

Protecting your Workforce from TB



Health Professionals Fact Sheet

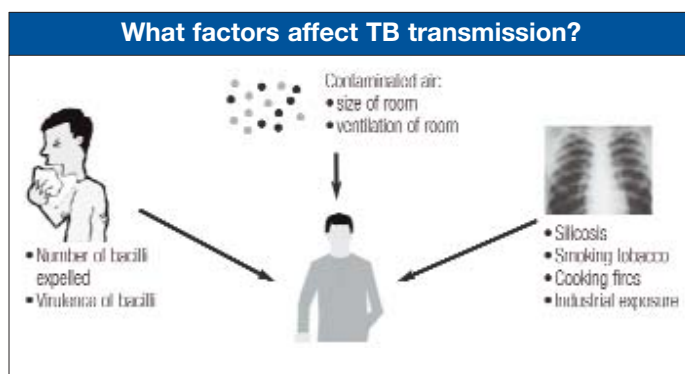


Fact Sheet 1 – TB/MDR TB: Infection and Transmission

What is TB? How does TB spread?

Tuberculosis is an infectious disease caused by *Mycobacterium tuberculosis*. Transmission occurs by the airborne spread of infectious droplets. When an infectious person coughs, sneezes or spits, he/she propels TB germs, known as bacilli, into the air. Left untreated, each person with active TB can infect an average of 10-15 people every year. Exposure to *M. tuberculosis* from an infectious case can lead to infection that is asymptomatic and non-contagious – referred to as latent TB. In some cases, the progression from infection to the development of the disease follows immediately after infection, but in others it occurs much later (or sometimes not at all), for example when someone's immune system is weakened following a period when infection is latent and is referred to as active TB.

Pulmonary TB is the most common (more than 80%) and most contagious form of active TB. However, TB bacilli can infect almost any part of the body, most commonly affecting the lymph glands, joints, bones, meninges or intestines, when it is referred to as extra-pulmonary TB.



Businesses with large workforces, such as oil and gas companies, mining companies as well as health centres/hospitals, are workplace settings with an increased risk of TB. Transmission generally occurs indoors, where droplet nuclei can stay in the air for a long time due to poor ventilation.

What is drug-resistant tuberculosis?

This is a case of tuberculosis (usually pulmonary) excreting bacilli resistant to one or more anti-tuberculosis drugs. In patients who have not had prior treatment with anti-tuberculosis drugs, the bacterial resistance is called primary resistance (if it is certain that the patient has not had previous treatment). After clinical assessment, if it is doubtful that the patient really has not received prior treatment, this is called initial resistance. Initial resistance is a mixture of primary resistance and undisclosed acquired resistance. In patients with some record of previous treatment, the bacterial resistance is called acquired resistance.

What is multi-drug resistant TB?

Multi-drug resistant tuberculosis (MDR TB) is a specific form of drug resistant TB with bacilli resistant to at least Isoniazid and Rifampicin (the two most powerful first-line anti-TB drugs), with or without resistance to other anti-TB drugs.

What are the causes leading to MDR TB?

Drug resistance arises due to the improper use of anti-tuberculosis drugs during the treatment of tuberculosis patients. This improper use includes:

- Inadequate treatment regimens administered by various healthcare providers
- Wrong treatment categorization by failing to elicit the history of previous anti-TB treatment
- Poor treatment management, including treatment that is not directly observed and the lack of sufficient care, support and patient involvement in the management of the disease which may lead to poor adherence to treatment
- Insufficient education and transfer of information and knowledge to patients in an understandable way to ensure complete and regular treatment.

Who is at risk of MDR TB?

- TB patients who have failed to take medications as prescribed
- TB patients who have been prescribed an ineffective treatment regimen
- TB patients who have been given poor quality drugs
- Persons who have been exposed to someone with active MDR TB, especially if their immune system is not functioning normally, e.g., those with HIV/AIDS or blood cancers such as leukemia
- People living in regions with a high incidence of MDR TB.

What is the incidence of MDR TB?

Each year, there are roughly 400,000 new cases of MDR TB in more than 100 countries. The World Health Organization (WHO) estimates that the average MDR TB patient infects up to 20 other people in his or her lifetime.

What is the association between TB and HIV?

TB and HIV form a lethal combination, each speeding the other's progress. HIV weakens the immune system. Someone who is HIV-positive and infected with TB is many times more likely to become sick with TB than someone infected with TB who is HIV-negative. TB is a leading cause of death among people who are HIV-positive. It accounts for about 13% of AIDS deaths worldwide.

Fact Sheet 2 – Identifying suspects and diagnosing TB

Rationale for prompt diagnosis

The systematic identification of adults with a persistent cough among outpatients in health facilities at the workplace can detect a large proportion of sources of tuberculosis infection. This reduces treatment delays and identifies infectious patients who are a risk to the community and to other staff.

TB incidence and basic symptoms

In any general health facility, 2-3% of new adult outpatients are estimated to be TB suspect. On an average, 10% of suspects are expected to have sputum smear-positive pulmonary TB. This would mean that in a typical workplace environment such as a factory, if 10 workers have persistent coughing, at least one of them could be a TB patient. In other words, in a country where the annual overall TB incidence rate is 200 cases per 100,000 population, about 40 cases per year may be expected among a workforce of 20,000. Such incidences can be even higher in high risk industry sectors such as the mining sector.

TB symptoms:

- The most common symptom of pulmonary TB is a persistent cough for three weeks or more, usually with expectoration.
- It may be accompanied by one or more of the following symptoms: weight loss, chest pain, tiredness, shortness of breath, fever, particularly with a rise in temperature in the evening, coughing up blood, loss of appetite, night sweats.

Careful diagnosis

The detection of TB cases requires two steps:

- **Identifying TB suspects** - In a workplace health centre, paramedical or administrative staff would largely be responsible for identifying persons with a persistent cough and referring them for a smear examination. If an employee is identified as having symptoms (see box) he or she should not be discriminated against.
- **Proceeding to diagnosis of TB among people identified as TB suspects** - The medical staff should record the suspect's name and address and collect a sputum sample for testing. There is no need to do a culture test for systematic detection of cases.

Every patient who has a cough for three weeks or more, with or without other symptoms, should have three sputum samples examined for Acid-fast

Key pointers on the Diagnosis of Pulmonary TB:

- Sputum microscopy is the recommended diagnostic tool for patients suspected of having pulmonary TB.
- Three sputum samples should be examined under the microscope.
- Sputum samples should be examined as soon as possible and not later than a week after they are collected.
- No radiographic pattern is diagnostic of TB, although the classical hallmarks of the disease are cavitation, apical distribution, pulmonary fibrosis, shrinkage and calcification.

bacillus (AFB). **Sputum smear microscopy is the primary tool for diagnosing TB as it is more specific and has less inter-reader variability than X-ray.** No radiographic pattern is diagnostic of TB, although the classical hallmarks of the disease are cavitation, apical distribution, pulmonary fibrosis, shrinkage and calcification.

Sputum microscopy is easy to perform at the peripheral laboratories, not expensive and specific with low inter- and intra-reader variation. Therefore, this is the key diagnostic tool used for case detection.

Employers with large workforces may have either on-site health facilities for TB diagnosis (sputum smear microscopy) or arrangements for referral of TB suspects for diagnosis. Many employers may directly refer TB suspects for diagnosis at the nearest health facility.

Since patients with active TB are the most infectious, they may be advised to refrain from work for the first two weeks of treatment. After two weeks of treatment, most patients are no longer infectious. It is very important to elicit the history of previous anti-tuberculosis treatment to help define a case; to identify patients with increased risk of acquired drug resistance; to prescribe appropriate treatment; and for epidemiological monitoring.

Presentation of TB in HIV-positive cases

Weight loss and fever are more common in HIV-positive patients with pulmonary tuberculosis. Cough is reported less frequently among HIV-positive TB cases, since there is less cavitation, inflammation and endo-bronchial irritation because of impaired cellular immunity.

The main types of extra-pulmonary TB seen among HIV-positive patients are lymphadenopathy, pleural effusion, pericardial effusion, miliary TB and tuberculous bacteraemia.

Fact Sheet 3 – The DOTS Strategy

The internationally recommended approach to TB control is DOTS, an inexpensive strategy that could prevent millions of TB cases and deaths over the coming decade. Studies show that at least one-third of the patients taking TB treatment do not take medicines regularly and as a result may remain infectious for an unnecessarily long period of time. The bacilli in their lungs may develop resistance to anti-TB medicines and people they infect will have the same drug-resistant strain. DOTS is the TB public health strategy designed to get around this issue.

The effective implementation of the DOTS strategy saves lives through decreased TB transmission, decreased risk of emergence of drug-resistance and decreased risk of treatment failure, relapse and death. Since DOTS was introduced on a global scale in 1991, approximately 3.5 million people have been cured of TB. In China, cure rates among new cases are 96%. In Peru, widespread use of DOTS for 10 years has led to the successful treatment of 91% of cases. In some parts of the world (China and India) the price of a six-month supply of anti-TB drugs for DOTS is as low as US\$ 10-20 per patient.

DOTS is primarily based on sputum microscopy, domiciliary treatment, short-course chemotherapy, intermittent chemotherapy and directly observed treatment.

Key elements of the DOTS Strategy

DOTS components	Method	Why it is important in the workplace
1. Political commitment	<ul style="list-style-type: none"> Government/senior management accords are a priority for TB control 	<ul style="list-style-type: none"> Only strong commitment can truly ensure that sufficient resources are mobilized and sustained over time
2. Good quality diagnosis	<ul style="list-style-type: none"> This relies primarily on sputum smear microscopy of patients at health facilities 	<ul style="list-style-type: none"> Early detection of infectious cases is essential to prevent further spread of TB Inability to diagnose promptly and accurately can result in prolonged illness, treatment failure and/or the development of multi-drug resistant TB (MDR TB)
3. Good quality drugs	<ul style="list-style-type: none"> A process is established to guarantee an uninterrupted supply of approved anti-TB drugs 	<ul style="list-style-type: none"> Inability to guarantee drug quality can result in treatment interruption and/or development of MDR TB
4. Short-course chemotherapy given under direct observation	<ul style="list-style-type: none"> A health worker or another trained person (usually not a family member) watches the patient swallow anti-TB drugs 	<ul style="list-style-type: none"> Inability to monitor drug intake during the intensive treatment phase can result in irregular medication, treatment failure and/or development of MDR TB The workplace is a convenient place for a patient to take daily drugs
5. Systematic monitoring and accountability	<ul style="list-style-type: none"> Treatment progress and outcome is monitored by microscopy for infectious cases Cohort analysis is used to evaluate the programme's performance 	<ul style="list-style-type: none"> Monitoring and evaluation is essential for programme quality control and sustainability

Fact Sheet 3 – The DOTS Strategy

DOT provision

Directly observed treatment (DOT) is a key part of promoting adherence to treatment. It helps to increase the likelihood of a successful treatment outcome and reduces the risk of emergence of drug resistance. It involves the direct observation of patients taking their drugs every day during the initial phase of treatment.

A person who delivers therapy and facilitates adherence to it by observing the patient swallowing the full course of the correct dosage of anti-TB medicines is called the DOT provider. A DOT provider can be a healthcare professional, supervisor at the workplace, community health worker or a trusted friend of the patient who cares and will support the patient while observing the patient swallowing the full course of the correct dosage of anti-TB medicines. The DOT provider is anyone who is acceptable and accessible to the patient, willing, trained and accountable to the health service. Patients have the option of identifying who is the most convenient.

DOT can occur in the clinic at your workplace, community TB clinics, hospitals, health centres or patients' homes. Initial personal communication between the health staff and the patient to explain the treatment of TB is crucial; an explanation of the type and colour of the drugs prescribed, the amount and frequency, possible side-effects, the frequency of sputum examination and the consequences of irregular or incomplete treatment need to be communicated in a supportive manner.

The World Bank has ranked the DOTS strategy as one of the "most cost-effective of all health interventions".

Fact Sheet 4 – Treatment Categories and Regimens

Once patients with infectious TB (bacilli visible in a sputum smear) have been identified using microscopy services, the doctor can categorize the treatment for the patient as shown in Table 1.

Category I: This category is generally prescribed to new sputum smear-positive patients. They have a high bacillary population with higher chances of having naturally occurring drug resistant mutants. Therefore, four drugs are prescribed during the intensive phase.

Category II: These are cases of patients who have had previous anti-tuberculosis treatment. Therefore, the chances of harbouring resistant bacilli are higher. Hence, a five-drug regimen is prescribed in the intensive phase, and the total duration of treatment is eight months.

Category III: These are sputum smear-negative cases with a low bacillary population. There is a lower chance for drug resistant mutants. Therefore, a three-drug regimen is prescribed.

Category IV: These are cases of patients who have received at least two courses of anti-tuberculosis therapy, and sometimes more than two courses (complete or incomplete) and remain sputum positive. Chronic cases are usually, but not always, excretors of resistant bacilli (the rate of acquired resistance is very high in this category of patients) and often excretors of multi-drug resistant bacilli. Specially designed standardized or individualized regimens using second line drugs are suggested for this category.

Drugs used for treating TB

The most common anti-TB medicines are Isoniazid, Rifampicin, Pyrazinamide, Streptomycin and Ethambutol. The drugs used, dosages and number of tablets for each dose are as follows:

Essential anti-tuberculosis (ATT) drugs		
Essential drug (abbreviation)	Daily	3 times weekly*
Isoniazid (H)	5 (4-6)	10 (8-12)
Rifampicin (R)	10 (8-12)	10 (8-12)
Pyrazinamide (P)	25 (20-30)	35 (30-40)
Streptomycin (S)	15 (12-18)	15 (12-18)
Ethambutol (E)	15 (15-20)	30 (20-35)
Thioacetazone** (T)	2.5	Not applicable

* The WHO does not recommend twice-weekly regimens.

** The WHO discourages the use of Thioacetazone in particular in HIV-positive patients due to high toxicity. It should be replaced with Ethambutol.

Treatment is in two phases – an intensive phase (two or three months) and a continuation phase (four or six months). The aim of the initial intensive phase is to kill TB bacilli rapidly. This is usually accompanied by a marked reduction in or disappearance of symptoms. The aim of the continuation phase of treatment is to destroy any lingering bacilli that could trigger a relapse. Every dose of medicine in the intensive phase and at least the first dose every week in the continuation phase are directly observed.

Typically, it is recommended to take medicines on an empty stomach for better absorption of the drugs.

Table 1 – Treatment regimen under DOTS as recommended by the WHO

TB diagnostic category	TB patients	TB treatment regimens ¹	
		Initial phase	Continuation phase
I	New sputum smear-positive; new smear-negative pulmonary TB with extensive parenchymal involvement and severe concomitant HIV diseases or severe forms of extra-pulmonary TB ²	Preferred 2 HRZE ³	Preferred 4 HR 4 (HR) ₃
		Optional 2 (HRZE) or 2 HRZE ⁴	Optional 4 (HR) ₃ or 6 HEV ⁵
II	Previously treated sputum smear positive PTB: <ul style="list-style-type: none"> relapse treatment after default 	Preferred 2 HRZES/ 1 HRZE ⁶	Preferred 5 HRE ⁶
		Optional 2 (HRZES) ₃ / 1 HRZE ₃	Optional 5 (HRE) ₃
	Treatment failure of Category I ⁷ in settings with: <ul style="list-style-type: none"> adequate programme performance high rates of MDR TB availability of Category IV regimens 	Specially designed standardized or individualized regimens are often needed for these patients	
	In settings with: <ul style="list-style-type: none"> poor programme performance low rates of MDR TB insufficient resources to implement Category IV treatment 	Preferred 2 HRZES/ 1 HRZE	Preferred 5 HRE ⁶
III	New smear-negative pulmonary TB (other than in Category I) Less severe forms of extra-pulmonary TB	Preferred 2 HRZE ⁸	Preferred 4 HR 4 (HR) ₃
		Optional 2 (HRZE) ₃ or 2 HRZE	Optional 4 (HR) ₃ or 6 HE
IV	Chronic (still sputum-positive after supervised re-treatment) Proven or suspected MDR TB cases ⁹	Specially designed standardized or individualized regimens are often needed for these patients	

¹ Numbers preceding regimens indicate length of treatment (months). Subscripts following regimens indicate frequency of administration (days per week). When no subscripts are given, the regimen is daily. Direct observation of treatment intake is required for the initial phase and strongly recommended when Rifampicin is used in the continuation phase and when treatment is given intermittently.

² Severe forms of extra-pulmonary TB include: miliary, disseminated TB is considered to be severe. The following forms of EPTB are classified as severe: meningeal, pericardial, peritoneal, bilateral or extensive pleural effusive, spinal, intestinal, genitourinary.

³ Streptomycin may be used instead of Ethambutol. In meningitis, Ethambutol should always be replaced by Streptomycin.

⁴ Intermittent initial phase therapy is not recommended when the continuation phase of Isoniazid and Ethambutol is used.

⁵ This regimen may be considered in situations when the preferred regimen cannot be applied.

⁶ Daily treatment is preferred. However, thrice-weekly treatment during the continuation phase or during both phases is an acceptable option.

⁷ Treatment failures may be at increased risk of MDR TB, particularly if Rifampicin was used in the continuation phase. Drug susceptibility testing is recommended if available. Re-treatment failures with known or suspected MDR TB should be treated with a Category IV regimen.

⁸ Ethambutol in the initial phase may be omitted for patients with limited non-cavitary, smear-negative pulmonary TB who are known to be HIV-negative, patients with less severe forms of extra-pulmonary TB and young children with primary TB.

⁹ Drug susceptibility testing is recommended for patients who are contacts of MDR TB patients.

Fact Sheet 4 – Treatment Categories and Regimens

Common side-effects of ATT drugs		
Symptoms	Drugs	Action
Drowsiness	Isoniazid (H)	Reassure patient
Red urine/tears	Rifampicin (R)	Reassure patient
Gastrointestinal upset	Any oral drug	<ul style="list-style-type: none"> • Reassure patient • Give drugs with less water • Give drugs over a longer period of time (20 min) • Give drugs after food • If needed, give antiemetics
Burning feet and palms	Isoniazid (H)	Give Pyridoxine 100mg/day until symptoms subside
Joint pains	Pyrazinamide (Z)	If severe, refer patient for evaluation
Impaired vision	Ethambutol (E)	Stop drug and refer patient for evaluation
<ul style="list-style-type: none"> • Dizziness • Ringing in ears • Loss of hearing 	Streptomycin (S)	Stop drug and refer patient for evaluation
Jaundice	<ul style="list-style-type: none"> • Isoniazid (I) • Rifampicin (R) • Pyrazinamide (Z) 	Stop drug and refer patient for evaluation

Tracking treatment results

Sputum smear testing is repeated after two months, to check progress, and again at the end of treatment. The recording and reporting system ensures that the patient's progress can be followed throughout treatment. It also allows the assessment of the proportion of patients who are successfully treated, giving an indication of the quality of the programme.

Treatment of TB in HIV-positive patients

Standard regimens, particularly if supervised properly, are as effective in HIV-positive as in HIV-negative patients but may require expert advice. DOT strategy that promotes adherence to therapy must be used for all patients with HIV related TB. It is advisable to treat TB as soon as it is detected, even if treatment for AIDS takes a while. The duration of therapy will be as per the treatment regimen and category. Patients who complete treatment show the same clinical, radiographic and microbiological response to short-course treatment whether they are HIV positive or negative. Adverse drug reactions are more common in HIV-positive than in HIV-negative TB patients. Risk of drug reaction increases with increased immuno-compromise. Most reactions occur in the first two months of treatment. The choice and dosage of antiretrovirals would depend on the anti-tuberculosis drugs being prescribed.

Fact Sheet 5 – Treating MDR TB in the DOTS Programme

Drug-resistant TB is generally treatable with second-line drugs. It requires extensive chemotherapy (up to two years of treatment) that is often costly (often more than 100 times more expensive than the treatment of drug-susceptible TB), and has severe yet manageable adverse reactions.

Management of MDR TB is more complex than drug sensitive TB and may require an expert's advice as:

- Second-line drugs more often cause side-effects and possess cross resistance to first-line drugs
- Costlier and sophisticated diagnostic methods and a strong health infrastructure are required
- Second-line drugs must be administered under strict direct observation for up to two years, and
- The monitoring of outcomes and performance of the programme is more complex and costly.

Prevention of MDR TB

The management of MDR TB is very complex, and its occurrence must be prevented by:

- The effective implementation of the DOTS strategy
- The proper categorization of patients by medical officers for treatment, by eliciting the history of previous treatment
- The diagnosed patients should be explained in plain words/educated as to why it is essential to know about previous anti-TB treatment and to take drugs under direct observation. Similarly, DOT providers should be educated and convinced about the importance of directly observed treatment (DOT).

DOTS has been documented to not only prevent the emergence of multi-drug resistance but also to decrease its prevalence in the community. Prevention of MDR TB is given priority over its treatment.

Management of MDR TB

The most important cause of treatment failure is the inability to administer complete and regular treatment and is not due to drug resistant bacilli. However, TB cases that continue to be smear-positive at the end of four months or more of the intensive phase of a Category II treatment under DOTS may be *suspected* of having MDR TB. Only these patients should be sent for culture and sensitivity testing of sputum to a quality assured culture and drug susceptibility testing laboratory. However, this practice might not be necessary in settings where prevalence of MDR-TB is low. Reliance on updated and valid drug resistance surveys is recommended before making decisions.

Diagnosed cases of MDR TB should be referred to and treated only at a specialized centre. Treatment of MDR TB requires prolonged chemotherapy, which is costly and can lead to adverse but manageable reactions. The treatment must be given for a period of 18-24 months with proper administration of second-line drugs based on drug susceptibility tests. Improper treatment of MDR TB could lead to resistance even to these second-line drugs and this could be fatal.

The WHO and support partners have developed guidelines for management of MDR TB. Successful treatment of MDR TB requires proper administration and the use of 4-7 of the following drugs under different protocols based on drug susceptibility testing or reliable drug resistant surveys:

Drugs used for treatment of MDR TB				
Drug	Mode of action	Recommended daily dosage*		
		Average (mg/kg)	Minimum (mg)	Maximum (mg)
Amikacin (Am)	Bactericidal	15	750	1000
Capreomycin (Cm)	Bactericidal	15	750	1000
Ciprofloxacin (Cx)	Bactericidal	10-20	1000	1500
Cycloserine (Cs)	Bacteriostatic	10-20	500	750
Ethionamide (Et)	Bactericidal	10-20	500	750
Kanamycin (Km)	Bactericidal	15	750	1000
Ofloxacin (O)	Bactericidal	7.5-15	600	800
P-aminosalicylic acid (PAS)	Bacteriostatic	150	8g	12g
Protionamide (Pt)	Bactericidal	10-20	500	750

* Thrice-weekly regimens are not recommended

Fact Sheet 5 – Treating MDR TB in the DOTS Programme

Some of the adverse effects of second-line drugs are:

Cycloserine	Central nervous system symptoms
Ethionamide	Gastrointestinal symptoms
Ethambutol	Visual disturbances
Pyrazinamide	Arthralgia
Streptomycin	Vestibular disturbance
Kanamycin	Vestibular disturbance
Amikacin	Vestibular disturbance
Ofloxacin	Gastrointestinal (rare) symptoms
Thioacetazone	Gastrointestinal symptoms
PAS	Gastrointestinal symptoms
Isoniazid – 600 mgm	Neuritis

Important points to remember:

- MDR TB can be cured in most cases under proper management conditions.
- MDR TB management strengthens the DOTS strategy.
- MDR TB management in an area can only be conducted when an effective DOTS based TB control programme is in place.



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