

A REVIEW ON: TUBERCULOSIS INFECTION AND LATENT TUBERCULOSIS

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Abstract

Tuberculosis is caused by mycobacterium Tuberculosis bacteria. TB kills more adult in India than any other infectious disease. 32% of world population suffering from TB. TB is spread through tiny droplets released into the air via cough and sneezing. Many guidelines for TB infection control have been published internally as follows..Guidelines for preventing mycobacterium Tuberculosis for transmission in health - care setting..The risk factor generate when there is an contact with TB infectiousness patient on daily basis..There are generally two types of contact (close and casual contact).close contact is basically when the person spend a long time (more than 8 hours) with infectiousness TB patient..Close household are generally those who share the patients breathing daily (bedroom, living room and kitchen) Close non-household are basically that when there are an sharing of breathing space with an TB patient outside the household (school, work place, etc)

Key words

Tuberculosis, mycobacterium bacillus, WHO, LTBI, Transmission, TB Development, Infection control, Tuberculin skin test, Treatment.

Introduction

Tuberculosis is a chronic granulomatous disease and major health problem developing in countries. TB kills more adult in India than any other infectious disease. Tuberculosis is caused by mycobacterium Tuberculosis bacteria. Mycobacterium Tuberculosis generally affects the pulmonary portion (lungs) of the human body . But it can affect other parts (such as brain, kidney , etc) The Robert Koch reported that mycobacterium Tuberculosis cause TB in human in 1882. According to WHO (world health organization) concluded that TB is the Ninth most fetal disease in the world. In 2001 , the WHO estimated that 32% of world population suffering from TB ,more than 10 million people suffering from TB and more than 2 million patients die due to tuberculosis and improper treatment

about quarter of the world's population is estimated and have infected with TB , Even through tubercle bacilli was identified nearly 130 years ago , The understanding of pathogenesis of the disease is still deficient. The TB can affect people of any age , individual person have weak Immune system. Eg :- person with HIV infection having more risk since The immune system in healthy people cause bacteria. The mycobacterium Tuberculosis bacteria are spread from one person to another person through tiny droplets released into TB , The air via cough and sneezing.

The infection with TB can result Two types;

- 1) Latent Tuberculosis infection
- 2) Tuberculosis Disease

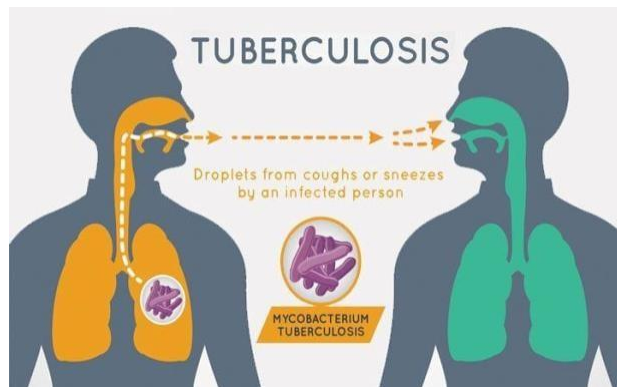
1) LTBI :

- ✓ doesn't grow in the body
- ✓ Person doesn't feel sick or symptoms
- ✓ Can't spread

2) Tuberculosis Disease:

- ✓ Grow in the body
- ✓ Person feel sick and symptoms
- ✓ Spread.

The mycobacterium Tuberculosis is divided every 16-20 hours . It have outer membrane lipid bilayer and contain mycolic acid in its cell wall. It is small, aerobic and non-motile bacillus, rod shaped structure.



Mode of transmission (%age)

Transmission of TB

When a person have TB disease in a lungs or throat, they can easily release TB germs into the air when a cough, sneezing, laugh or speak these germs can not be seen with eye. It remain in the air, if the people breathing that germs into their lungs which can be coming people infected. This is mostly likely happened in people spend lots of time with having TB patients. TB can not be spread by touching surface or other people such as handshake

, sharing food. Once the TB Germs lands on surface they can not cause infection. Most of the time TB affect the lungs and some time affect any part of the body. Disease in the lungs is called pulmonary TB and disease in other body part is called extrapulmonary TB. Disease in lungs spread one person to another person some one have strong cough and lots of TB germs in the lungs, it mostly likely spread to other. A majority of person who intake M.TB bacteria through air can cause an effective response in the lungs. Which leads to inhibition in the growth of the M.TB in the lungs, in this condition is known as latent TB or LTBI

.LTBI is transmitted disease the person have low immune system, and those have HIV, AIDS they are easily affected with TB is also transmitted through droplets aerosolization from an individual who has active TB. Active Fast Bacillus (AFB) positive patients has the highest or more chances to easily affected with TB. However AFB patient with negative smears but positive culture may still transmit the TB disease. The germs of TB easily break or divide into the air in 4-6 hours, another condition that may arise more risk for affected to M.TB infection in the lungs such as diabetes patients, long term use of corticosteroid, poly-morphine, vitamin D etc.

Droplet infection 50%
No idea 14%
Blood 3.3%
Droplet infection and contaminate urine and stool 3.3%
Droplet infection and use material contaminated by TB patient 5%
Direct contact with TB patient 5%

Droplet infection and direct contact 9.3%
Coughing, sneezing and consuming food contaminated by TB patient 10%

Mathematical model of transmission

The representative Quantitative study for Germs carried out in the air through droplets. Edward Riley modified well use of the super mass equation for Tuberculosis ward experiment. The equation is given below:-

$C = S(1 - e^{-Iqt/Q})$ Where,
 C= Number of new cases,
 S= Number of affected people exposed, e=
 Natural log,
 I= Number of infection source,

q = Number of infectious Dose , P = Human ventilation Rate , t =Exposure Duration, Q = infection free ventilation

TB outbreak and infection control

TB outbreak have reported regularly in middle and high school, military location in the south Korea. Therefore LTBI treatment is become important policy for Korea and therefore Reducing the TB patients in the south Korea, and LTBI control guidelines have Korean for TB many guidelines for TB infection control have been published internally as follows,

- 1) Guidelines for preventing mycobacterium Tuberculosis for transmission in health - care setting
- 2) WHO fir infection control in health - care facilities
- 3) Guidelines for Design and construction of health - care facilities Infection control:

- Facility-level management measures Implement the set of facility-level management activities: Identify and strengthen local coordinating bodies for TB infection control, and develop a facility plan (including human resources, and policies and procedures to ensure proper implementation of the controls listed below) for implementation. Rethink the use of available spaces and consider renovation of existing facilities or construction of new ones to optimize implementation of controls. Conduct on- site surveillance of TB disease among health workers and assess the facility. Monitor and evaluate the set of TB infection control measures.

- Administrative controls Promptly identify people with TB symptoms (triage), separate infectious patients, control the spread of pathogens (cough etiquette and respiratory hygiene) and minimize time spent in health-care facilities. Provide a package of prevention and care interventions for health workers, including HIV prevention, antiretroviral therapy and isoniazid preventive therapy for HIV-positive health workers.

- Environmental controls Use ventilation systems. Use ultraviolet germicidal irradiation fixtures, at least when adequate ventilation cannot be achieved and where routine maintenance of equipment can be guaranteed.

- Personal protective equipment use particulate respirators for all health care workers caring for TB patients and TB suspects.

- Household: Managerial activities Basic infection control behavior-change campaigns (minimize stigma and exposure of non-infected individuals)
 - Administrative controls Early case detection is most important
 - Environmental controls Natural ventilation may be sufficient
 - Personal protective equipment Health-care providers should wear particulate respirators when attending MDR-TB patients in enclosed space.

Preventive measure

Avoid close contacts with persons having active TB disease or Inactive disease not adequately treated. Get Vaccination to prevent TB. Stop interacting with groups having high rate of TB transmission, such as homeless persons, injection drug users, and persons with HIV infection or AIDS. Don't work or reside with people who are at high risk for TB in facilities or institutions such as hospitals, homeless shelters, correctional facilities, nursing homes, and residential homes for those with HIV. Maintain well balanced diet to keep immune system strong. Don't Smoke or Drink. Houses should be adequately ventilated. Anyone who coughs should be educated on cough etiquette and respiratory hygiene, and should follow such practice. If you feel any symptoms, consult the doctor immediately.

Symptoms

People with LTBI don't feel sick

Common symptoms of TB :-

- Pain in the chest
- Prolonged weakness
- Weight loss
- Fever
- Night sweats
- Cough (some time with blood)

Certain Conditions can increase the risk fir TB disease;-

- due to use of Tabacco
- Having weak Immune system
- Having diabetes
- Being malnourished.

Clinical perspective of the Infection of TB

It has been seen that patients which are suffering with pulmonary or endobronchial TB are highly contagious and the infectiousness is increased in the following conditions. Due to presence of lung cavities. Due to presence of respiratory symptoms like cough. HIV-CO-Infection increases the risk of TB reactivation by 18 times.

These infectiousness are rapidly reduced by anti-TB chemotherapy.

Kill dividing of bacilli:- drugs with early bactericidal action provide quick symptom relief to the patient by reducing bacillary load in the patient and achieve quick sputum negativity so the patient is non-contagious to the transmission of TB is interrupted.

Killing persisting bacilli:- This depends on sterilizing capacity of the drug. To provide relief to the patient. TB bacilli are get eliminated to 1/25th of initial level within 2 days of anti-TB chemotherapy and to 1/100th within 2-3 weeks of anti-TB chemotherapy in drug-sensitive TB patient.

Firstly TB infectiousness are not easily not be determined without TB diagnosis.

TB infectiousness diagnostic procedure:-

Medical history and physical examination where collection of all the information about symptoms, exposure to TB and relevant medical history conducting physical examination to check signs of TB. Tuberculin skin test (TST) or interferon gamma release assay (IGRA) these test used to detect immune response to TB antigens. Chest X rays for examining the abnormalities in the chest, example lung cavities which indicate of TB. Bacteriological test it is an collection of sputum for acid-fast bacilli (AFB) small microscopy to detect TB bacteria. Nucleic acid amplification tests (NAAT) performing molecular tests like polymerase chain reaction (PCR) to identify TB DNA/RNA. Drug susceptibility testing is an process of examining the susceptibility of the TB bacteria to specific anti-TB medications. Clinical evaluation where collection of all information of clinical presentation and get towards the treatment.

TB Infection of Contacts and Risk of Active TB Development

The risk factor generate when there is an contact with TB infectiousness patient on daily basis. There are generally two types of contact (close and casual contact). close contact is basically when the person spend a long time (more than 8 hours) with infectiousness TB patient. These close contact are further divided into two parts which is close

household and close non-household. Close household are generally those who share the patients breathing daily (bedroom, living room and kitchen). Close non-household are basically that when there is an sharing of breathing space with an TB patient outside the household (school, work place, etc). Basically after the examination higher priority is given to close contacts including households contact. When M.tuberculosis is inhaled than alveolar macrophages kill the tuberculosis bacilli. If the patient is get infected with M.tuberculosis than 10% of infected hosts progress to achieve TB and other remaining 90% progress to LTBI.

Active TB

Person who is suffering from Tuberculosis should be treated with proper medication for elimination of bacterial infection. Directly observed therapy (DOT) which has a procedure towards patients that they observed the symptoms and provide proper needed medicine or anti-tuberculosis. Medication for treatment of TB are classified as first line and second line drugs. First line drugs :- Isoniazid, Rifampicin, Ethambutol, Pyrazinamide. Second line drugs :- Kanamycin, Streptomycin, Amikacin. Medication in initial stages of TB are crucial because there is not availability of proper data regarding the drug resistance towards bacteria. Therefore in initial phase only INH, RIF, PZA and EMB drugs are used for treatment. Medication are given to the patient daily for 2 weeks then twice weekly in the initial phase. Medication is of 4 month in continuous phase and some time it is extended for 7 months for some special patients. Example:- Cavitory pulmonary TB patient, Pregnant women, severe liver disease. Proper completion of TB treatment is calculated by total number of doses taken and duration of therapy.

LTBI Treatment

TB reactivation cases get reduced upto 90% if LTBI patients take proper medication therapy. The standard medication period is of nine months of daily self-admiring of isoniazid, another is an period of 6 months course. But it is not preferred mostly because efficacy get reduced. Due to the continuity of medication there is an chance of side effects by medicine. Mostly adherence is measure problem which affect the therapy completions. Pyridoxine supplementation to isoniazid is given to the patient which have high risk of neuropathy, including others high risk disease (Diabetes mellitus, HIV, Renal failure, Alcoholism or Thyroid disease and also to the pregnant or breastfeeding).

Conclusion

Tuberculosis is a chronic granulomatous disease and major health problem developing in countries. TB kills more adult in India than any other infectious disease. Mycobacterium Tuberculosis is spread from one person to another person through tiny droplets released into TB, The air via cough and sneezing. About quarter of the world's population is estimated and have infected with TB. Many guidelines for TB infection control have been published internally as follows. Guidelines for preventing mycobacterium Tuberculosis for transmission in health - care setting. The risk factor generate when there is an contact with TB infectiousness patient on daily basis. There are generally two types of contact (close and casual contact). close contact is basically when the person spend a long time (more than 8 hours) with infectiousness TB patient. Close household are generally those who share the patients breathing daily (bedroom, living room and kitchen) Close non-household are basically that when there are an sharing of breathing space with an TB patient outside the household (school, work place, etc)

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