Manage TB
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Lecture – 02
The Epidemiology of Tuberculosis
Session 01

Welcome to this session on a Epidemiology of Tuberculosis in which we will learn about natural dynamics of disease in the population, what is the present disease situation in India and globally, what have we achieved so far in terms of reducing the burden of TB; where do we want to go from here and the way forward.

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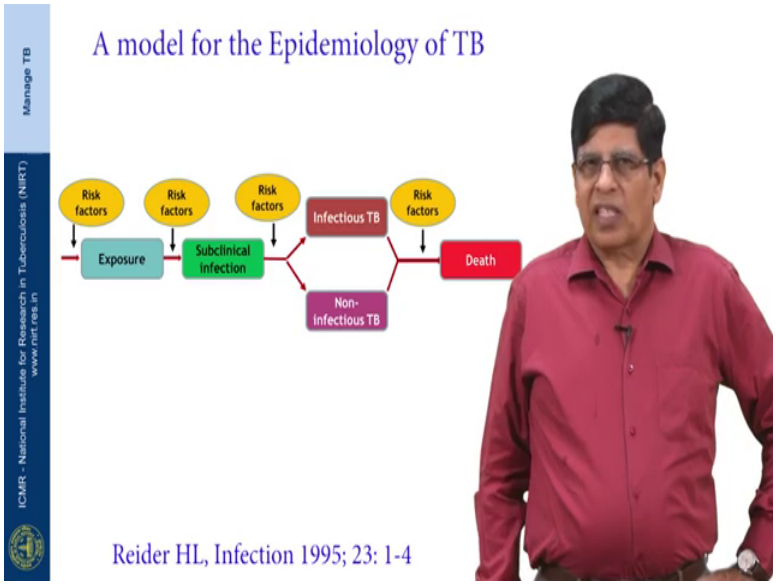

TB as you know is an infectious disease exposure to the infection is deemed to have a append when a susceptible person shares the air space with the infectious patient before completely air exchange has taken place. A proportion of those who are exposed get infected of the infected about 10 percent will break down to active tuberculosis disease over their lifetime and half of this risk occurs within first 2 to 3 years.

If the disease is untreated most of the patients come to be disease in 5 to 7 years and some also undergo natural cure.

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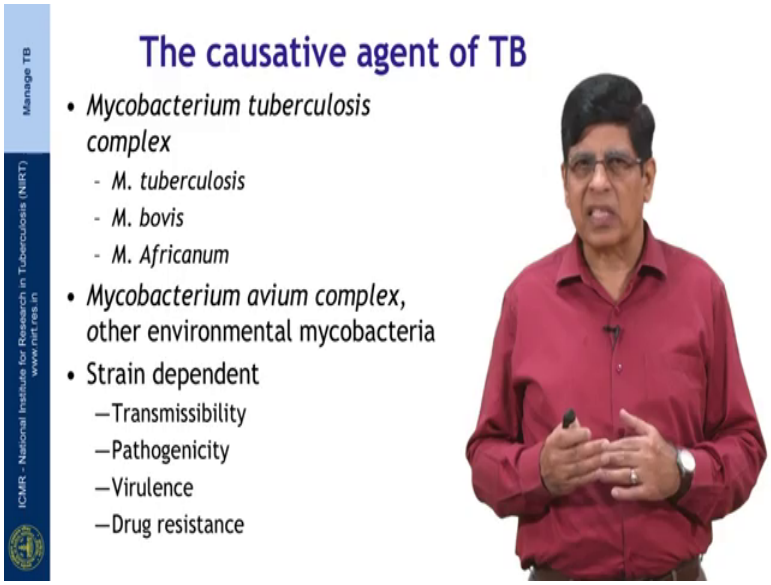

As you know the disease is caused by a group of genetically related organisms which are together called as Mycobacterium tuberculosis complex of them the predominant organism is the micro vector in tuberculosis. Mycobacterium bovis causes the disease in about 2 percent of the total disease burden. Africanum is restricted to certain geographical areas of the world.

There are other group of organisms which are called as environmental mycobacterium which are generally present in soil and water, normally that do not cause a disease in an immune competent person. But when the immunity levels go get reduced drastically then they can cause active disease of all these organisms term together as a environmental mycobacteria or a non tuberculous mycobacteria mycobacteria or any a complex organisms are the predominant ones.

There are various strains of mycobacterium tuberculosis circulating in the community and the transmissibility of the organism, the ability to cause this disease, the severity of the disease and propensity to develop drug resistance in the organism varies from strain to strain widely.

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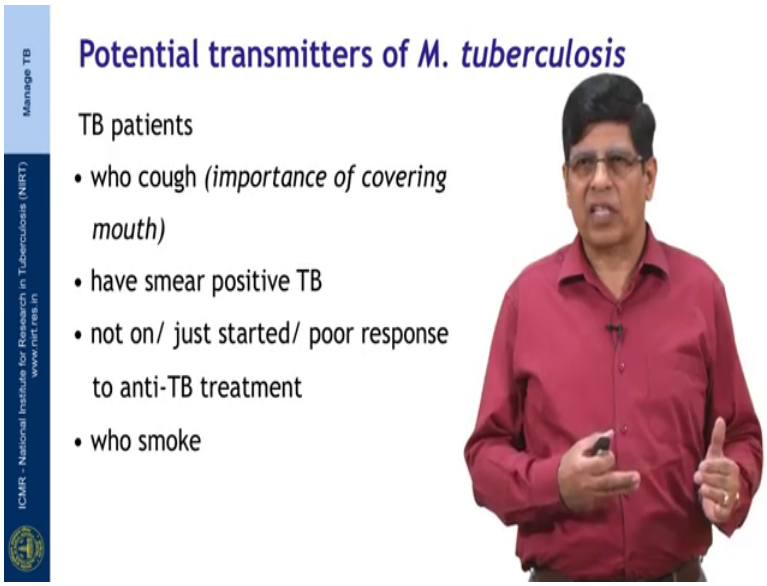

Who are the ones who transmit the disease? It is majority of the disease transmission takes place from smear positive cases who are the most infectious ones of all the forms of pulmonary tuberculosis and the ones who are having frequent coughing.

The disease is highly transmissible before the treatment is started or the before the sputum conversion has taken place and also the smoking increases the frequency of coughing thereby increasing the likelihood of transmission of infection from a infectious case to a susceptible person.

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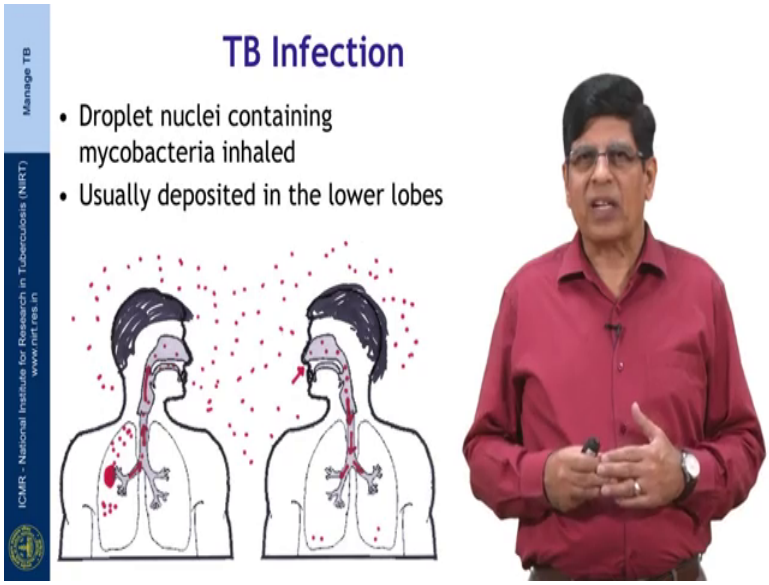

Now, what happens when one coughs? Thousands of droplet nuclei are thrown about in the air and the smaller ones they get inhaled and settle down in the alveoli of the susceptible person and these are the ones which are able to establish infection in the susceptible person.

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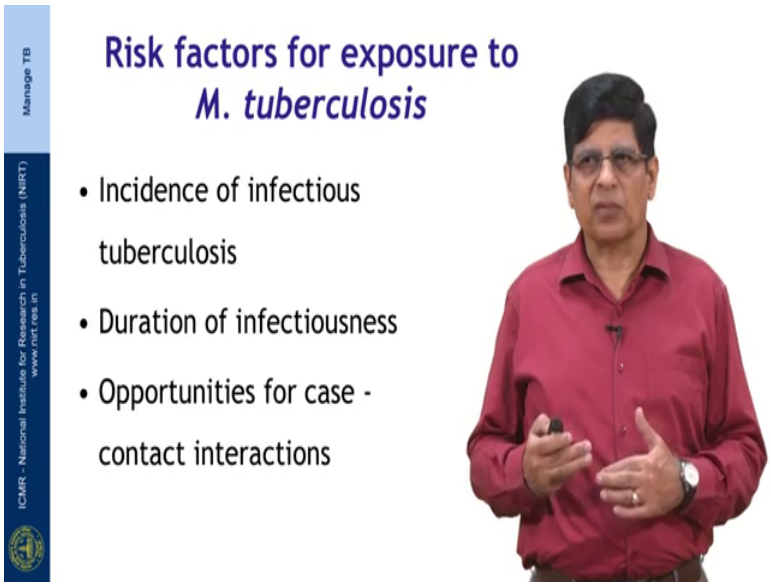

Risk of exposure of a given person depend upon the incidents of infectious tuberculosis in the whole community, the average duration of infectiousness of these cases and the number of contexts that a person when he is in the infectious stage comes in contact with.

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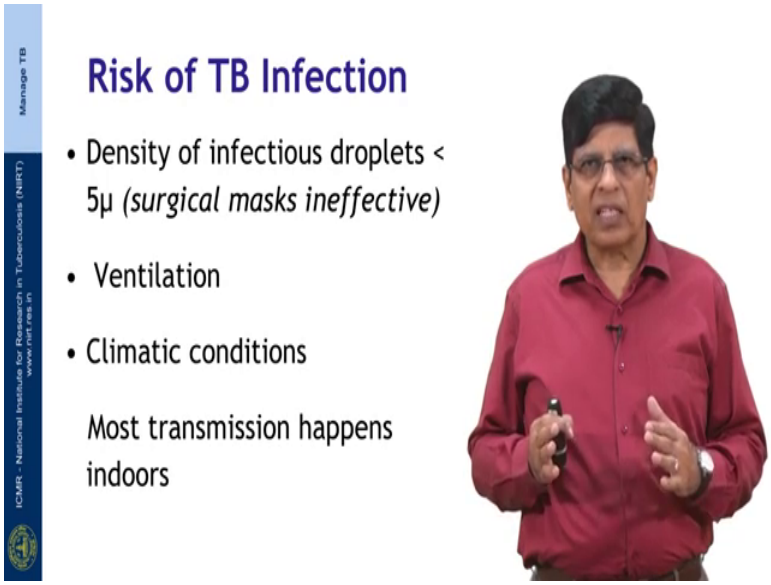

The risk of getting infection depends upon the environments, the wind velocity and the ventilation. Usually the droplet nuclei which are the smaller ones; they remain buoyant in the air for prolonged period of time and the ones which are less than 5 microns in diameter, they are able to gain entry into the deeper alveoli and establish themselves as infection.

Poor ventilation facilitates the acquisition of infection; climatic conditions such as the cold climate when people keep their windows and door closed that also facilitate increased transmission because of basically reduced transmission ventilation.

We have to remember that most of the transmission happens indoors very little transmission happens outdoors because of the dilution effect of the air velocity or if a person coughs very closely to the on the face of the patient, it is also said that about 5 minutes of close talk is equal to one forceful cough.

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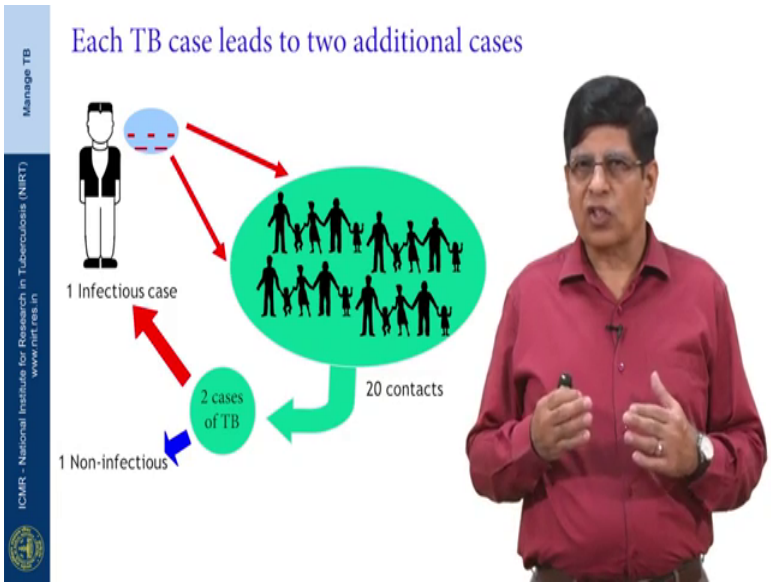

In a situation of poor TB control program or no program a sphere positive case remains infectious for a period of about 2 years, after them he either dies or in undergoes natural cure of course, some patients will die early some people patient survive longer.

Now, over this average period of 2 years he infects about 20 contacts and as I said earlier 10 percent of those infected break down into disease over their lifetime.

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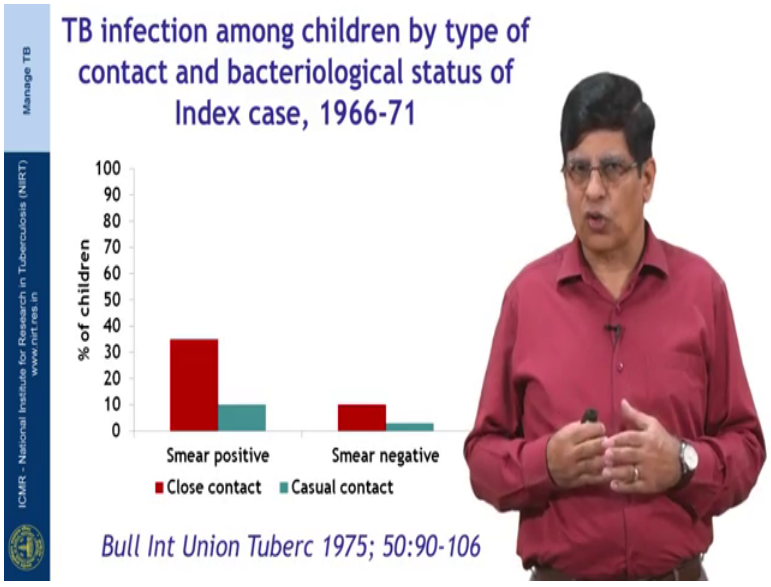

So, you can see that in case of poor programs or no programs the TB burden keeps doubling itself over a course of generation. This slide shows that we about 40 percent of

the close contacts as shown in the red bar on the left get infected compared to about 10 percent of those who are casual contacts and this smear negative TB is also infectious though only one-fifth as infectious as smear positive in pulmonary TB.

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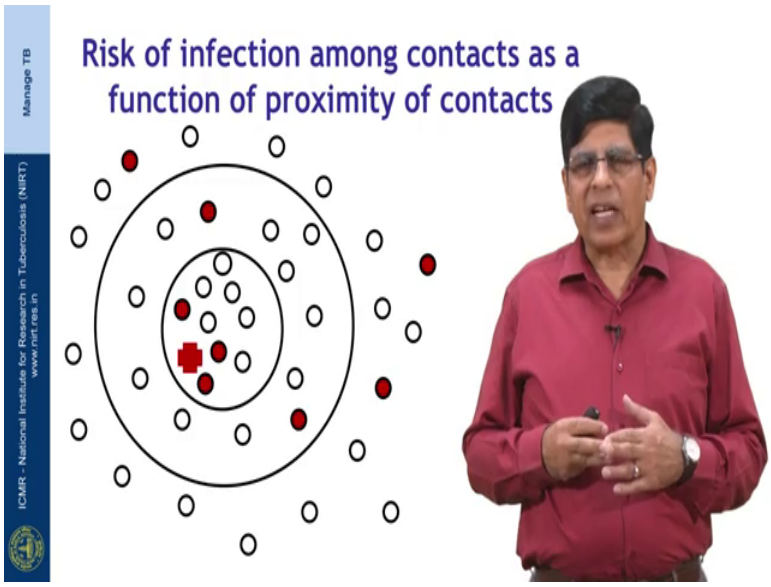

Now, in this slide you can see the across in the inner circle the inner circle represents a households, the outer circle represents the neighborhood and then the overall community.

Now, you can see that the higher proportion of persons who are the context in the household will get infected by these patients, if proportion also get infected in the neighborhood and become routine.

So, though the risk of infection is highest among the household contacts, but overall the number of infections caused by the patient outside the household is more than the infections caused within the household.

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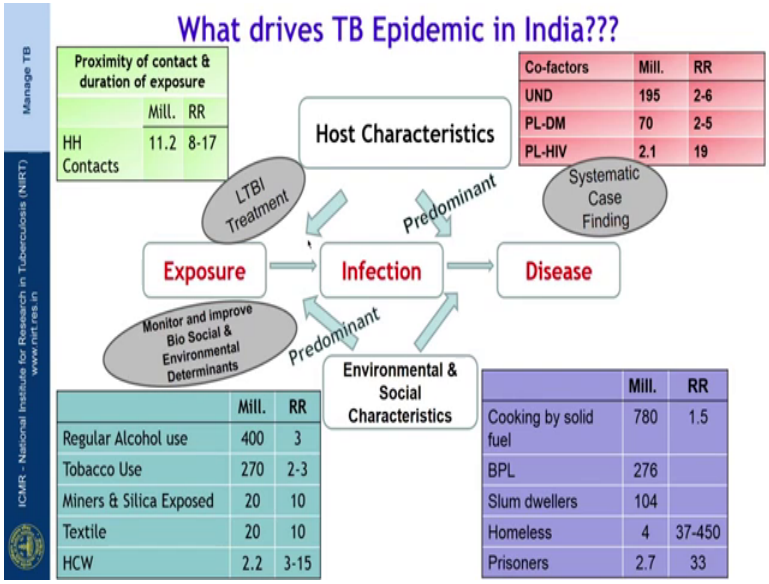

Now, in spite of all our efforts TB continues to be high burden TB disease in this country and let us look at what drives the current epidemic of TB. There are 400 million people who use alcohols at any point of time, there are additional 270 million tobacco users alcohol and tobacco use increases the risk of infection and risk of disease by 3 times compared to a person who has been remotely infected in the past let us say 10 to 20 years back.

There are certain occupations just like minors those people who work in silica expose industries those exposed to organic textile dusts and healthcare workers who have much higher risk of TB compared to the normal population. Indoor air pollution affects 780 million population in this country and they have one and a half time the risk of TB disease compared to the general population.

Then you have other people living in urban slums in poverty the homeless people in prisons where the housing conditions and the living conditions are much poorer than the general community and. So, the chances of transmission and exposure are much higher all these factors predominantly act through increasingly exposure to transmission rather than breakdown of infection to disease though some impact is also over there.

Now, given that there are something like 2.8 million incident cases in the country every year and more than 3 million prevalent cases at any point of time. So, there are about 12

million household contacts at any given point of time and the relative risk of disease in these patients is more than 10 compared to general population.

Some mathematical models have revealed that preventive treatment of all the household contacts not just these children below 6 years which is the current policy and revised national TB control program will prevent about 2 million cases over the course of next decades. Then there are others host characteristics such as malnutrition diabetes HIV prevalence which increase the propensity of infection to break down into active disease.

Though the relative risk of HIV is 20 compared to a normal HIV negative remotely infected person. It contributes to about 5 percent of the disease incidence. On the other hand under nutrition contributes about 35 percent of the total disease incidents. Now, all these factors highlight the importance of systematic screening of the people who have high likelihood of having prevalent TB, addressing environmental and social characteristics as well as the treatment of latent TB infection if we have to mass towards our targets of TB control and elimination.

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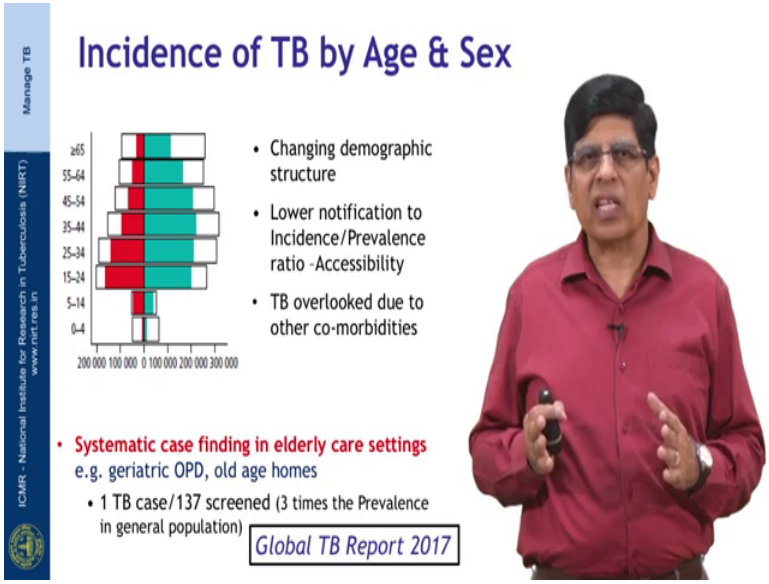

TB incidence is generally higher in older age groups; as you can see that compared to you know younger age groups and higher in males compared to females. The increasing population size and increasing life expectancy thereby indirectly increase the overall burden of disease and that we have to kept keep in mind when we examine the trends of TB in terms of impact of let us say the revised national to be control program.

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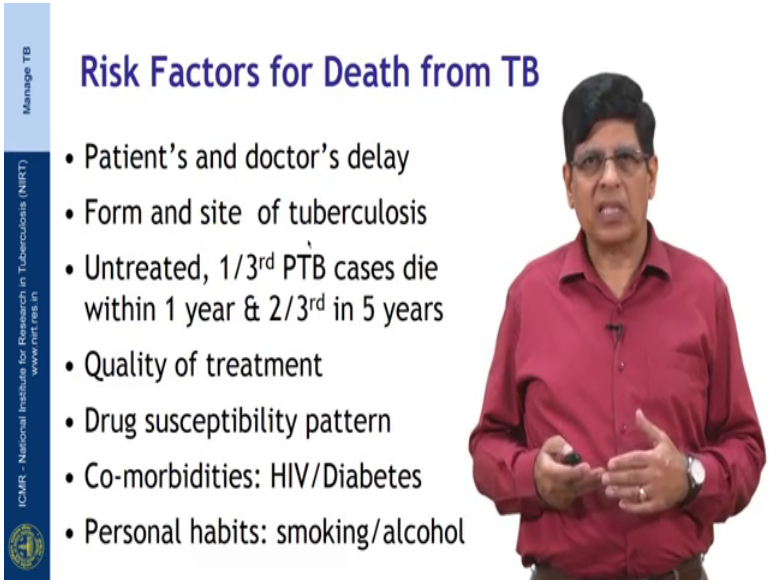

The probability of dying from TB increases with the delay from onset of disease true diagnosis and initiation of treatment. Smear positive cases and certain forms of extra pulmonary TB like TB meningitis have higher probability of dying from TB. If untreated one-third of pulmonary TB cases die over a course of 1 year and two-third in about 5 years.

The probability of treatment success also depends upon quality of treatment and also the drug susceptibility pattern. The co-morbidity is like HIV diabetes and personal habits like smoking and alcohol also increase the probability of unfavorable treatment outcome from anti TB treatment.

Thank you so much.