# Tuberculosis

- **Objectives :**

1. Understand the epidemiology and global burden of TB.
2. List the sign and symptoms and risk factors of different types of TB, with particular emphasis on pulmonary TB.
3. Describe trends and state reasons for resurgence of pulmonary TB.
4. List population subgroups at risk for pulmonary TB.
5. Draw the cycle of infection of pulmonary TB.
6. Outline procedures for community diagnosis of pulmonary TB with emphasis on the limitation of each procedure.
7. Describe measures for prevention and control for pulmonary TB.
8. Describe the role of WHO to address the global burden of TB, particularly directly observed therapy short course (DOTS) for pulmonary TB .

**Done by :** Mohammed hakeem - Ali shahada - Ghada alqarni - Lujain alzaid

**Team leader:** **Saad Al-tweirqi**

**Reviewed by:** **Yazeed Al-Dossare**

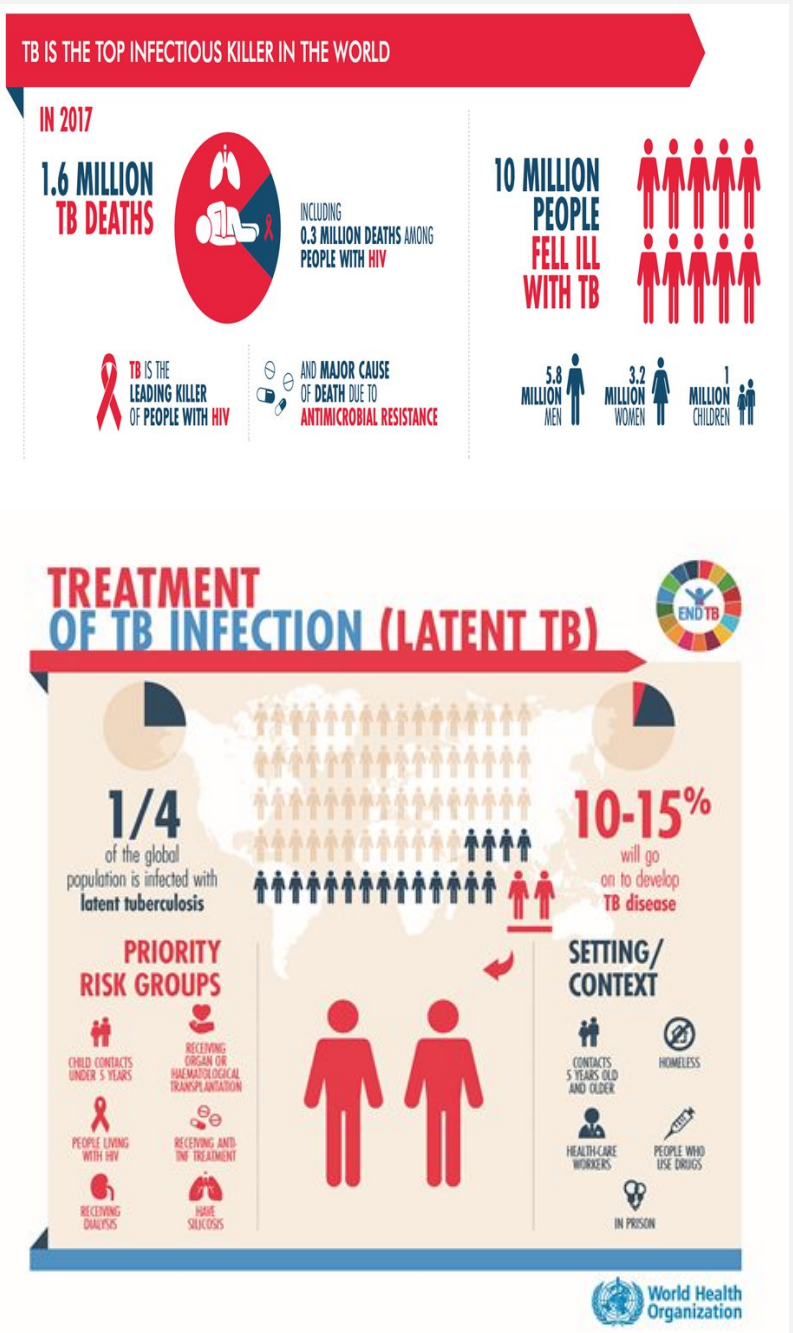
- **Resources :**

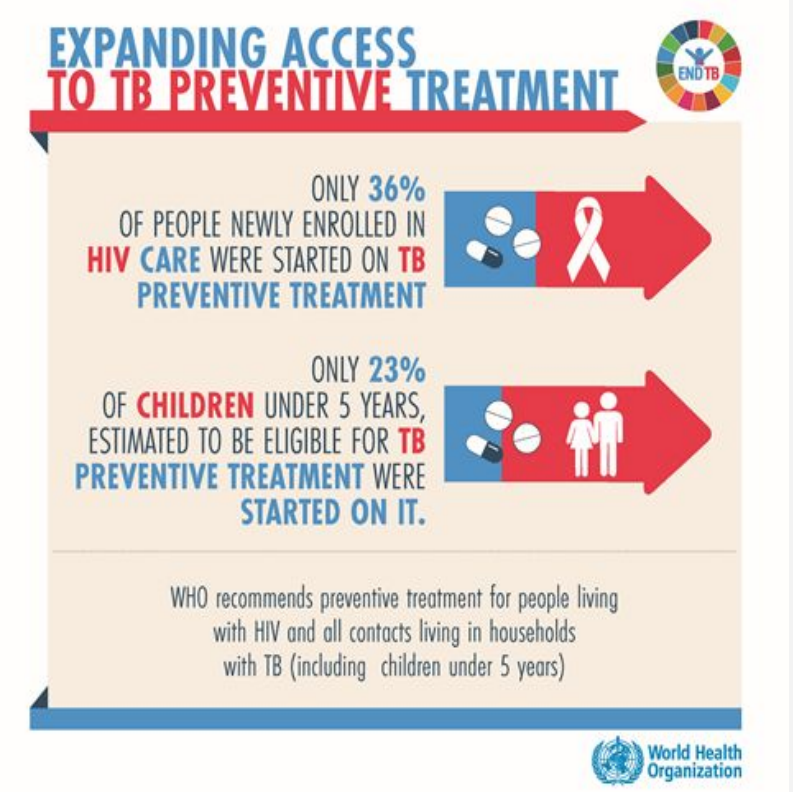
Slides.

Doctor’s notes.

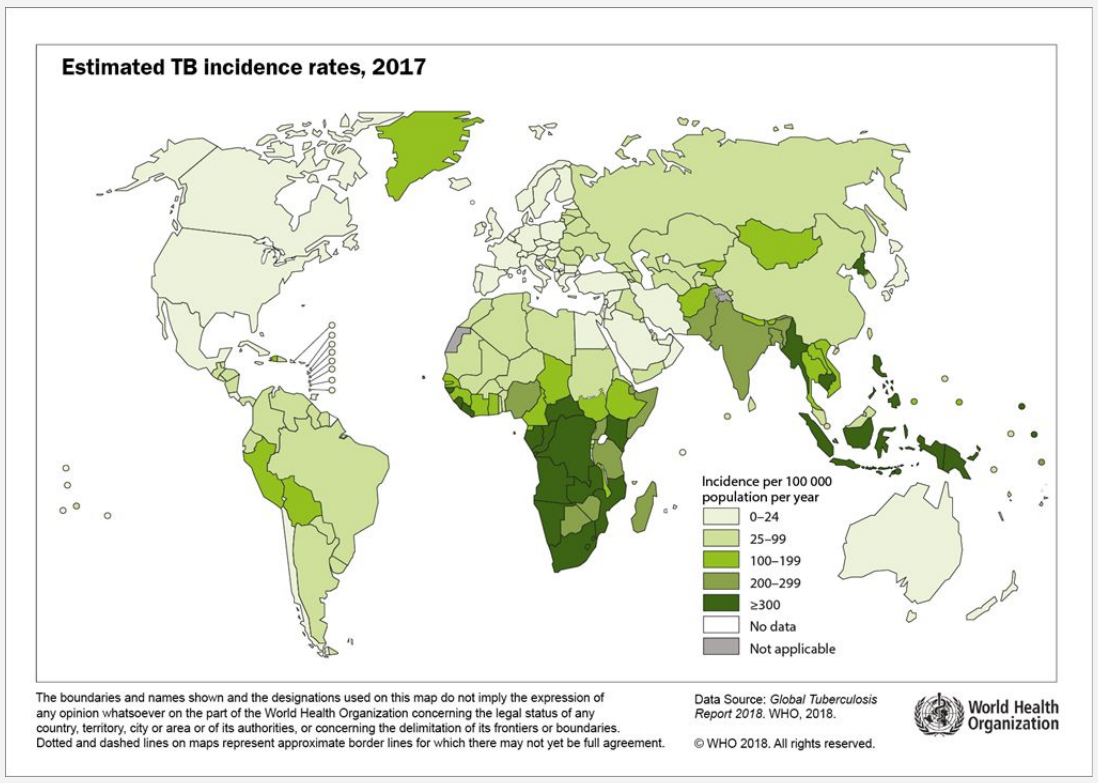
[Colors index : Important | Notes | Note | Slides | Extra] [ Editing file | Share note ]

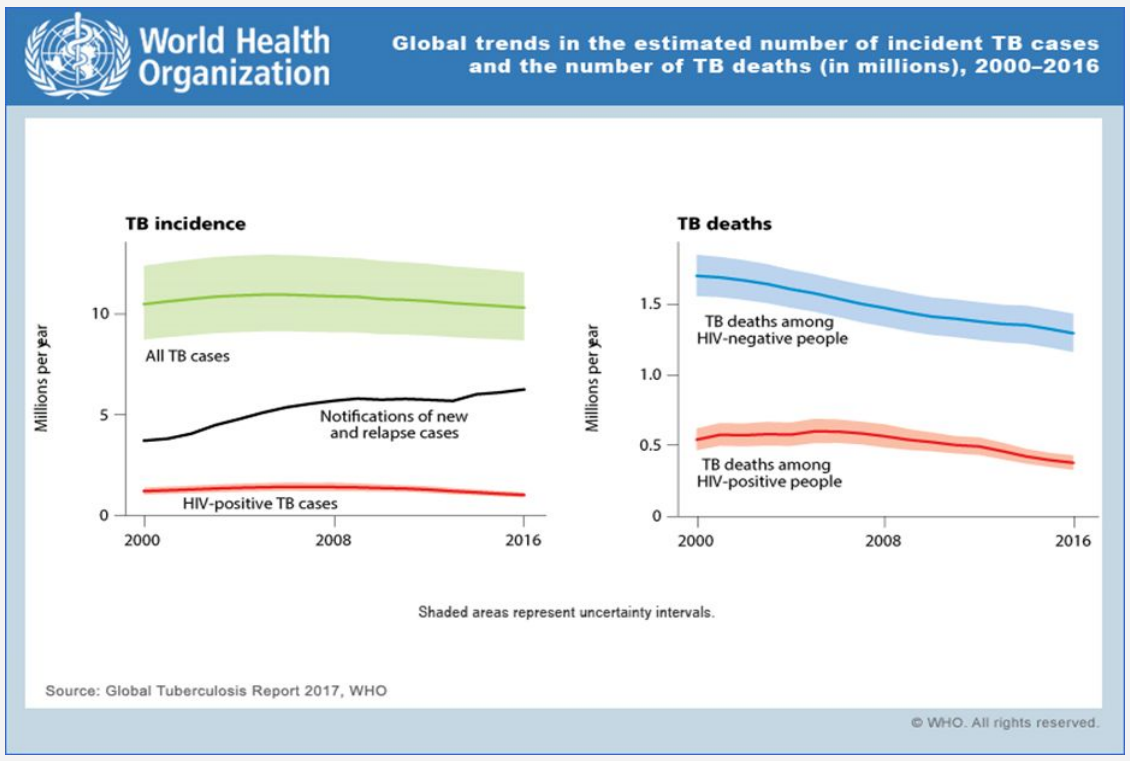
# Epidemiology and Global burden of TB



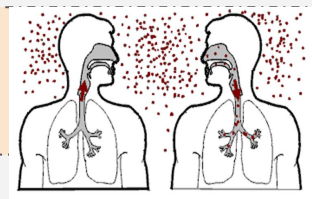




Common infectious disease, though not high incidence in KSA
Highly prevalent in countries in east asia and africa. Mostly due to low standard of living conditions



## Transmission of M. tuberculosis



- Spread by droplet nuclei.
- Expelled when person with infectious TB coughs,sneezes, speaks, or sings.
- Close contacts at highest risk of becoming infected and prolonged exposure usually needed to establish infection.
- Risk of transmission outdoors is reduced because of dilution and bacilli are killed by ultraviolet light.
- Transmission occurs from person with infectious TB disease (<u>not latent TB infection</u>).

## Probability TB Will Be Transmitted

- Infectiousness of person with TB.
- Environment in which exposure occurred.
- Duration of exposure.
- Virulence of the organism.

Suspected TB patients should be isolated and masked till treated, to reduce infection spread

## CYCLE OF INFECTION OF PULMONARY TUBERCULOSIS

Patients commonly present with 1 month history of productive cough,fever,weight loss and night sweats

**Agent :**

Mycobacterium tuberculosis

**Reservoir :**

Man in the form of a case .

**Susceptible host:**

Low standard of living,malnutrition,alcoholism,HIV/AIDS

**Incubation period= 4-12 weeks**

**Portal of exit:**

Respiratory tract. Source of infection:Sputum and contaminated articles, dust.

**Portal of entry (inlet):**

Respiratory tract.

**Transmission:**

- 1- contact : direct,indirect and droplet.
- 2- Air borne: droplet nuclei and dust transmission

## Conditions That Increase the Risk of Progression to TB Disease

- HIV infection
- Substance abuse
- Recent infection
- Chest radiograph findings suggestive of previous TB
- Diabetes mellitus
- Silicosis
- Prolonged corticosteroid therapy
- Other immunosuppressive therapy

HIV and immunosuppressant drugs lower the body's' immunity thus increasing susceptibility of TB infection

## Persons at Higher Risk for Exposure to or Infection with TB

imp

- Close contacts of persons known or suspected to have TB
- Residents and employees of high-risk congregate settings
- Health care workers (HCWs) who serve high-risk Clients
- Medically underserved, low-income populations
- Persons with malnutrition
- Children exposed to adults in high-risk categories
- Persons who inject illicit drugs

The infection can spread by coughing,sneezing and even speaking

Low income populations usually live in crowded houses which increases risk of TB spread

## Common Sites of TB Disease

- Lungs
- Pleura
- Central nervous system
- Lymphatic system
- Genitourinary systems
- Bones and joints
- Disseminated (miliary TB)

pex of the lung is a common site due to low blood supply

## Latent Tuberculosis Infection (LTBI)

| | |
|---|---|
| **Definition** | • defined as a state of persistent immune response to stimulation by Mycobacterium tuberculosis antigens with no evidence of clinically manifest active TB.<br>• There is an increased chance of developing active TB disease from the infection. |
| **Trearment** | Isoniazid (has been the standard treatment ) **Treatment is indicated for 6 months, though some patients refuse to take it as they are asymptomatic and you cannot force them** |

# Diagnosis of TB

**Evaluation for TB:**

1. Medical history
2. Physical examination
3. Mantoux tuberculin skin test
4. Chest radiograph
5. Bacteriologic or histologic exam

# Symptoms

| of Pulmonary TB | Systemic Symptoms |
|---|---|
| • Productive, prolonged cough<br>• (duration of >3 weeks)<br>• Chest pain<br>• Hemoptysis<br><br>Not likely to be TB if patient present with only 2 day history of cough | • Fever<br>• Chills<br>• Night sweats<br>• Appetite loss<br>• Weight loss<br>• Easy fatigability |

# Medical History

- Symptoms of disease
- History of TB exposure, infection, or disease
- Past TB treatment
- Demographic risk factors for TB
- Medical conditions that increase risk for TB
- disease

# Testing for TB Disease and Infection

All testing activities should be accompanied by a plan for follow-up care

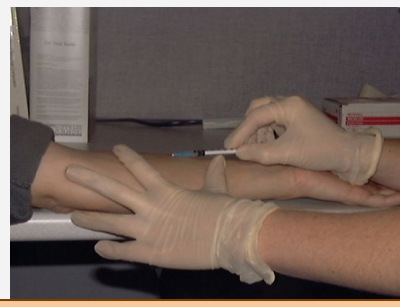
If positive follow up with an X-RAY to confirm the diagnosis

## Tuberculin Skin Test

Requires two visits by the patient. On the first visit the tuberculin is administered and on the second the induration is measured

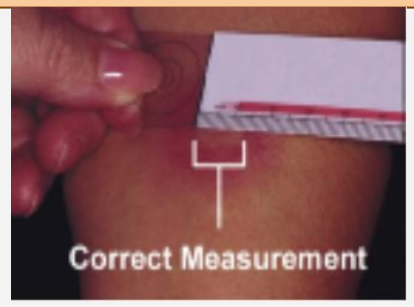
## 1- Administration

- Inject intradermally 0.1 ml of 5 TU PPD tuberculin
- Produce wheal 6 mm to 10 mm in diameter
- Do not recap, bend, or break needles, or remove needles from syringes
- Follow universal precautions for infection control



## 2- Reading

- Read reaction 48-72 hours after injection
- Measure only induration not the redness
- Record reaction in millimeters




A tuberculin skin test reaction is considered positive if the transverse diameter of the indurated area reaches the size required for the specific group.

| Induration size | Imp table Group |
|---|---|
| ≥5 mm | • HIV-positive persons. Due to suppressed immunity<br>• Patients with organ transplants and other immunosuppressed patients. |
| ≥ 10 mm | • Recent immigrants from countries with a high prevalence of TB.<br>• HIV-negative injection drug users.<br>• Laboratory personnel.<br>• Health care workers.<br>• Persons with increased risk of TB e.g. DM, silicosis, … |
| ≥15 mm | • Persons with no risk factors for tuberculosis |

Even vaccintated people may have a positive tubeculin test, that is way it is not diagnostic on its own

# Tuberculin Skin Test
# Cont.

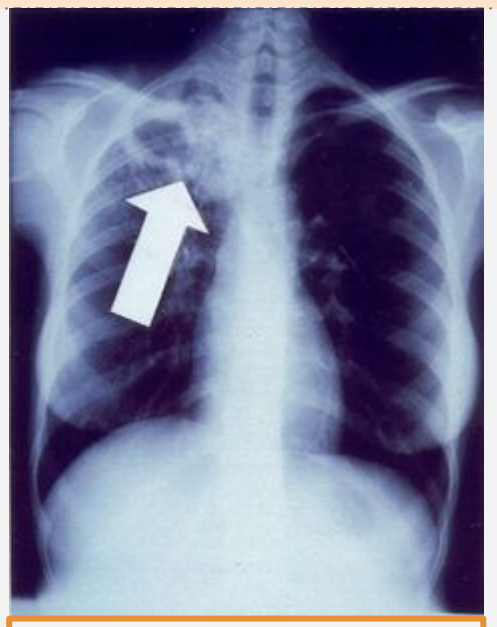
## Factors that May Affect the Skin Test Reaction

| Type of Reaction | Possible Cause |
|---|---|
| **False-positive** | • Non-tuberculous mycobacteria<br>• BCG vaccination Bacillus Calmette-Guerin Vaccine |
| **False-negative** | • Recent TB infection<br>• Very young age (< 6 months old)<br>• Live-virus vaccination<br>• Overwhelming TB disease<br>• HIV positive people |

## Chest Radiograph

- Abnormalities often seen in apical or posterior segments of upper lobe or superior segments of lower lobe.
- May have unusual appearance in HIV-positive persons.
- Cannot confirm diagnosis of TB

Infiltration will be seen on X-RAY



Arrow points to cavity in patient's right upper lobe

Bronchial lavage can be done instead if sputum cannot be obtained

## Sputum Specimen Collection

- Obtain 3 sputum specimens for smear examination and culture.
- Persons unable to cough up sputum, induce sputum, bronchoscopy or gastric aspiration
- Follow infection control precautions during specimen collection

# Smear Examination

- Strongly consider TB in patients with smears containing alcohol acid-fast bacilli (AAFB).
- Results should be available within 24 hours of specimen collection.
- Presumptive diagnosis of TB.

Patient with AAFB and positive X-RAY along with symptoms of TB infection should be commenced on treatment even before the culture is obtained, but if its positive in absence of chest sign treatment should be withheld till culture results are available

# Cultures

- Use to confirm diagnosis of TB.
- Culture all specimens, even if smear negative.
- Results in 4 to 14 days when liquid  medium systems used.

## Blood Tests for TB Infection

Interferon Gamma Release Assays (IGRA)

Is starting to replace tuberculin skin test

## Quantiferon

| | |
|---|---|
| **Definition** | • is a simple-blood test, a modern alternative to the tuberculin skin test that can aid in diagnosing M. tuberculosis infection.<br>• highly specific and sensitive |
| **Advantages** | • Requires a single patient visit to conduct the test.<br>• Results can be available within 24 hours.<br>• Prior BCG (Bacille Calmette-Guérin) vaccination does not cause a false-positive Quantiferon result.<br>• A positive test result suggests that M. tuberculosis infection is likely; a negative result suggests that infection is unlikely.<br>• Used to detect persons with Latent TB infection. |
| **Disadvantage** | They do not help differentiate latent tuberculosis infection (LTBI) from tuberculosis disease. |

# Treatment of TB Infection

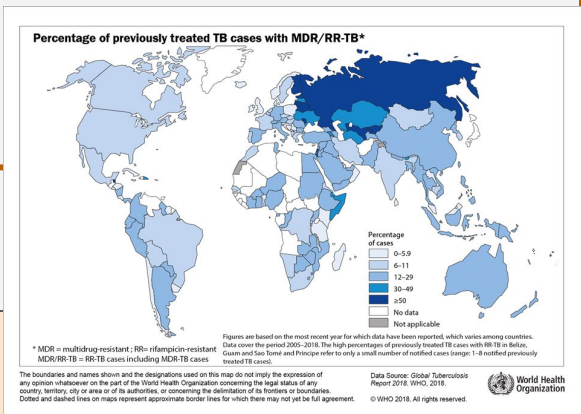
## DIRECTLY OBSERVED TREATMENT, SHORT COURSE(DOTS)CHEMOTHERAPY

- Health care worker watches patient swallow each dose of medication.
- Consider DOT for all patients.
- DOT can lead to reductions in relapse and acquired drug resistance.
- Use DOT with other measures to promote adherence.

## The five elements of DOTS:

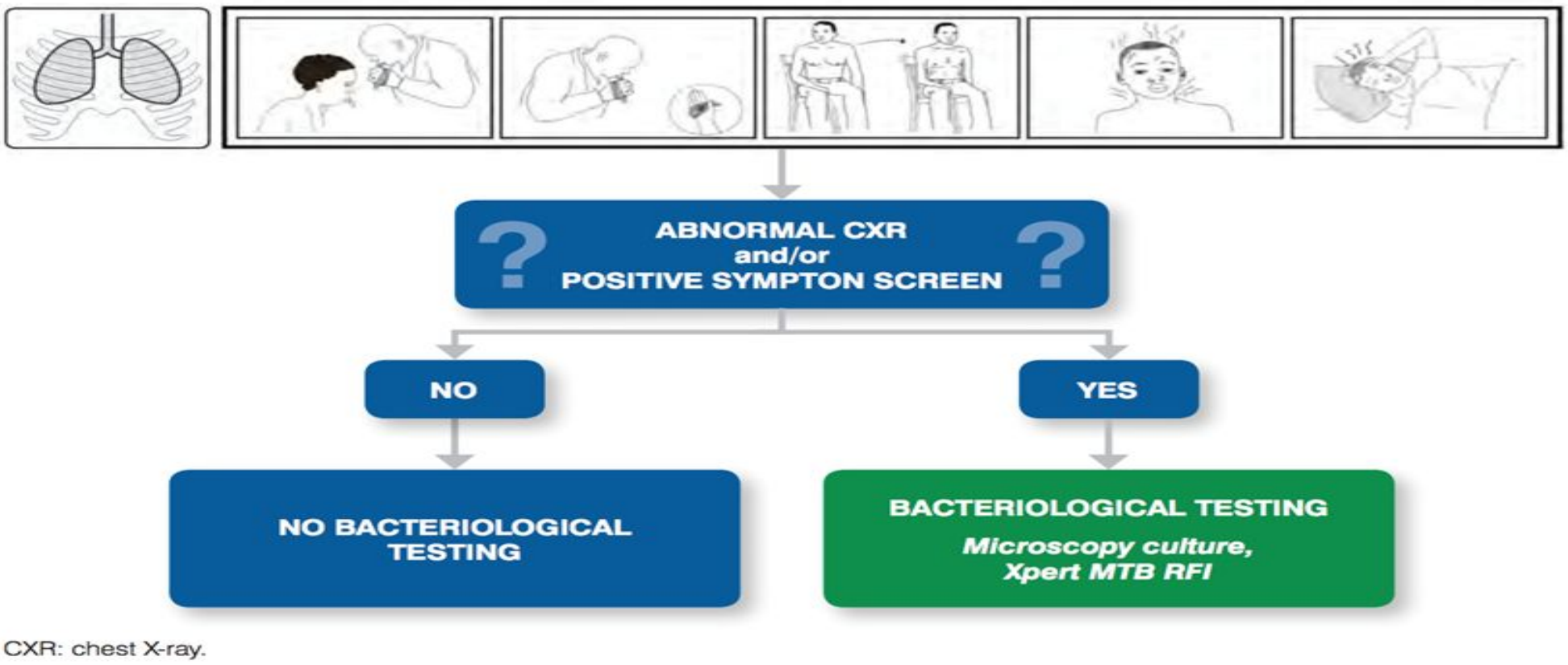
1. Political commitment with increased and sustained financing
2. Case detection through quality-assured bacteriology
3. Standardized treatment, with supervision and patient support
4. An effective drug supply and management system
5. Monitoring and evaluation system, and impact measurement

| Treatment of | Patient is only discharged when he has a negative sputum result |
|---|---|
| **TB for HIV-Negative Persons** | • Include four drugs in initial regimen<br>– Isoniazid (INH)<br>– Rifampicin (RIF)<br>– Pyrazinamide (PZA)<br>– Ethambutol (EMB) or streptomycin (SM)<br>• Adjust regimen when drug susceptibility results are known<br>The 4 drugs are taken for 2 months followed by 4 months of INH and RIF. Vitamin B6 is also added to prevent peripheral neuropathy side effect of INH |
| **Extrapulmonary TB**<br>**(Bone and Joint TB, Miliary TB,or TB Meningitis in Children)**<br>TB meningitis require a CSF sample and PCR for diagnosis | • In most cases, treat with same regimens used for pulmonary TB<br>• Treat for a minimum of 12 months |
| **Multidrug-Resistant TB (MDR TB)** | • Presents difficult treatment problems<br>• Treatment must be individualized<br>• Clinicians unfamiliar with treatment of MDR TB should seek expert consultation<br>• Always use DOT to ensure adherence |



# Screening

FIG. 3. WHO's recommended screening strategy for TB prevalence surveys *(21)*




CXR: chest X-ray.

# WHO EFFORTS

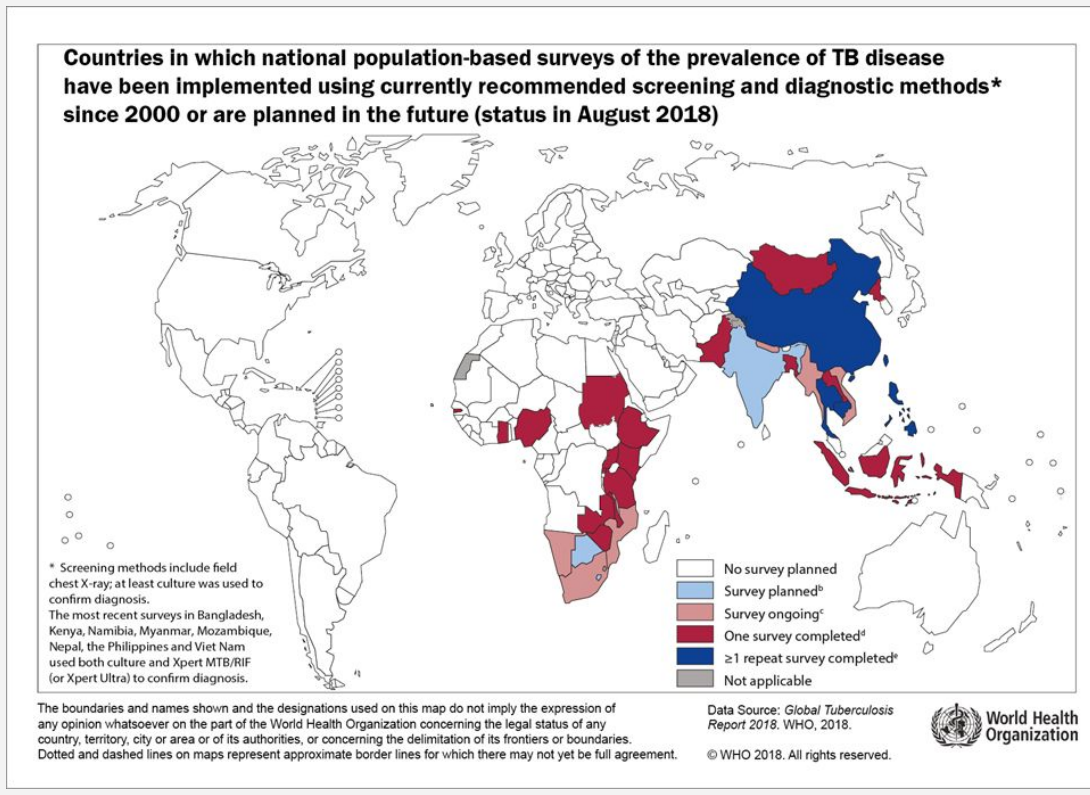
## STRATEGY

**A WORLD FREE OF TB**
ZERO deaths, disease, and suffering due to TB

**END THE GLOBAL TB EPIDEMIC**

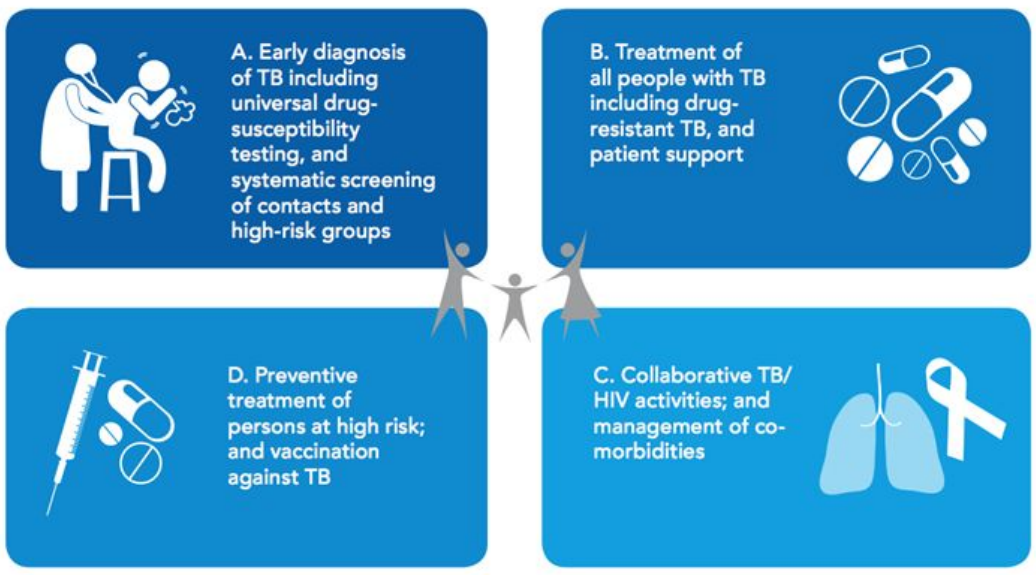
| | MILESTONES | | TARGETS | |
|---|---|---|---|---|
| | 2020 | 2025 | SDG* 2030 | END TB 2035 |
| *Reduction in number of TB deaths* compared with 2015 (%) | 35% | 75% | 90% | 95% |
| *Reduction in TB incidence rate* compared with 2015 (%) | 20% | 50% | 80% | 90% |
| *TB-affected families facing catastrophic costs due to TB (%)* | 0% | 0% | 0% | 0% |

* The United Nations Sustainable Development Goals (SDGs) include ending the TB epidemic by 2030 under Goal 3.




## INTEGRATED, PATIENT-CENTRED CARE AND PREVENTION

### How pillar 1 works : Key actions



# Preventing and Controlling TB

**Three priority strategies:**

1. Identify and treat all persons with TB disease
2. Identify contacts to persons with infectious TB; evaluate and offer therapy
3. Test high-risk groups for latent TB infection (LTBI); offer therapy as appropriate

Also screen close relatives of the patient

Administered at birth along with hepatitis B Vaccine

## BCG Vaccination

- In countries where tuberculosis is prevalent and the risk of childhood infection is high.
- the national policy is to administer BCG very early in infancy either:

  At birth or at 6 weeks of age with other immunizing agents such as DPT and polio.

**Health care providers should work with health department in the following areas :**

- Overall planning and policy development
- Identification of persons with clinically active TB
- Management of persons with disease or TB suspects
- Identification and management of persons with TB
- Laboratory and diagnostic services
- Data collection and analysis
- Training and education

## Data Collection and Analysis

- TB reporting required in every state.
- All new cases and suspected cases promptly reported to health department.
- All drug susceptibility results sent to health department.

## Training and Education

TB control programs should:

1. Provide training for program staff.
2. Provide leadership in TB education to the community.
3. Ensure community leaders, clinicians, and policymakers are knowledgeable about TB.
4. Educate the public.

# Why is it a concern for Saudi Arabia?

World Health Organization

www.who.int/tb

## TUBERCULOSIS & DIABETES

### THE DUAL EPIDEMIC OF TB AND DIABETES

**DEADLY LINKAGES**

- People with a weak immune system, as a result of chronic diseases such as diabetes, are at a higher risk of progressing from latent to active tuberculosis.
- Diabetes triples a person's risk of developing TB. About 15% of TB cases globally may be linked to diabetes
- TB can temporarily cause impaired glucose tolerance which is a risk factor for developing diabetes
- The likelihood that a person with TB will die or relapse is significantly higher if the person also has diabetes.
- A large proportion of people with diabetes as well as TB are not diagnosed, or are diagnosed too late.

### KEY ACTIONS

- Early detection can help improve care and treatment outcomes of both diseases. All people with TB should be systematically screened for diabetes. Systematic screening for TB in people with diabetes should be considered in settings with high TB prevalence.
- WHO-recommended treatments should be rigorously implemented for people with TB/diabetes.
- It is important that proper care for diabetes is provided to minimize the risk of TB.
- Diabetes prevention on population level also helps prevent TB.
- A joint response is needed to ensure coordinated clinical management and address common health system bottlenecks and social determinants

World Health Organization

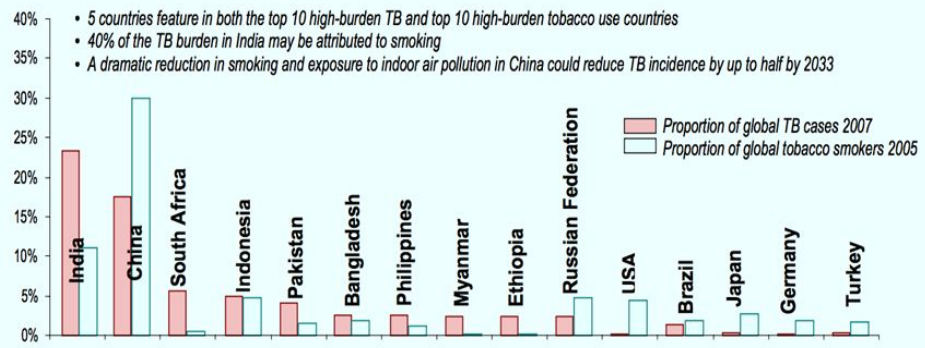
www.who.int/tb
www.who.int/tobacco

## TUBERCULOSIS & TOBACCO

### A strong association

- Smoking substantially increases the risk of tuberculosis (TB) and death from TB
- More than 20% of global TB incidence may be attributable to smoking
- Controlling the tobacco epidemic will help control the TB epidemic
- Smoking is a risk factor for TB, independent of alcohol use and other socioeconomic risk factors
- Smoking increases the risk of TB disease by more than two-and-a-half times
- The WHO monograph on TB and tobacco describes other linkages and evidence

***Correlation of high-burden TB and high-burden tobacco-use countries***




**THE TUBERCULOSIS EPIDEMIC**

- 2 billion people are infected with the TB bacilli
- TB is a disease of poverty with the vast majority of deaths occurring in low- and middle-income countries with more than half of all deaths occurring in Asia
- 9.27 million new TB cases in 2007
- 1.75 million people died from TB in 2007
- 5% of all TB cases have multidrug-resistant TB

**THE TOBACCO EPIDEMIC**

- More than 1 billion people smoke with nearly 70% of them living in low- and middle-income countries
- Tobacco use is the leading preventable cause of death
- More than 5 million people die per year from tobacco use. Unchecked, the epidemic will kill more than 8 million people per year by 2030

It is a concern due to immigrants coming from counties with high TB prevalence. So they must be properly screened to prevent the spread of the disease

Very useful and important !!!

# Summary

## 1-Transmission of M. tuberculosis:

- Transmission occurs from person with infectious TB disease (not latent TB infection)
- Spread by droplet nuclei.
- Expelled when person with infectious TB coughs,sneezes, speaks, or sings.

## 2-Persons at Higher Risk for Exposure to or Infection with TB

- Close contacts of persons known or suspected to have TB.
- Residents and employees of high-risk congregate settings.
- Health care workers (HCWs) who serve high-risk Clients.
- Medically underserved, low-income populations.

## 3-Common Sites of TB Disease:

Pleura , lungs , central nervous system , bones

## 4- Symptoms: .

Chest pain, productive cough , fever , chills, Night sweats.

## 5-Diagnosis of TB:

1. Medical history ,Physical examination
2. Mantoux tuberculin skin test
3. Chest radiograph
4. Bacteriologic or histologic exam

## 6-Latent Tuberculosis Infection (LTBI):

- defined as a state of persistent immune response to stimulation by Mycobacterium tuberculosis antigens with no evidence of clinically manifest active TB.

## 7-Preventing and Controlling TB

1. Identify and treat all persons with TB disease
2. Identify contacts to persons with infectious TB; evaluate and offer therapy
3. Test high-risk groups for latent TB infection (LTBI); offer therapy as appropriate

## Treatment of TB Infection

- **TB for HIV-Negative Persons:**
  Isoniazid (INH)– Rifampicin (RIF)– Pyrazinamide (PZA)– Ethambutol
- **Extrapulmonary TB:**
  In most cases, treat with same regimens used for pulmonary TB
- **Latent TB** :
  Isoniazid (INH)
- **Multidrug-Resistant TB (MDR TB):**
  Presents difficult treatment problems

- Treatment must be individualized
- Clinicians unfamiliar with treatment of MDR TB should seek expert consultation
- Always use DOT to ensure adherence

# MCQs

**Q1- a patient suspected to have TB , skin tuberculin test showed a 12 mm induration which of the following is correct with a negative chest X-ray ?**

A- isolate and treat for 6 months
B- give the patient a prophylaxis treatment
C- give the patient a BCG vaccine
D- investigation results are negative send the patient home

**Q2 - An immunocompromised smoker patient , 15 years ago was diagnosed with TB , A week a go he started to develop symptoms of TB which of the following is correct ?**

A- appearance of strains of M. tuberculosis resistant
B- the patient has (TB resurgence)
C- Deterioration of the living conditions
D- all of the above

**Q3 - 25 year old male asymptomatic his result in quantiferon test was positive , what will the next step ?**

A. start treatment immediately
B. need icu admission
C. chest X-RAY
D. observation

**Q4 - according to your answer in the question 3, if it is normal .what is your next step ?**

A- treatment with Isoniazid (INH)– Rifampicin (RIF)– Pyrazinamide (PZA)– Ethambutol
B- Isoniazid (INH) only
C- isoniazid (INH)– Rifampicin (RIF)
D- None of them

Answers : **1.B, 2.D ,3.C, 4.B**