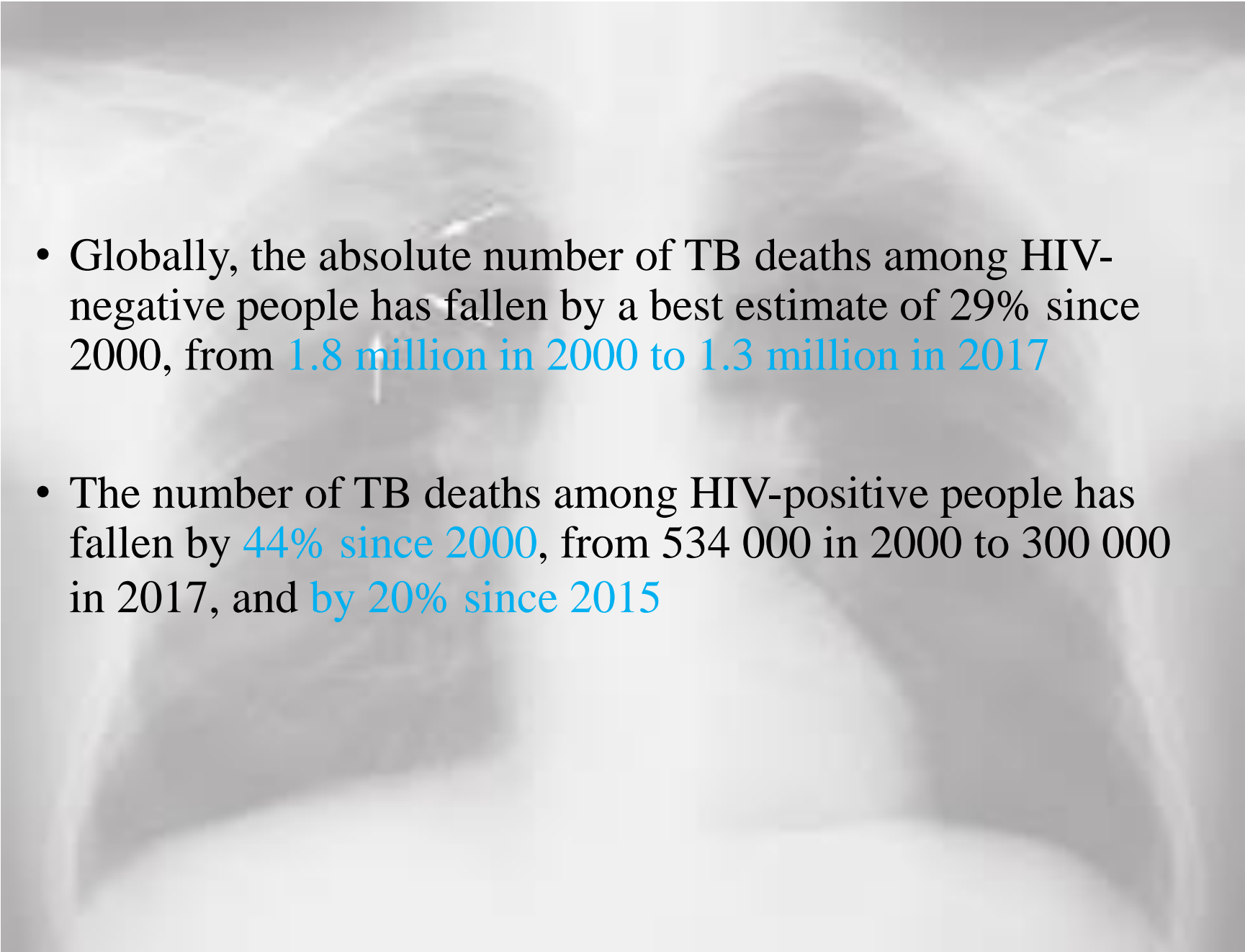
United to End TB: An Urgent Global Response to a Global Epidemic

- TB caused an estimated **1.3 million deaths** (range, 1.2–1.4 million) among HIV-negative people.(2017)
- **300 000 deaths from TB** (range, 266 000–335 000) among HIV-positive people.(2017)
- **TB is one of the top 10 causes of death** and the leading cause from a single infectious agent.
- Bangladesh is one thirty **high TB burden country** in the world

- 
- **1.7 billion** (23% of World's population) people have latent TB and thus at risk of developing active TB disease during their lifetime
 - 558 000 people developed TB that was resistant to rifampicin (RR-TB), the most effective first line drug, and of these, **82% had multidrug-resistant TB (MDR-TB)**.

Progress in TB



- 
- Globally, the absolute number of TB deaths among HIV-negative people has fallen by a best estimate of 29% since 2000, from 1.8 million in 2000 to 1.3 million in 2017
 - The number of TB deaths among HIV-positive people has fallen by 44% since 2000, from 534 000 in 2000 to 300 000 in 2017, and by 20% since 2015

- *Tuberculosis is potentially fatal contagious disease that can affect almost any part of the body but mainly an infection of lung*



Mycobacterium Tuberculosis



Human

Mycobacterium Bovis



Animal

Classification of TB



Pulmonary TB

Primary TB

Secondary TB



Extra Pulmonary TB

Lymph node TB

Gastrointestinal TB

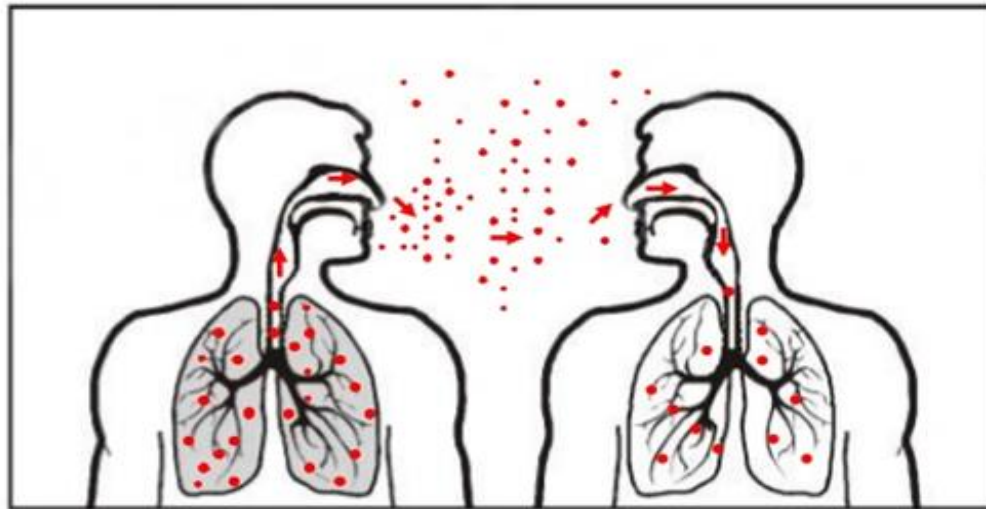
Tuberculous meningitis

Skeletal TB

Pericardial TB



Transmission of TB



**Dots in air represent droplet nuclei containing
*M. tuberculosis***

- M. tuberculosis is carried in *airborne particles*, called droplet nuclei, of 1– 5 microns in diameter. Infectious droplet nuclei are generated when persons who have pulmonary or laryngeal TB disease *cough, sneeze, shout, or sing*. Depending on the environment, these tiny particles can remain *suspended in the air for several hours*. M. tuberculosis is transmitted through the air, not by surface contact. Transmission occurs when a person *inhales droplet nuclei containing M. tuberculosis*, and the droplet nuclei traverse the mouth or nasal passages, upper respiratory tract, and bronchi to reach the alveoli of the lungs

Factors	Description
Susceptibility	Susceptibility (immune status) of the exposed individual
Infectiousness	Infectiousness of the person with TB disease is directly related to the number of tubercle bacilli that he or she expels into the air. Persons who expel many tubercle bacilli are more infectious than patients who expel few or no bacilli
Environment	Environmental factors that affect the concentration of <i>M. tuberculosis</i> organisms
Exposure	Proximity, frequency, and duration of exposure

- Young children with pulmonary and laryngeal TB disease are less likely than adults to be infectious. This is because children generally do not produce sputum when they cough. However, transmission from children can occur. Therefore, children and adolescents with TB disease should be evaluated for infectiousness using the same criteria as adults.

These criteria include presence of cough lasting 3 weeks or longer; cavitation on chest radiograph; or respiratory tract disease with involvement of lungs, airways, or larynx

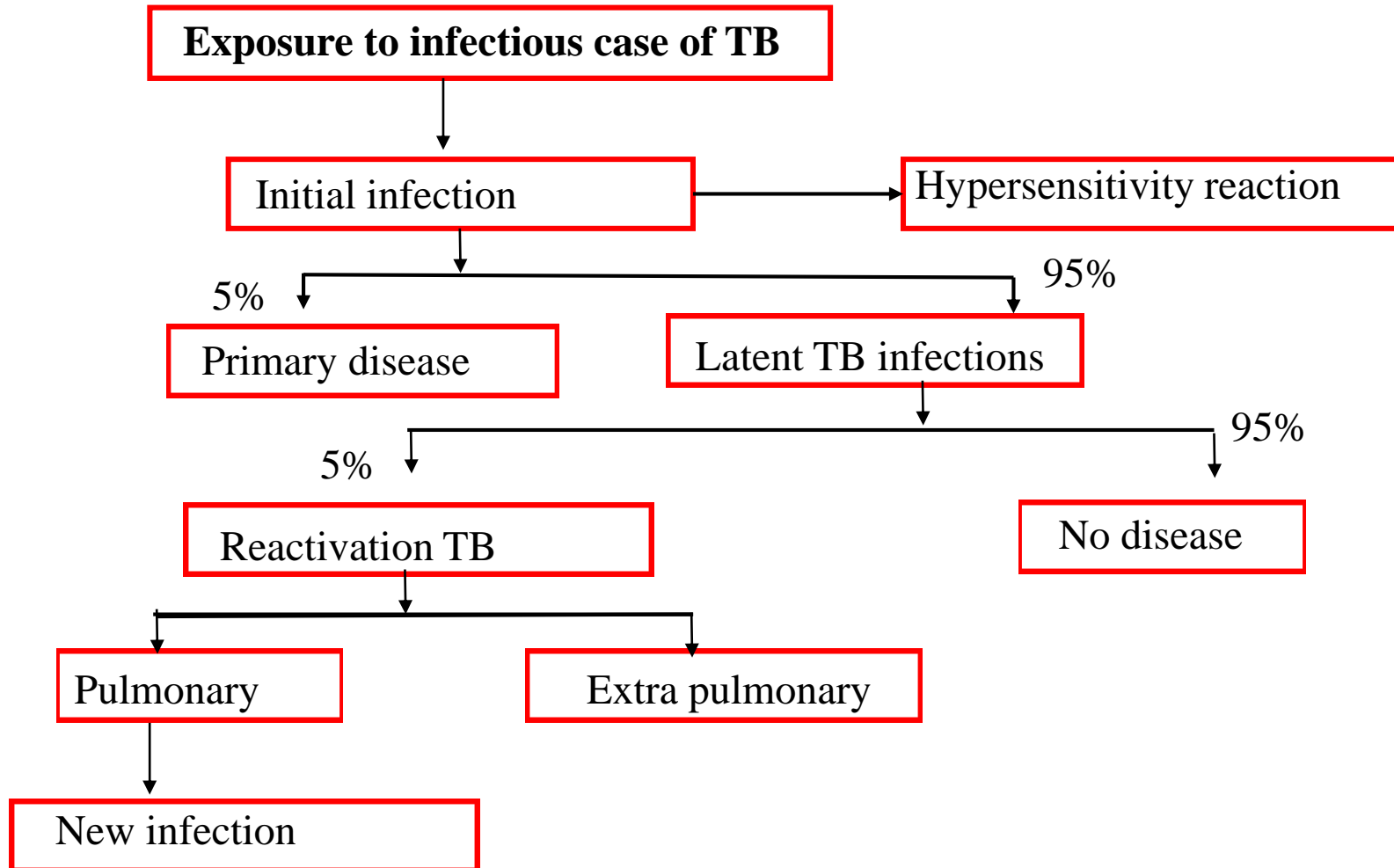
**Environmental Factors that Enhance the Probability that
M. tuberculosis Will Be Transmitted**

Factor	Description
Concentration of infectious droplet nuclei	The more droplet nuclei in the air, the more probable that <i>M. tuberculosis</i> will be transmitted
Space	Exposure in small, enclosed spaces
Ventilation	Inadequate local or general ventilation that results in insufficient dilution or removal of infectious droplet nuclei
Air circulation	Recirculation of air containing infectious droplet nuclei
Specimen handling	Improper specimen handling procedures that generate infectious droplet nuclei
Air Pressure	Positive air pressure in infectious patient's room that causes <i>M. tuberculosis</i> organisms to flow to other areas

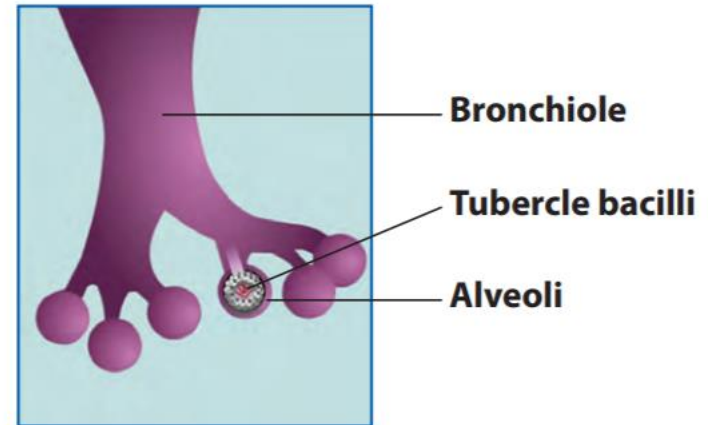
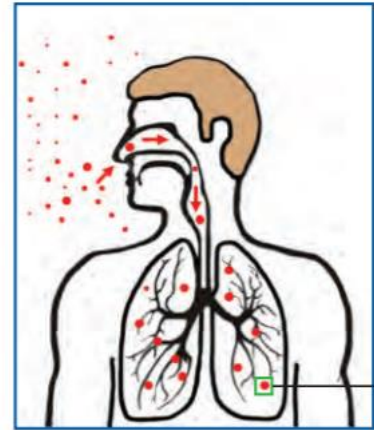
**Proximity and Length of Exposure Factors that Can Affect
Transmission of *M. tuberculosis***

Factor	Description
Duration of exposure to a person with infectious TB	The longer the duration of exposure, the higher the risk for transmission
Frequency of exposure to infectious person	The more frequent the exposure, the higher the risk for transmission
Physical proximity to infectious person	The closer the proximity, the higher the risk for transmission

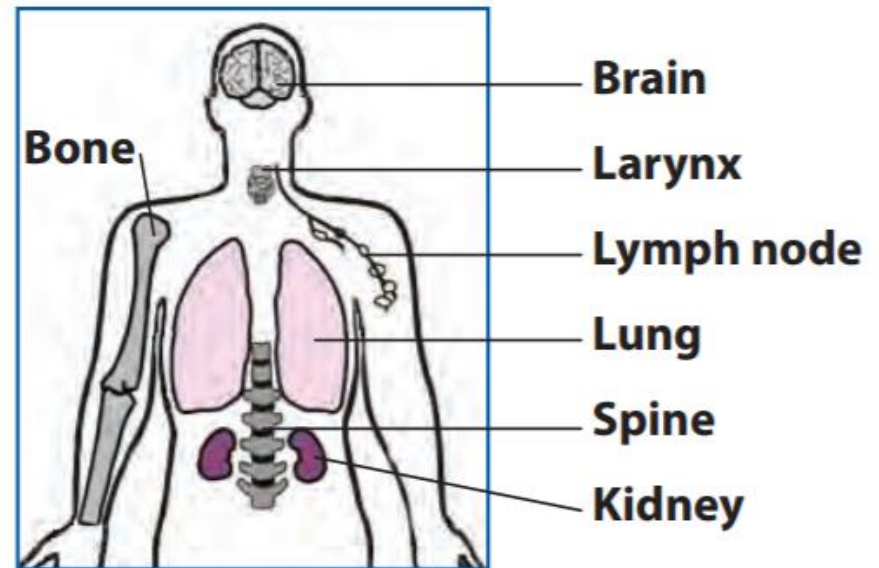
Pathogenesis of TB



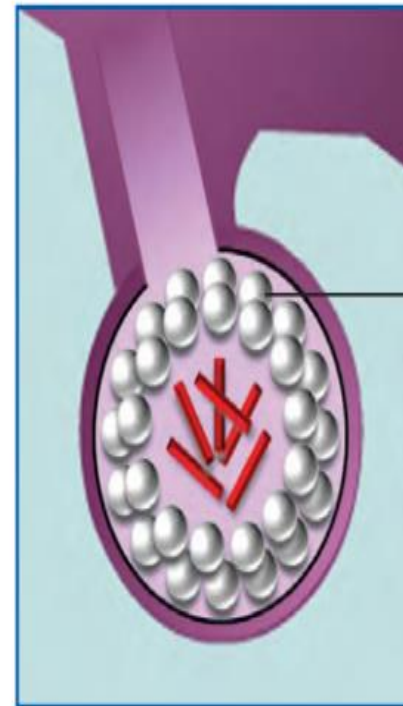
- Droplet nuclei containing tubercle bacilli are inhaled, enter the lungs, and travel to the alveoli.
- Tubercle bacilli multiply in the alveoli



- A small number of tubercle bacilli enter the bloodstream and spread throughout the body. The tubercle bacilli may reach any part of the body, including areas where TB disease is more likely to develop (such as the brain, larynx, lymph node, lung, spine, bone, or kidney)

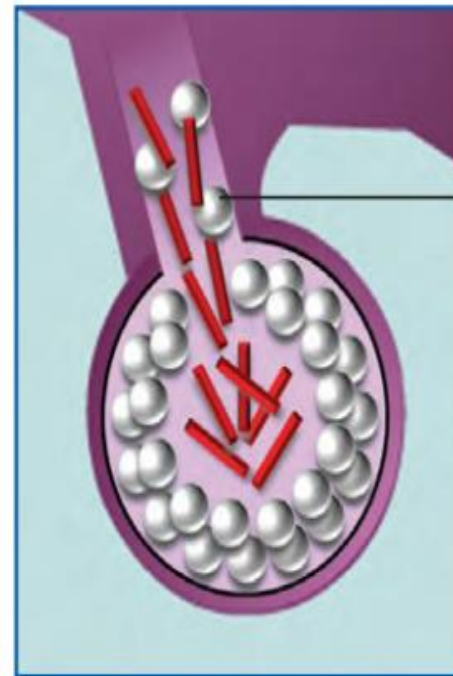


- Within 2 to 8 weeks, special immune cells called macrophages ingest and surround the tubercle bacilli. The cells form a barrier shell, called a granuloma, that keeps the bacilli contained and under control (LTBI).



Special immune cells form a barrier shell (in this example, bacilli are in the lungs)

- If the immune system cannot keep the tubercle bacilli under control, the bacilli begin to multiply rapidly (TB disease). This process can occur in different areas in the body, such as the lungs, kidneys, brain, or bone



**Shell breaks
down and
tubercle
bacilli escape
and multiply**

Latent tuberculosis infection

- Persons with LTBI have *M. tuberculosis* in their bodies, but do not have TB disease and cannot spread the infection to other people. A person with LTBI is not regarded as having a case of TB

TB Disease

- In some people, the tubercle bacilli overcome the immune system and multiply, resulting in progression from LTBI to TB disease . Persons who have TB disease are usually infectious and may spread the bacteria to other people. The progression from LTBI to TB disease may occur at any time, from soon to many years later

Risk Factors for Progression

- Persons infected with HIV
- Children younger than 5 years of age
- Persons infected with M. tuberculosis in the past 2 years
- Persons who are receiving immunosuppressive therapy
- Persons with diabetes, kidney disease, pre-existing lung disease
- Persons who lower than their ideal body weight
- Cigarette smokers, drug abusers, alcoholics
- Medically underserved, low income populations

SIGNS AND SYMPTOMS OF

ACTIVE TB

COUGHING THAT
LASTS THREE OR
MORE WEEKS



CHEST PAIN, OR PAIN WITH
BREATHING OR COUGHING



COUGHING
UP BLOOD



LOSS OF
APPETITE



FEVER



CHILLS



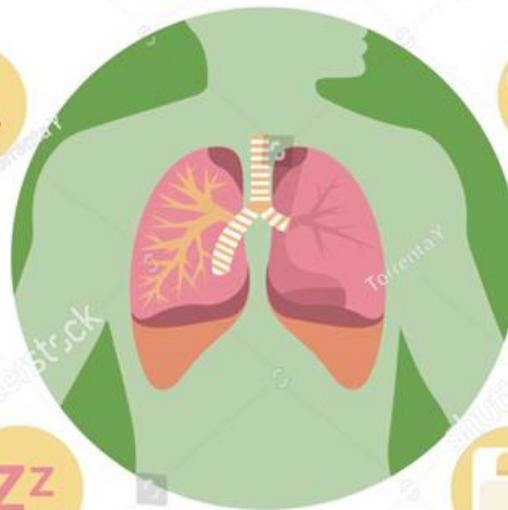
NIGHT
SWEATS



UNINTENTIONAL
WEIGHT LOSS



FATIGUE



Diagnosis

- Skin test/Tuberculin skin test (TST)/Mantoux test (MT)
- $>15\text{mm}$ =Further investigation and probability of TB infection (Do not give BCG)



- Sputum for bacteria (smear/culture media/Gene Xpert)
- Chest X ray



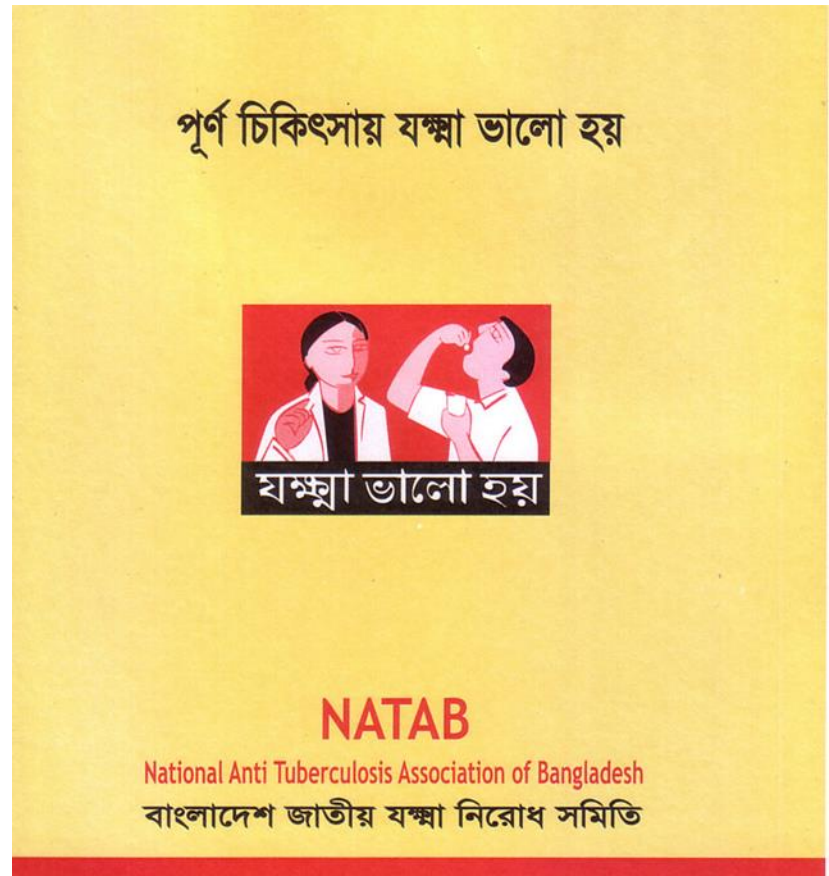
TB lung



Healthy lung

Treatment

- TB can be effectively treated with current drugs available
- Treatment required for 6-9 months
- Two lines of drugs:
 - First line:
 - Isoniazid
 - Rifampicin
 - Ethambutol
 - Pyrazinamide
 - Second line



MDR-TB and XDR-TB

Multidrug resistant TB (MDR-TB)

Organisms resistant to the most effective anti-TB drugs, isoniazid and rifampin

Extensively Drug Resistant TB (XDR-TB)

Organisms resistant to both first line anti-TB drugs, isoniazid and rifampin plus two or more second line drugs

What is DOTS (directly observed treatment, short-course)

- DOT means that a trained health care worker or other designated individual (excluding a family member) provides the prescribed TB drugs and watches the patient swallow every dose

Why use DOT

- We cannot predict who will take medications as directed, and who will not. People from all social classes, educational backgrounds, ages, genders, and ethnicities can have problems taking medications correctly.
- Studies show that 86-90% of patients receiving DOT complete therapy, compared to 61% for those on self-administered therapy.
- 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

Who can deliver DOTS

- A nurse or supervised outreach worker from the patient's county public health department normally provides DOT.
- In some situations, it works best for clinics, home care agencies, correctional facilities, treatment centers, schools, employers, and other facilities to provide DOT, under the guidance of the local health department

- Family members should not be used for DOT. DOT providers must remain objective
- For complex regimens including IV/IM medications or twice daily dosing, home care agencies may provide DOT or share responsibilities with the local health department

How can a DOT provider build rapport and trust

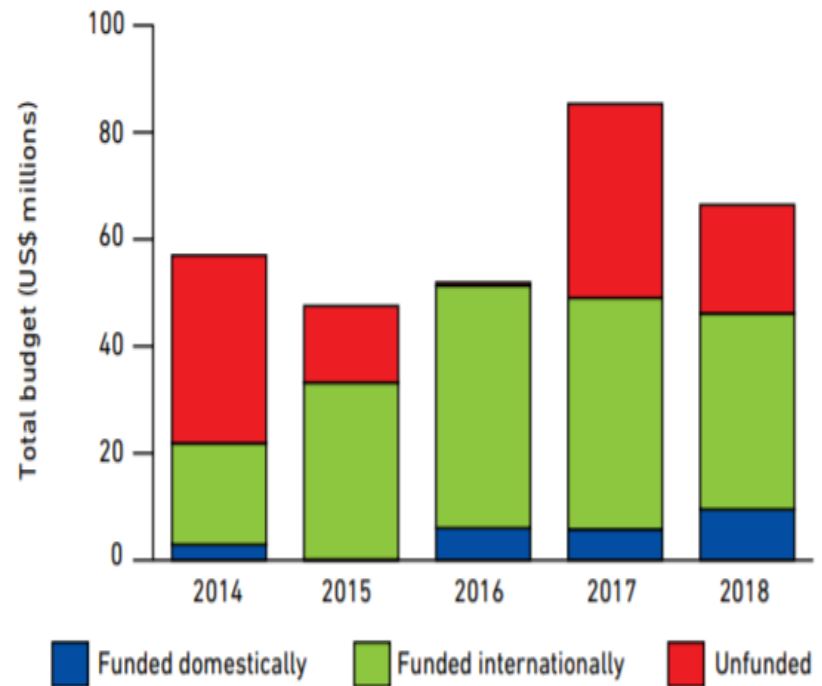
1. “Start where the patient is.”
2. Protect confidentiality.
3. Communicate clearly.
4. Avoid criticizing the patient’s behavior; respectfully offer helpful suggestions for change.
5. Be on time and be consistent.
6. Adopt and reflect a nonjudgmental attitude

Bangladesh situation

- Bangladesh one of 8 countries sharing 2/3 of global TB burden
- In 2017, a total of 364,000 new cases were detected and 59,000 deaths were attributed to TB. MDR cases reported 5,800
- Have been implementing Directly Observed Chemotherapy, Short Course (or DOTS) since 1993
- A treatment success rate of 93% has been achieved among TB cases. MDR-TB treatment success rate is also high at 73% (greater than 55% globally)
- Challenges: ensuring universal access to TB care, Lack of engagement of private health practitioners and lack of awareness

TB financing in 2018

- National TB budget \$66millions
- Funding source
 - Domestic 14%
 - International 55%
 - Unfunded 31%



- <https://www.canada.ca/en/public-health/services/infectious-diseases/canadian-tuberculosis-standards-7th-edition/edition-14.html>



THANK YOU

- <https://www.canada.ca/en/public-health/services/infectious-diseases/canadian-tuberculosis-standards-7th-edition/edition-14.html>