



Pratiques Network

IMPORTANT NOTICE

These technical notes are distributed through the "Pratiques" network between the NGOs who have signed the "Inter Aide Charter".

The aim of this network is to facilitate the exchange of ideas and methods between field teams working on development programs. We would like to stress here that these technical notes are not prescriptive. Their purpose is not to "say what should be done" but to present experiences that have given positive results in the context in which they were carried out.

*"Pratiques" authors allow the reproduction of these technical notes, **provided that the information they contain is reproduced entirely including the source (Pratiques Network), the authors and this notice.***

BASIC INFORMATION ON VIRUS, BACTERIA AND TUBERCULOSIS

FAMILY DEVELOPMENT PROGRAM

Organisation	ATIA http://www.atia-ong.org/
Date	October 2021
Author(s)	Vincent Griffaton, Head of Country and Program Manager, ATIA, 2011-2021
Editor(s)	Adrien Cascarino, Technical Support on Family Development Program, ATIA 2014-2021 Thierry Comolet, MD
Key words	Family Development – Social Worker – Motivation – Training – Observation
Summary	The Social Workers are not doctors and the basic information given through this training is not aimed at skipping a qualified doctor's guidance. Though, this helps providing commonly known evidence that can be useful for the SW to inform and motivate families along their immunization or treatment process.

1. Virus and bacteria

Immunisation and treatment by antibiotic

1.1. Immunisation

1.1.1. List of mandatory vaccines (as per the Government of India)

We provided the below-displayed table to the SW along with the PAT but we have to consider that the Aanganwadi (ICDS) are the most reliable source, even if some of them are not always up-to-date. Moreover, most of the families will not be able to remember what vaccines they have received and they will rather state that they have got “birth” vaccines or “till 2,5M” vaccines.

	Disease prevented	BIRTH	1,5M	2,5M	3,5M	9M	15M	16-24M	5 y
BCG (injection / upper arm)	tuberculosis	Dose1							
OPV (polio oral drop)	poliomyelitis	Dose0	Dose1	Dose2	Dose3			Booster	
Hep B (hepatitis B / injection /thigh)	Jaundice	Dose0	Dose1	Dose2	Dose3				
DTP (/ inj./thigh)	diphtheria, tetanus and pertussis		Dose1	Dose2	Dose3			Booster	Booster Upper arm
Measles (If not MMR1 instead/inj. /upper arm)	MMR: Measles, Mumps, Rubella					Dose1			

1.1.2. List of optional vaccines and the disease they prevent (ranked by importance)

1. Hemophilus Influenza (Hib): some meningitis, tonsillitis
2. Rotavirus drop: many diarrheas
3. Pneumococcus (conjugate vaccine): pneumonia, otitis, some meningitis
4. Chicken pox: varicella
5. Typhoid: typhoid fever
6. Hepatitis A: most jaundices

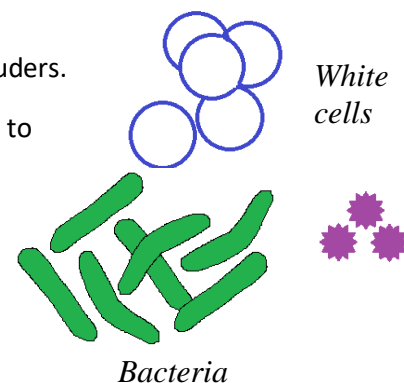
1.1.3. Immunisation = training of white cells

White cells are like guardians inside our body and fight against all harmful intruders.

Intruders can be **bacteria** or **virus**, that are developing/proliferating and try to destroy some parts of our body. These attacks are **infections**.

When white cells identify an attack, they go together to fight it and multiply to be more effective. It produces **heat, swelling and redness** at specific places or **fever** to whole body.

White cells fight better the intruders that they have learned to know. Some intruders are unknown to them or too strong, so the **white cells need training and information first**. This is the role of immunisation.



Different kind of vaccines?

Immunisation usually consists in introducing the virus/bacteria (or small parts of these microorganisms) into the body to trigger the immune system (in particular the white cells) and train it to defend the body against these specific intruders. Most vaccines are injected, some are efficient by oral route. Before being introduced into the human body, the virus/bacteria are always killed or weakened so they cannot harm the body. Thus the white cells can still be trained to recognize the wild virus/bacteria and fight them.

- Killed/Inactivated virus: Polio injectable, Hepatitis A
- Live/attenuated virus: MMR, chickenpox, influenza, rotavirus, polio oral
- Inactivated toxin: Diphtheria, Tetanus
- Conjugate (strong and weak antigens): Hepatitis B, Haemophilus Influenza (Hib), Pertussis, Pneumococcus

However some local or general **reactions (like fever) are often observed after a vaccination/immunization**. It means that the body is fighting the injected virus/bacteria. This reaction is usual and means that the white cells are learning. Such febrile children can be given paracetamol, according to their weight, in order to lower fever

Children should not get immunized when they are sick, when they have fever or are feeling unwell: in this case the white cells are already busy with another infection and it is not recommended to inject additional intruders at this time

Bacteria or virus?

Disease	Virus/Bacteria	Vaccine
Polio	Virus	Polio oral, or inj
Hepatitis B	Virus	HepB
Rubella	Virus	MMR
Measles	Virus	MMR
Mumps	Virus	MMR
Chicken pox	Virus	Chicken pox
Hepatitis A	Virus	HepA
Influenza (Flu)	Virus	Influenza
Rotavirus (child diarrhea)	Virus	Rotavirus
Diphtheria (severe tonsillitis)	Bacteria	DTP
Pertussis (whooping cough)	Bacteria	DTP
Tetanus	Bacteria	DTP
Tuberculosis (BCG)	bacteria	BCG
Haemophilus Influenza	Bacteria	Hib

Bacteria are single-celled microorganisms that are everywhere in the environment. Most of them are harmless and good for the body: Billions of them (about 2Kg) help the digestion inside the intestines and some are preventing disease too. Only few of them (about 1%) cause disease in people.

Virus are smaller than bacteria and cannot survive without a living host (our body, animals or plants). Virus attach themselves to cells and usually reprogram them to multiply, thus spreading a disease.

N.B: Some infections not listed above (diarrheas, pneumonia, tonsillitis, meningitis) may be caused by **both virus OR bacteria** or by other small organisms called fungi (yeast).

How infections are spread?



Both bacterial and viral infections are spread in specific ways:

- Coughing and sneezing
- Contact with infected people, especially through unwashed hands, unprotected sex or during pregnancy (mother to child)
- Contact with contaminated food and water and sometimes surface or objects
- Contact with infected creatures including pets, livestock and insects like flies, mosquitoes and ticks bites

1.2. Treatment by Antibiotic

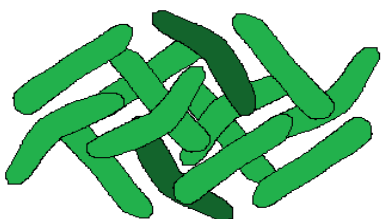
Infection can be produced by virus or bacteria. Many of them can be controlled by the immune system (by the action of white cells) without any help from external inputs, especially when the body is well nourished. Though, doctors may order useful medications to help the body control infections: on the more beneficial are antibiotics.

Antibiotics have no use on virus, only on bacteria.

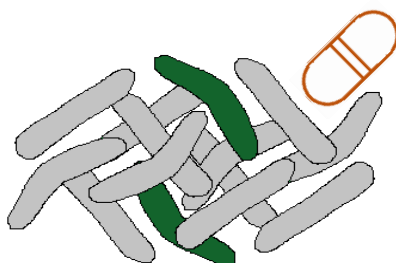
- if your infection is due to virus, It is useless to take antibiotics
- Do not take antibiotic without being prescribed to by a real doctor. Doctors can know if it is virus or bacteria or both: doctors usually know the environment and diseases most frequents in the area or season, he/she will ask about different symptoms that can help him identify the disease.

If you start antibiotic, **follow the treatment till the term** ordered by the doctor.

- After taking antibiotics during a few days, sick persons usually feel much better and can believe being cured. BUT It does not mean that the infection is over: indeed, most of the bacteria have been killed but the strongest still remain till the treatment is complete (duration is specified by the doctor).



Before treatment: *bacteria are multiplying (in dark, the strongest)*

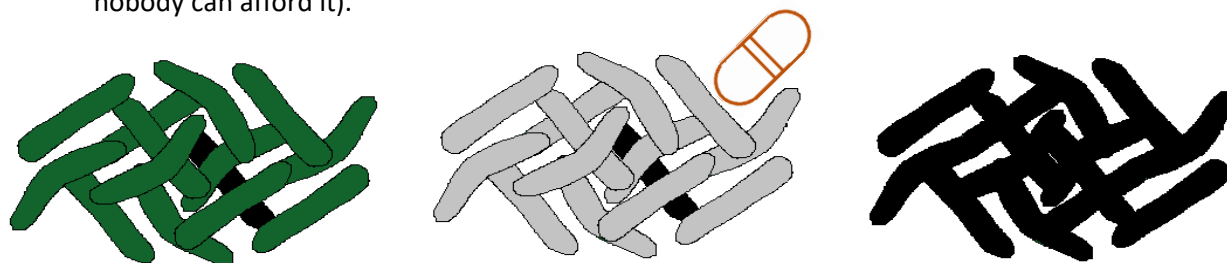


After few days of treatment: *most of the bacteria are killed (in grey) except the strongest*



After having stopped the treatment before term: *strongest bacteria multiply*

- It is wrong to stop the treatment as soon as we feel better because the strongest bacteria will remain and will continue to develop, especially after the weakest ones have been destroyed and have let space for the strongest resistant one. This process eventually “selects” the strongest bacteria and creates a stronger infection.
- After early interruption, giving again the same treatment is usually not sufficient to kill this new form of the infection: we say that this **new form of the infection has become “resistant” to the antibiotic treatment**. A stronger antibiotic will be needed. This selection process may continue and worsen as long as the successive treatments are not adequately followed till completion, leading eventually to a **multi-resistance**, for which no treatment is available (or so expensive that nobody can afford it).



If you take antibiotics while you are infected by virus only:

- The antibiotic treatment will mostly kill useful bacteria of the gut and elsewhere. This also makes way to strongest and more dangerous bacteria and can lead to a new severe infection or to resistance.

Overuse and misuse of antibiotic can lead to **resistance in your body and within the community**: resistant infection can be developed by others and subsequently contaminate you later. It is worth explaining to your friends and neighbors the need **to limit the use of antibiotics** and keep them precious for cases where they are really necessary.

Antibiotic have been discovered and released to the public only recently (80 years ago). Before having antibiotics, people were dying easily from common infections. Antibiotic is sometimes the only option to cure a disease. The development of new antibiotic is slow and expensive and is not warranted. So, we need to be careful and not waste this asset by overusing and misusing it.

1.3. Questions to ask one month after the training to ensure that the team members still remember the basics

- Why it is important to immunize children? (training the immune system to fight disease, protect the community as well)
- When should we avoid to immunize children? (fever, feeling unwell)
- How can you know which vaccines are mandatory? (Immunization card delivered by hospital/Aanganwadi)
- What antibiotic are for? (bacteria)
- What are they not for? (virus, disease that is not due to infection)
- How long do you need to take antibiotic? (as long as ordered by doctor)
- What may happen if you do not take antibiotic till the term decided by doctor? (resistance, relapse, increased severity))

- What is resistance to antibiotic? (developing stronger bacteria that will not be killed any more by the antibiotic and resist to treatment)
- What will happen if you treat a virus with antibiotic? (no relief, but possible resistance elsewhere)

2 TBcontrol

2.1. TB potted history

- TB disease has been found in the mummies of ancient Egyptians and Andean Indians.
- It has been also called “white plague”, “Captain of the men of death”
- 1882: Identification of **TB bacteria**/bacilli (*Mycobacterium tuberculosis*) by Robert Koch
- 1919: Invention of the **vaccine**, named *Bacille Calmette & Guerin* after its inventors: **BCG**
- 1943: **1st antibiotic** active against TB (Streptomycin)
- 1952 & 1966: Development of other antibiotics (Isoniazid, Rifampicin)

2.2. What is TB?

TB is one of the **most common** infections in the world.

TB is now the world's **deadliest infectious disease**, causing more annual deaths than HIV.

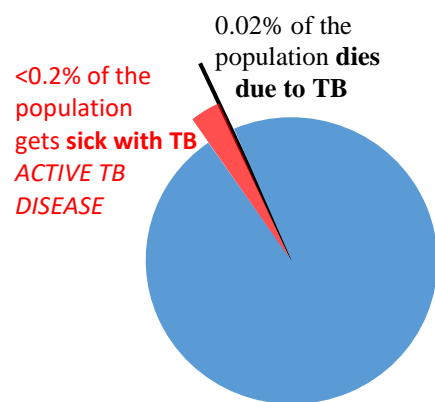
It is caused by a **bacteria** (single-cell organism) named *Mycobacterium tuberculosis*.

Less than 0.2% of the population is sick with TB (ACTIVE TB DISEASE). Worldwide, we count 10 million new cases per year (incidence).

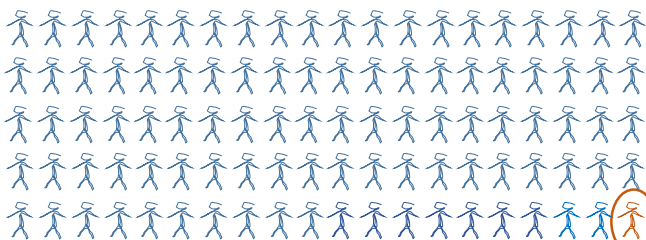
In 2017, there were **1.6 million TB-related deaths** worldwide (including the 300 000 HIV associated cases): about 0,02% of the world population, i.e. 16 % of the new TB cases)¹.

Children are more vulnerable: 1 dies out of 2 when sick.

Without treatment, only 1/3 of the people sick with TB (ACTIVE TB DISEASE) would recover. Whereas, **with a proper treatment, nearly 100% can be cured.** Though, the actual recovery rate is 85%, mainly because of late diagnosis and treatment discontinuation (also causing resistance).



NOT SICK WITH TB (incl. 25% of LATENT TB)



SUCCESSFULLY

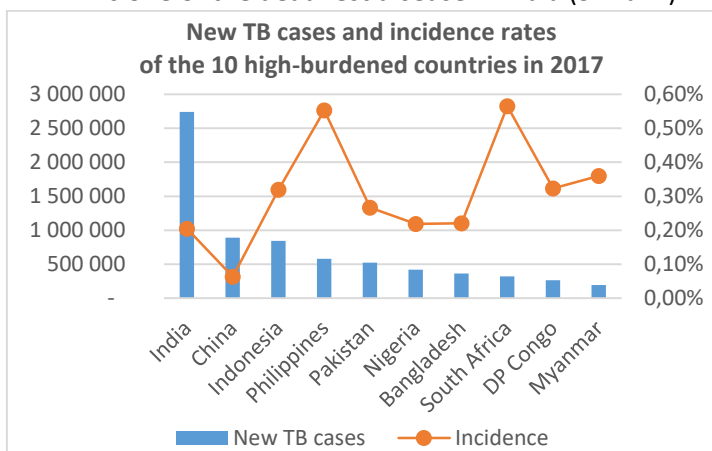


N.B: Such schemes were used all along the training to help the trainees understand the percentages. During the training, we drew dots instead of stick men.

¹ https://www.who.int/gho/tb/epidemic/cases_deaths/en/

2.3. Context of India

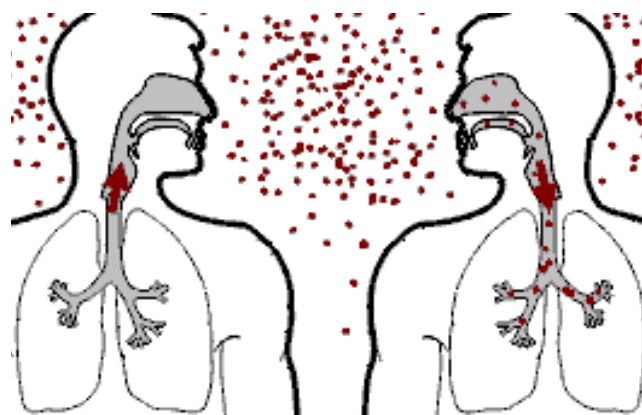
- India has **more new cases than any other country**: 2.7 million new cases in 2017² out of 1.3 billion population. It is twice more than China (889 000 new cases) with its bigger population (1.4 billion).
- TB is **one of the deadliest disease** in India (3rd rank).



Rank	Cause of Death	% of total Deaths (Age 25-69) ³
1	Cardiovascular Diseases	24.8
2	Respiratory Diseases	10.2
3	Tuberculosis	10.1
4	Malignant and Other Tumors	9.4
5	Ill-Defined Conditions	5.3
6	Digestive Diseases	5.1
7	Diarrhoeal Diseases	5.0
8	Unintentional Injuries	4.6
9	Intentional Self-Harm	3.0
10	Malaria	2.8

2.4. How TB spreads

- TB is transmitted **from a sick person (a patient with active TB) to another person, through the air**
- TB bacteria are coughed up into the air from the lungs of a sick person:, while **coughing, sneezing, spitting, talking, singing**.
- When coughing, very very small drops are expelled from the lungs of a sick person, they contain TB bacteria and can be inhaled by another person.
- Such droplet can remain a long time in the air in close indoor premises (like for Covid19).
- Once the TB bacteria are inhaled, they push their way into the lungs
- **Though, brief exposure to a source of TB rarely infects a person. Infection is rather caused by day-after-day close contact, especially in close indoor premises/rooms.**



Social workers, who spend 20 mn to 1 hour per week in a house where people sick with TB are living, are not very likely to catch their TB.

Risks of contamination are dramatically reduced once TB patients are treated correctly. A TB patient suffering of drug sensitive TB (the vast majority) is NOT infectious any more after taking thoroughly 15 days of correct treatment.

Wearing a mask (tightly fitted) provides a good protection against TB

² <https://tbfacts.org/tb-statistics/>

³ <https://www.worldatlas.com/articles/the-leading-causes-of-death-in-india.html>

2.4.1. Risks of getting TB disease are higher if:

- The contact person’s Immune system is weakened, e.g in case of:
 - Smoking
 - Malnutrition
 - Disease (particularly HIV, Diabetes, exposure to Silica)
 - Old and most of all very young age (immune system weakened or not enough developed)
 - Recent TB infection (less than 2 years)
 - Alcohol: excessive consumption is now suspected to be facilitating TB (<https://www.who.int/fr/news-room/fact-sheets/detail/alcohol>)
- House is too:
 - crowded
 - congested
 - not well ventilated

<p>TB is NOT spread by:</p> <ul style="list-style-type: none"> • Brief contact to a person sick with TB • shaking someone’s hand • sharing food or drink • touching bed linens • using same toilet seats • sharing toothbrushes • kissing without coughs • heredity (genetic) • bodily fluids: urine, sweat, blood • Exposure to cold air or pneumonia • Mosquitoes, flies, dust 	<p>TB does NOT:</p> <ul style="list-style-type: none"> • turn into HIV • provide cancer <p>The official guidelines are unclear on sexual intercourse. However, extended sexual intercourse can increase the risk of getting TB if the faces of the persons involved are very close.</p>
--	---

Ask participants: **What are you usually afraid of with TB?** [List their fears and try to get answers and reactions from the participants according to what we explained earlier]

2.5. Possible protection

Ask participants before giving guidance.

- Keeping a **good nutrition**
- Air **ventilation** of the living rooms (bedrooms too).
- Direct **sunlight** kills TB germs rapidly. But they can survive in the dark for a long time. This is why people usually get infected inside their home.
- **Covering the mouth and nose of all TB patients** when coughing, sneezing and talking
- **Immunization** (BCG) provides some protection to the children
- Getting tested for TB in case of suggestive symptoms (the sooner the better), especially for people who have spent time with TB patients

2.6. Symptoms suggestive/evocative of TB

- Fever
- Night sweats
- Weight loss
- Cough (chronic: more than 2 weeks)

*For Pulmonary TB (the **most common**, with 85% of the cases)*

- Sputum – white, grey, yellow, red : the presence of blood is very suggestive of TB

For Extrapulmonary TB:

- Many symptoms can indicate the presence of TB in various places, depending on the organ attacked by TB

The **symptoms can remain moderate during several months.**

Consequences: people who do not take the symptoms seriously, who do not come to health posts to be diagnosed, → They **contaminate other people** (10-15 people living close to a coughing TB sick person can be infected in one year, according to WHO).

- **Symptoms of severe, advanced TB disease:**
 - Persistent cough
 - Chest pain
 - Coughing with bloody sputum
 - Shortness of breath
 - Fever
 - Fatigue, loss of appetite, loss of weight

2.7. Treatment

- An effective treatment is well established and documented and is implemented in India.
- The treatment is divided into 2 phases and usually **lasts 6 months** in Rajasthan.
- during the first 2-month phase, **4 “first line” antibiotics** specific of tuberculosis are given together (Rifampicin, Isoniazid, Ethambutol, Pyrazinamide) and then only Rifampicin and Isoniazid during the remaining four months.
- **There may be some side effect of the treatment, especially during the first 2 months**
- Usually, a TB patient taking thoroughly a TB treatment is **no more contagious after 3 weeks of treatment** (1 cough = approx. 500 droplets x approx. 150 cough/day = 75 000 droplets)
- **Alcohol consumption should be stopped** during the treatment: it adds more pressure to the liver and contributes to weaken the body. Though, alcohol has no effect on the effectiveness of antibiotics.
- **Nutrition** is also a key of the success of the treatment: Undernutrition has been associated with malabsorption of anti-TB drugs. Government of India now provides food allowance along with medicines.
- Most of the infected patients can be **cured if the treatment is taken regularly and till the term.**
- **Stopping the treatment too early, before its scheduled end is worse than not taking treatment at all** (see next chapter)

Diagnosis cost: free at public hospital

Treatment cost: free at public hospital
Treatment duration: 6 months (if no resistance)

2.7.1. Schemes existing in Rajasthan

Information from Jaipur District Health department:

- Free **test** (pulmonary and extra pulmonary) in public health facilities dedicated to TB: urine and blood test, surgical evaluation, mental evaluation. Only MRI, **scans** and blood tests for calcium and serum are not free of charge, unless they are ordered by a public doctor.
- Free **treatment** (all stages)
- Monthly allowance for **nutrition** provided by government on patient’s bank account: 500 Rp/ month of treatment
- **Counselors** from Government identify TB sick people and do the follow up of their treatment (at health centers mainly).
- Only in rural: **Transport** reimbursement to get medicine at the block center every week (no more DOTS with daily contact).

2.7.2. Resistance and treatment

In a previous training (*Virus and Bacteria: immunization & treatment*), we already explained the risks of creating resistance by stopping a treatment by antibiotics prematurely. We also explained that resistant forms of disease are also developed by other people and can be transmitted to us directly.

→ resistance of TB germs to anti-TB medicines happens **when anti-TB medicines are used inappropriately** (for example if patients stop taking the drugs after a few weeks because they start to see signs of recovery) **or with the delivery of lower quality drugs.**

→ Resistant forms of TB can also be **caught directly**, from a patient with a drug-resistant form of TB.

The resistance to anti-tuberculosis antibiotics can be partial (resistance to only one drug), severe (MDR-TB) or extremely severe (XDR-TB):

- **Multi-drug resistant TB (MDR):** it is resistance to the 2 most powerful first line anti-TB drugs (Rifampicin AND Isoniazid).
 - ⇒ Special diagnosis techniques : automated gene amplification machine (Xpert ®) or culture in special laboratories
 - ⇒ Treatment with 2nd line drugs that are more expensive, and toxic than 1st line TB drugs.
 - ⇒ **Longer treatment, with more side effects** (joints pain, vomiting, deafness, hepatitis, behavior change, etc.), and **slower healing and more failure.**
- **Extensively drug resistant TB (XDR):** This is MDR-TB (resistance to 2 main first line TB drugs), WITH, in addition, resistance to two of the more critical second-line drugs.

	TB	MDR TB	XDR TB
% of population	3% sick with ACTIVE TB disease	4% of new ACTIVE TB cases 19% of previously treated TB cases	6% of MDR patients
Causes	Contamination	Contamination, OR Insufficient duration or quality of treatment	Contamination, OR Insufficient duration or quality of treatment
Treatment duration	6 months x2 →	9 months - 1 year x2 →	2 years
Treatment cost	Free at public hospital	Free at public hospital	Free at public hospital

Treatment success rate ⁴	>85%	/1.5→	54%	/1.8→	30%
-------------------------------------	------	-------	-----	-------	-----

2.8. Possible support from FDP

To avoid the risks of more transmission and contamination, the FDP SW can:

- Encourage all sick people –especially those with symptoms suggestive of TB- to be screened
- Make all patient with respiratory symptoms aware of the risks of transmission and propose possible protection means (handkerchief on mouth, avoid spitting, room ventilation, covering one’s cough, sunlight, etc.).

To avoid the risks of discontinuation of the TB treatment, the FDP SW can:

- **Ensure strict confidentiality:** TB patients are usually ashamed of their disease and do not want to be known as TB patients among the community (shame).
- **Encourage the patient to ask a doctor** if any side effect appears: pain in the abdomen, yellow eyes, skin itching, fatigue, colour blindness, deafness, dizziness
- **Inform about government TB facilities** for diagnosis and treatment.
- **Encourage the patient to keep taking treatment**, especially when she/he starts feeling better and wants to get back to work. This is the toughest part in families with limited income.
- Connect them with Government-supported **TB counselors** and inform them about possible support schemes (500/month, etc.)
- **Provide psycho-social support:** ensuring that the patient has been properly informed by doctors about the disease, seeking the support of other family members (to avoid them to put pressure on TB patients to make them interrupting their treatment in order to go back to work and earn) and see with them how to ensure an income without stopping the treatment, fighting the stigma of TB that prevent the treatment to be continued or testing, encouraging to stop alcohol and tobacco, etc.
- **ASK SW TO GIVE OTHER IDEAS**
- Exploring partner’s ambivalence about treatment:

Taking treatment CONS <i>To listen from the partner</i>	Not taking treatment CONS <i>To help the partner get aware of</i>
Side effects	Death
Not possible to work due to side effects	Not possible to work because of weakness
Shame due to hospital visits	Shame due to cough and ill-face
...	...

⁴ WHO, 2017 update, *Multidrug-Resistant Tuberculosis*