TB Basics
Diagnosis, Treatment and Prevention

Workshop to build the TB/HIV capacity of civil society activists, advocates and organizations for people who use drugs

10th- 11th June, Liverpool
Or

DEATH BY POWERPOINT
How long has TB been infecting humans?

- TB disease has been found in the mummies of ancient Egyptians and Andean Indians
- Global problem for thousands of years
- Consumption, white plague, Captain of the men of death!
- Cause of TB identified 24 March 1882 by Dr. Robert Koch
A potted history of TB

- 1882 TB bacilli identified by Koch
- 1907 TST - tuberculin skin test (von Pirquet)
- 1919 BCG – Bacille Calmette & Guerin vaccine
- 1943 Schatz & Waksman discover streptomycin
- 1948 BMRC trial of streptomycin vs bed rest
- 1952 Development of isoniazid
- 1966 Development of rifampicin
- 1978 Short course chemotherapy (DOTS)
What is TB?

- TB is a bacteria (single-cell organism)
- More specifically, it is a type of mycobacteria
  - “myco” means waxy in Latin and refers to TB’s waxy cell wall
  - There are 70 different types of mycobacteria
What is TB?

- The scientific name for the TB microbe is *Mycobacterium tuberculosis* or *M.tb*
What is TB?

- Beneath a microscope, it has a long rod-like shape or ‘bacillus’

- The thick waxy cell wall allows the germ to spread through the air in water droplets
How is TB transmitted?

• TB is transmitted through the air

• TB bacteria are coughed up from the lungs of an infected person into the air

• Once the TB bacteria are inhaled, they push their way into the lungs
TB Infection and Disease
Transmission of TB

- Droplet nuclei containing mycobacteria inhaled
Not all TB infections lead to TB disease

• Latent TB infection (aka LTBI) occurs when the immune system has contains TB and prevents disease.

• Active TB disease refers to the time when TB breaks out and causes disease.
TB Definitions

- **Latent TB infection (LTBI)**
  - TB bacilli live dormant inside the lung, but do not cause destruction of organs
  - No signs or symptoms of disease
  - Not infectious

- **TB disease**
  - TB bacilli progressively invade and damage a part(s) of the body
  - Signs and symptoms of disease appear
  - Can be infectious
What is the risk of LBTI progressing to active disease?

In HIV-negative persons, the body’s immune system usually keeps TB infection under control.

Only 5-10% of LTBI cases progress to active TB during their lifetime.

People living with HIV with LTBI have a 5-10% risk of developing TB disease each year.
TB Disease

- The TB germ can "wake up" at any time (usually within 1-2 years) and make a person sick

- More likely to get TB disease when a person’s body is weakened from:
  - HIV
  - Diabetes
  - Poor Nutrition
  - Cancer medications
  - Steroids
  - Drug use
  - Smoking
  - Old Age
What happens during active TB disease?

- Active TB disease may occur in the lungs (pulmonary TB) and/or in other parts of the body (extrapulmonary TB).

- **Pulmonary TB** is the most common form of TB disease and is the infectious form.

- The damage caused by pulmonary TB sends pus containing TB bacilli into the lungs, which a person with TB may cough up in spit or sputum.

- **Extrapulmonary TB** is normally rare but occurs in up to 40% of TB cases among people living with HIV.
Definitions: Patients with TB

- **Pulmonary TB (PTB)**
  - Disease involves the lung tissue
  - Smear-positive: visible TB bacilli in sputum, very infectious
  - Smear-negative: no visible TB bacilli in sputum, less infectious

- **Extra-pulmonary TB (EPTB)**
  - Disease involving an organ other than the lung, includes pleural TB
  - Not infectious unless also have pulmonary TB
What are symptoms of TB disease?

- Due to general infection and immune response
  - Fever
  - Night sweats
  - Weight loss

- Due to direct damage
  - Pulmonary TB
    - Cough
    - Sputum – white, grey, green, red
  - Extrapulmonary
    - Just about anything…..depending on site

- People living with HIV develop symptoms late and are less likely to present with coughing.
TB Basics Summary

- Caused by *Mycobacterium tuberculosis*
- Transmitted through the air
- Infection can cause latent TB or progress to active TB
- Active TB can be pulmonary or extra-pulmonary
- Pulmonary TB can be smear positive or smear negative
- People living with HIV are more likely to progress to active TB and often develop symptoms late
Group work

• TB Diagnosis

• TB Treatment (TB/HIV and drug resistant TB)

• TB Prevention
Diagnosis

• Microscopy of specially stained sputum is the main test for diagnosing TB (1-2 days)
• TB bacilli seen in the sputum sample using a microscope (smear positive or AFB +)
• Detects only ½ of all TB and 1/3rd of HIV related TB
• PLHIV higher proportion of
  – sputum negative pulmonary TB
  – extrapulmonary TB
Diagnosis

- X-ray also has a role for diagnosing TB if smear –ve
- Role of culture: (takes 3 - 4 wks)
- EPTB may require tissue samples/culture
- Diagnostic process will differ depending on the setting (rural/urban/laboratory capacity/availability of X-Ray/culture)
Tuberculosis Case definition

**TB case** - A patient in whom tuberculosis has been confirmed by bacteriology or **diagnosed by a clinician**.

**Smear positive pulmonary TB case** - A patient with one or more positive sputum smear examinations (direct smear microscopy) AFB+.

**Smear negative pulmonary TB case** – A patient with two sputum smear examinations negative for AFB; X ray suggests TB, unresponsive to a course of broad-spectrum antibiotics (except in a patient with strong clinical evidence of HIV infection); **and a decision by a clinician to treat with anti tuberculosis chemotherapy**; or positive culture but negative AFB sputum examinations.

**Extrapulmonary TB case** - one culture-positive specimen, or histological or strong clinical evidence. **Followed by decision by a clinician to treat with a full course of anti-tuberculosis chemotherapy**
Diagnosis

• Early detection and treatment is the priority, especially for people living with HIV

• Anybody with symptoms suggestive of TB should be investigated.

• Close contacts of TB patients should also be checked by health staff

• Active versus passive case finding
Diagnosing TB infection

- Where there is high prevalence of TB the tuberculin test (TST) is of little value.

  - does not distinguish between infection and disease

  - negative result in the case of someone co-infected with HIV, severe malnutrition & miliary TB.
Treatment

• TB is treatable and curable, even in people living with HIV

• First line TB drugs
  Rifampicin (R)
  Isoniazid (H)
  Ethambutol (E)
  Pyrazinamide (Z)
Treatment

Divided into two phases:

*Intensive phase* (all 4 drugs) for 2-3 months depending on if the patient has been treated before.

*Continuation phase* (rifampicin and isoniazid) for 4-6 months, depending on whether you have been treated before.
Treatment

The Aims of anti-TB Treatment

a. To cure the patient of TB
b. To prevent death from active TB or its late effects
c. To prevent TB relapse or recurrent disease
d. To prevent the development of drug resistance
e. To decrease TB transmission to others.
Treatment Support

Essential for:

- Monitoring side effects
- Encouraging the patient to keep taking treatment
- Provision of extra care needed (psycho-social)
Treatment and care of HIV related TB

- Provide HIV testing and counselling
- Introduce HIV prevention methods
- Introduce co-trimoxazole preventive therapy (CPT)
- Ensure HIV care and support
- Introduce antiretroviral therapy (ART)
Early ART and CPT are linked to better outcomes in TB treatment

ART during TB treatment rather than after reduces mortality by over 50% (SAPIT trial South Africa)

ART after 2 weeks v 8 weeks reduces mortality from 27% to 5% (among drug users in Tehran)

Death was strongly associated with absence of ART

Cotrimoxazole reduces mortality by 50%
With TB treatment over 90% cure rates possible only 3-5% die but if HIV 4 time higher death rates

- New smear-positive (data from 55 countries)
- New smear-negative and extrapulmonary (data from 48 countries)
- Re-treatment (data from 31 countries)
The Lisbon Outbreak
The largest documented outbreak of MDR TB in Europe

Mid 90s Rise in TB cases poor outcome in HIV unit.

95/173 (55%) TB cases in HIV positive patients were MDR

Subgroup study (37)
All MDR and all drug users - showed transmission in HIV ward.
All died: mean survival 83 days after diagnosis
No susceptibility testing results available for 60% before death

Improving infection control (isolation rooms)
and empirical treatment with 6 drugs when patient is suspected of having TB introduced during 1996

Reduction from 42% of TB cases MDR in 1996 to 11% MDR in 1999.
Multi-Drug Resistant (MDR) TB – resistant to the 2 most powerful first line anti-TB drugs

Rifampicin
Isoniazid
Drug Resistant TB

Caused by:

- Poor quality medication
- Inadequate or erratic treatment
- Transmission from one person to another
Multi-Drug Resistant TB

Difficult to diagnose
- Time for culture
- Special laboratories

Treat with second-line drugs

MDR TB treatment takes 3-4 times longer and costs 100 times more

More side effects and drug interaction esp with ART
Extensively drug resistant TB - XDR TB

- MDR-TB that is also resistant to 2/3 most powerful second line TB drugs
- Difficult to diagnose
  - Time for culture
  - Special laboratories
- About 10% of MDR TB is XDR
- High fatality rate in people living with HIV
- Present in every region of the world
Prevention of Tuberculosis

1. Early diagnosis and prompt effective treatment of infectious cases

2. Good infection control

3. Isoniazid preventive therapy

4. Other factors better housing, nutrition, alcohol reduction….
TB Infection control in HIV care

“Excuse me, does anyone have a cough?”
Infection Control

1. Involve patients & community in advocacy campaigns
2. Infection control plan
3. Safe sputum collection
4. Cough etiquette and cough hygiene
5. Triage TB suspects to fast tract or separation
6. Rapid TB diagnosis and treatment
7. Improve room air ventilation
8. Protect health care workers (Screen, IPT)
9. Capacity building
10. Monitor infection control practices.
Isoniazid Preventive Therapy

- Isoniazid treatment for 6 months given to PLHIV can reduce by 40-60%.

- The effect is more pronounced in people with a positive Tuberculin test.

- Screening for TB is needed first to exclude active disease.