CHAPTER II

ESSAY

How can We Increase the Cure Rates Among the TB Patients in Nepal?

2.1 Introduction

The main issue in this essay is how can the low cure rates in National TB control program in Nepal be raised. Cure rate is the number of patients cured divided by the number of patients treated. As defined by the WHO, cured is a sputum-smear positive patient who has subsequently completed the treatment and had two consecutive negative smears, at least a month apart, the last one being at the end of the treatment (NTP TB Manual, 1996). At present the cure rate is below 50 % (NTP Annual Report, 1996). The National Tuberculosis Program (NTP) has set a target to achieve and sustain a cure rate of 85 % by the year 2000 AD (NTP 9th 5 Year Plan, 1997). Unless and until the desired cure rate of 85 % is achieved, it is not recommended to increase coverage (case finding). Without achieving the cure rate of 85 %, if we increase the coverage there will be more cases with multi-drug resistant TB (MDR-TB).

The benefits of curing the patients are that the patient individually is free from the illness and suffering and he is able to work and fulfill his normal duties. The family benefits because there is no economic loss caused by the loss of working days or payment for his treatment. The community benefits because there is no more spread of

the disease from that individual. Curing each and every patient will hasten the disappearance of the TB from the society and will strength the economy.

The only way to prevent and control TB from spreading is to cure the TB patient. The only way to cure a patient with TB is to treat him/her with ant-TB drugs. Drug treatment is the only effective method to control TB. Other methods are chemoprophylaxis, BCG vaccination, ventilation, and isolation of the patients. All these methods are preventive methods and not economically viable measures for control because in a society where TB is prevalent it is impossible to isolate, give chemoprophylaxis or hospitalize all of the patients. So the best method is to treat the infectious TB patient. Treating the TB patient we are treating the source of infection and, thus, cutting the chain of transmission (Crofton, 1994).

The right choice of the treatment contributes a great deal to the outcome of the treatment. Many factors like the cost of the treatment, and side effects of the treatment and so forth have to be weighed before choosing the right regimen. To have the chosen regimen sustained for a period of time, the regimen must be affordable for the government and not dependent on donor fundings.

The length of the treatment and the need to take several drugs is a major challenge in TB control. The patient after taking a few weeks of treatment feels much better and does not feel it is necessary to continue the treatment even though he knows

that it is harmful to discontinue the treatment. Therefore, supervising the patient while taking the drugs is necessary.

Nepal has chosen DOTS (Directly Observed Treatment Short-course) to be implemented in all the districts by the end of 2000 (NTP 9th 5 Year Plan, 1997). DOTS though a bit expensive has other benefits such as high cure rates and less side effects thus low drop out rates, and low relapse rates.

DOTS is necessary to achieve and sustain 85 % cure rates. Without DOTS the unsupervised SCC (Short Course Chemotherapy) will create multi-drug resistance. The potential advantages of DOTS are that cure rates can be increased, strengthens the health services by creating rapport between the community and the PHC, and strengths the community participation (Hausler & Raviglone, 1995). The potential disadvantages are that it may make treatment less accessible, will be unpopular because of significant stigma of TB, and it will create extra workload for health workers.

DOTS is much more than simply watching someone take their medicines. It is way of providing the necessary support to the patient that will enable them to complete a full course of treatment. Without such support, cure rates will be low, and TB control will not be achievable. Therefore, a definition of DOTS is a means of ensuring that the patient takes his prescribed drugs under supervision of the health worker, a family member, or someone from the community until he/she is cured.

Possible methods of implementation of DOTS in Nepal are in hospital, health post based, by a community based health worker, in the community or in the home. A balance has to be achieved between accountability and accessibility. The first three methods involve a high degree of accountability, and are therefore preferred, but are relatively inaccessible to the patient. The latter two are accessible, but have little accountability to health service. The low cure rates can be raised by using treatment regimens and method of DOTS that is acceptable to the providers and patients. Acceptability, affordability, and accessibility of the treatment will increase the adherence of the patients to the treatment and thus the cure rates in the NTP will be raised.

Increasing the cure rates is a challenging task for the NTP. NTP of Nepal has adopted DOTS (Directly Observed Treatment Short-course) where the patient on treatment is supervised by the health worker throughout the treatment. DOTS is a strategy for ensuring that every patient who starts treatment gets the best chance of being cured, where someone supervises that the patient regularly takes his medicine as prescribed (Stop TB at the Source, 1995). DOTS is a very cost effective strategy as rated by the World Bank Report, 1993. DOTS cures the sick patients, prevents the drug resistance, and extends the lives of the HIV patients (Stop TB at the Source, 1995).

This is the right time to implement DOTS because HIV/AIDS is on the rise. TB and HIV form a deadly combination, each multiplying the impact of the other. HIV

and TB have been described as the "Diabolic Duet". The reason is that the two go together. When HIV increases, so does TB. When people are infected with both TB and HIV, TB is more likely to become active because of person's weakened system.

As more TB cases become infectious, it means larger numbers of people carry and spread TB to healthy population. TB is the leading opportunistic infection to kill HIV positive people. So if we implement DOTS, we can stop the spread of TB and prolong the lives of HIV patients.

Another potential reason to implement DOTS is that the multi-drug resistance (MDR-TB) is on the rise. Drug resistance poses a major problem, because it is difficult and expensive to treat successfully. It is most commonly arises as a result of poor treatment regimens and inability to ensure that the patient takes all the prescribed drugs. This problem of MDR-TB can be addressed by using DOTS.

The time is right to implement DOTS now because all the governments are politically committed to control TB and we have the tools and techniques to diagnose and treat TB. If we can find 70 % of the TB patients and implement DOTS and cure 85 % of the TB patients enrolled in the treatment for 12 consecutive years then the prevalence TB will be half (WHO, 1995).

2.2 Mycobacterium Tuberculosis

TB is caused by *Mycobacterium tuberculosis*. It usually attacks the lungs, causing a condition known as pulmonary TB. The cells of the immune system fight back but can not kill all of the germs. Only persons who are actually sick with TB can infect others; it is not spread by insects, blood supplies or water. Like the common cold, and unlike AIDS, the disease is spread through the air and by relatively casual.

A person with active TB will infect 10 to 20 other people in the span of a single year if untreated. However, only 5-10 % of people who are infected with TB actually become sick or infectious themselves (Toman, 1984), because the immune system acts as a barrier to the TB organisms. People with weaker immune systems have a much greater chance of developing the disease. Overcrowding, congestion, malnutrition, and unsanitary living condition are some of the factors which can contribute to the spread of the TB infection.

2.3 Major Public Health Problem

2.3.1 Magnitude

Tuberculosis is a major public health problem in the world today, and poses a serious challenge to national and international public health work. Someone in the world is newly infected with tuberculosis literally with every tick of the clock -- one person per second (Stop TB at the Source, 1995). Fully one third of the world's entire population, 1.9 billion people, are now infected with the TB bacillus (Annual Report on TB Epidemics, 1997). By the end of this decade it is estimated that 300 million

more people will become infected, and that 90 million people will develop the disease. TB kills three million people annually and will claim 30 million lives by the end of this century (Annual Report on TB Epidemics, 1995). TB kills more adults each year than AIDS, malaria and other tropical diseases combined.

Apart from the human suffering involved, the impact on economic and social development is immense. The majority of those who fall ill and die from TB are young parents and workers, often in their most productive years. If a central objective of development is to reduce economic inequities, then sharp reductions in TB morbidity and mortality must be included as a priority within development assistance for the health sector (The World Development Report, 1993). The poor are at greater risk of being infected with TB because they live and work in circumstances where uncured, infectious patients are found most often. They are more likely to become ill, once infected, due to malnutrition, stress, and morbidity associated with other diseases which compromise their immune status. TB has always been a disease associated with poverty.

In the last decade we have learned that women's deaths due to maternal causes have been greatly underestimated. What was not appreciated until recently was that even more women die from TB than from maternal causes (WHO, 1996). The disease and its consequences are passed from one generation to the next. A mother with TB is very likely to infect her children.

People infected with TB live up to 5 years without treatment and they infect 10-20 people every year (Gryzbowski, 1978). These patient go to many places seeking health care and they spend a lot of their hard earned money before being diagnosed with TB. Therefore, these people with undiagnosed TB can infect many people before being diagnosed. It is necessary to identify these patient as early as possible and treat them until cured. However, with a such a NTP with cure rate below 50 %, it is harmful to increase the coverage because this would result in more chronic cases, which would be very difficult and expensive to treat.

2.3.2 Global Public Health Problem

The disease is especially devastating in developing countries, where it accounts for 95% of total cases. A quarter of all these deaths in adults can be prevented (World Health Statistics Quarterly, 1995). So great is the concern about the world-wide magnitude of the modern TB epidemic that in April 1993 the World Health Organization (WHO) declared tuberculosis to be a "global emergency" -- the first declaration of its kind in WHO history (Stop TB at the Source, 1995). Globally, tuberculosis kills more people than any other single infectious disease (World Development Report, 1993).

2.3.3 Leading killer

TB is the leading infectious killer of youth and adults (Stop TB at the Source, 1995). A third of the world's population is infected with the TB bacillus. TB is a leading killer of women. TB likely creates more orphans than any other infectious

disease. TB is the leading infectious killer of people living with HIV/AIDS (WHO Fact Sheet 104, 1996). Every country and everybody is vulnerable to the consequences of poor TB treatment practices in other countries because people are traveling and migrating (Groups at Risk, 1996). Migration, international travel and tourism are increasingly allowing TB to penetrate borders. In the United States, one third of all TB cases are foreign-born individuals, while in many other industrialized countries one half or more cases are foreign-born (WHO Fact Sheet 104, 1996).

2.4 Conceptual Framework

In the conceptual frame work (see Fig 2.1) we can see that a tuberculosis patient in the community can infect healthy people but fortunately not all the infected develop the disease. Once the infected person develops the disease, he or she will go to a health facility seeking care. The facility can be governmental or private. Once the patient is enrolled in treatment, he either gets well (cured) or he dies. At present the cure rate is below 50 % and most of the patients who are not cured either die or become chronic and remain a source of Multi-drug Resistance (MDR-TB). MDR-TB is very difficult and expensive to treat. Having MDR-TB is like having a death sentence in the developing world (Iseman, 1997).

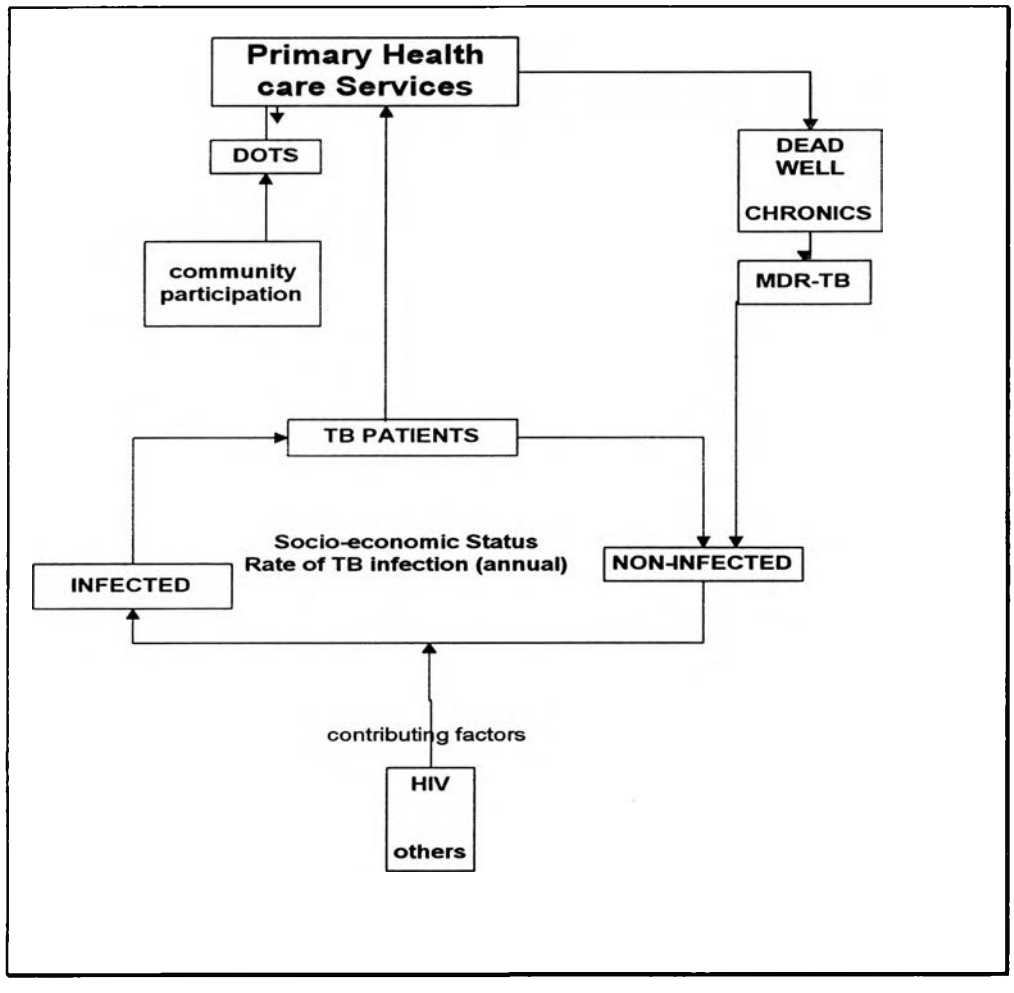
If left alone TB has a innate tendency to decline. Without any treatment, 30 % of the TB patients are cured, 50 % die, and 20 % remain with chronic TB (Grzybowski, 1978) as compared to our current NTP (National TB Program) outcome of around 50 % are cured, 20 % die, and 30 % remain chronic TB. Having

such a NTP does more harm than good. Naturally the cure rate and death rates are better but the control creates more MDR-TB which is very difficult to treat and it contributes to expanding the infectious pool. The bigger the infectious pool the higher the rate of infection and, thus, more people will be infected and more people will develop the disease.

In a community, socio-economic status also predetermines the rate of the infection. The more people are deprived from physical facilities such as housing, drinking water, proper ventilation, etc., the higher the annual rate of infection in that community. There will be more patients in the community and the more the TB patients, the more people will be infected.

The majority of those who fall ill and die from TB are young parents and workers, often in their most productive years. The poor are at greater risk of being infected with TB because they live and work in circumstances where uncured, infectious patients most often are found. They are more likely to become ill, once infected, due to malnutrition, stress, and morbidity associated with other diseases which compromise their immune status. TB has always been a disease associated with poverty. Those people who are HIV positive are at high risk of developing TB . Persons with other immuno-compromised diseases such as diabetes and thyrotoxicosis also have a greater risk of developing TB.

Fig 2.1 Conceptual Framework

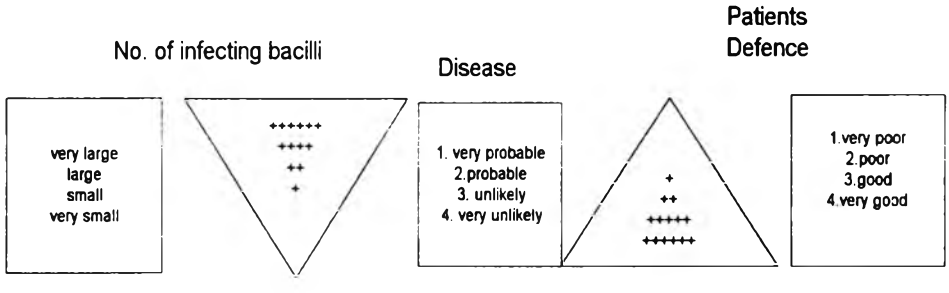


If DOTS is implemented in the health care system and community participation from the community then more people will be cured and thus the compliance and the cure rate will increase. The more the patients are cured, the lower the incidence of MDR-TB.

2.5 TB Infection and disease

Having TB infections means that the TB germs are in the body but they are in an inactive state. After TB germs enter the body, in most cases, body defenses control the germs by building a wall around them the way a scab forms over a cut. The germs can stay alive inside these walls for years in an inactive state. While TB germs are inactive, they can not do damage, and they can not spread to other people. The person is infected, but not sick. He/she probably won't even know that he/she is infected. Millions of people have TB infection. For most of them, the germs will always be inactive.

Fig 2.2: Infection and disease



Probability of developing tuberculosis disease The influence of the numbers of infecting bacilli and the strength of the the patient's defence

Source: Crofton, 1994

Most people who are infected with TB germs never become infectious or sick. The bacilli remain dormant in the lung and do not spread to others until they are activated by several factors. The factors like poor nutritional condition and weakened immune system facilitate the activation of the bacilli from the dormant stage in the

lungs. It is possible to get TB disease shortly after the germs enter the body if the person's body defenses are weak. It is also possible, even after many years, for inactive TB germs to become active when body defenses are weakened. This may be due to aging, a serious illness, drug or alcohol abuse, or HIV infection (the virus that causes AIDS). When defenses are weakened and inactive TB germs become active, the germs can then break out of the walls, begin multiplying and damage the lungs or other organs. A person infected with very few numbers of infecting bacilli who has a very poor body defense will have high probability of developing the TB disease and vice versa. A schematic presentation of the infection and the disease is given (Fig. 2.2).

2.6 TB Situation in Nepal

2.6.1 Morbidity and Mortality of TB in Nepal.

Tuberculosis is an immense problem in Nepal, causing great suffering and death. Recent estimates suggest that about 60% of the adult population is infected with the tubercle bacillus, and each year about 50,000 people develop TB, over 20,000 of whom have the sputum smear positive disease (National TB Program Review, 1994).

Nepal suffers considerably. In May 1995 HMG with WHO and with major donor agencies, and INGOs in TB control, conducted a review of the TB situation and gave the following report. It is estimated that almost 45 people die from tuberculosis daily. And about 13,000 to 16,000 people die annually. At any given

point, there are around 90,000 patients of all forms. Every year 50,000 new cases arise. Nine million people are infected with tuberculosis. Less than 50 % of the cases are registered in the TB treatment and of these less than 50 % complete the treatment (WHO/HMG Review Report, 1995). These results are nowhere near the WHO target of 85% cure rate and 70% case finding. Continuing the program in such a way would do more harm than good. This alarming report gave an impact to the National Tuberculosis Program (NTP). It was clear that the NTP needs to organize and have plan a of action to improve itself.

2.6.2 TB in Nepal

TB is a well known disease in Nepal, recognized and feared for centuries. Though now known as "Tee Bee" traditional names are also used , such as *khapate, chaya rog, sukenas, sukuti*. These names reflect the people's perceptions about the disease and each describes the process of wasting, drying up, brokeness, blackening, and destruction. In Sanskrit it is called *Rajyachhayama*, 'king of diseases".

Although Nepal has a long history of activities designed to combat the menace of TB, achievements have been below expectations in defeating this disease, and the incidence of TB continues to rise.

2.7 Directly Observed Treatment Short-course (DOTS)

2.7.1 Definition of DOTS

DOTS stand for Directly Observed Treatment, Short Course, and it is a strategy for ensuring that every patient who starts treatment gets the best chance of being cured. As part of the DOTS strategy, health workers or the trained supervisor counsel and observe their patients swallowing each dose of a powerful combination of medicines, and the health services monitors the patients' progress until each is cured. Political and financial commitment and a dependable drug supply are essential parts of the DOTS strategy. The DOTS strategy focuses on the cure of every TB case. Good TB control which cures patients has proven successful in preventing drug resistance in Algeria, Chile, Korea, Tanzania and New York City (Annual Report on TB Epidemics, 1997).

DOTS provides a standardized combination of the most effective medicines, ensures through direct observation that these medicines are taken regularly until patients are cured, and monitors the patients' overall progress so that action can be taken if cure is not being achieved. Therefore, DOTS is symbolized by the outstretched hand of the health worker and volunteers who provide powerful anti-TB medicines to patients, and watches them swallow the pills.

DOTS is not simply watching a patient take their drugs-it also involves providing motivation, encouragement and follow-ups to the patient. DOTS is not just the solution to poor compliance, therefore DOTS must include a package of activities that will help patients to complete their treatment. Above all DOTS is not easy, it requires a commitment from health workers, patients, and community. DOTS is much

more than simply watching someone take their medicines. It is way of providing the necessary support to the patient that will enable them to complete a full course of treatment. Without such support cure rates will be low, and TB control will not be achievable. Therefore a definition of DOTS is a means of ensuring that the patient takes his prescribed drugs under supervision of the health worker, a family member, or someone from the community until he/she is cured.

2.7.2 Possible methods of implementation of DOTS

Possible methods of implementation of DOTS in Nepal are as follows: in hospital, health post based, by a community based health worker, in the community and by a family member. DOTS can be provided to the patients if they can be hospitalized but this can be expensive and there are not enough hospitals to admit all the patients. But even if the patient were to be admitted who would feed their dependents! Another method of delivery of DOTS in the health post, the patient comes daily to the healthpost daily but this would create extra load for the overburdened health workers and the patients would not be able to attend daily. Another method is when a field worker such as VHW (Village Health Worker) or MCHW (Maternal-Child Health Worker) can see the patient each day but these people are volunteers and they have their own assigned duties. DOTS can be delivered in the community, when a reliable community member, such a political leader, a teacher, or an old TB patient can supervise the patient daily. In the home, a reliable family member is able to take responsibility for supervising the treatment. The first methods are accountable methods to the health services but these methods are not accessible to

the patients. The latter three are accessible to the patients but not accountable to the health services. The study proposed tries to make the delivery of DOTS accountable as well as accessible to the health services and the patients.

A balance has to be achieved between accountability and accessibility. The first three methods involve a high degree of accountability, and are therefore preferred, but are relatively inaccessible to the patient. The latter two are accessible, but have little accountability to health service.

2.7.3 Accessibility of DOTS

The low cure rates can be raised by using treatment regimens and methods of DOTS that is acceptable to the providers and patients. Acceptability, affordability, and so accessibility of the treatment will increase the adherence of the patients to the treatment and thus the cure rates in the NTP will be raised. Increasing the cure rates is a challenging task for the NTP.

2.7.4 Prerequisites for DOTS

To increase the cure rate, the patient must adhere to the treatment. To adhere to the treatment certain activities are necessary. These activities are drug regimens, logistical systems, skilled committed staffs, quality of service, and health education.

A drug regimen should be one that rapidly renders the patient non-infectious, and cures them without producing significant adverse effects within a relatively short period of time. Short course-chemotherapy used in DOTS cures patient relatively

quicker than the standard regimen and has less side effects. NTP Nepal has chosen SCC as the national regimen. Though the SCC is a bit expensive, it has less side effects, low drop out rates and the main advantage is the duration is only 8 months where as in standard regimen the patient has to take the drugs for more than one year (see Table 2.1).

Table 2.1: Regimens used in NTP, Cost and outcome.

Alternative Regimens	Cost	Side effects	Drop out rate	Cure rate	Duration of Treatment
Standard	**US $ 17 ***	**30 % ****	**35 % ****	**40 % ****	**12 months ***
SCC	**US $ 30 ***	**7 % ****	**13 % ****	**60 % ****	**8 months ***
DOTS	**US $ 35 ***	**5 % ****	**5 % ****	**85 % +****	**8 months ***

* WHO , 1994
** Shakya, 1996

Logistical Systems is a important system that must ensure a regular and uninterrupted supply of medicines with buffer stocks. In a country with poor infrastructure, the roads are usually not so good and in the rainy seasons the floods make it impossible to travel and have material delivered so the need to have buffer stocks of medicines is very necessary.

Skilled and committed staffs a system to ensuring staff are trained and supervised to maintain the necessary to diagnose and treat people with TB. The staffs must also be committed to stay and work in that place.

Quality service is one which is valued by the community; it has to be: appropriate, accessible, acceptable, equitable, effective and efficient. If the quality of service is good, meaning that if patient are attended and get relieved of their sufferings, the people will have more faith on the services and more people use the services.

Health Education should aim to empower patients, families, and communities to understand more about their disease. The patient must be aware of the signs and symptoms of the disease and they must also know that this can be treated and the drugs are available in the health facility nearest to their homes.

Therefore, there has to be a standard drug regimen that will cure the patient quickly and the drug regimens should have less side effects. Logistical system has to regular and uninterrupted. There must also be skilled and committed health workers and the quality of the services provided must be good. Above all, the patients must be have health education about the disease and its symptoms. If any of these links in the chain are missing, the chain breaks, and the patient will probably not be able to complete the course of treatment.

DOTS has three parts. The first part is-direct observed treatment. This means that someone is responsible for making sure that the patient takes their medicines regularly and correctly every day. This person can be a health worker at the health facility or it can also be someone in their own family, such as secondary school age son

or daughter, or someone in the village. This person motivates, educates and encourages the patient to complete the treatment course.

The second part is Short Course Chemotherapy (SCC). This means a course of treatment lasts for 8 months, and it includes rifampicin, isoniazid, ethambutol, and pyrazinamide. It is vitally important that patients taking these medicines are fully supervised for at least the initial two months of treatment. If not the drugs may not be taken properly, and drug resistance develop. The third factor of DOTS is monitoring system that checks that patients are being cured. Individual patients are monitored by examining the sputum.

2.8 Benefits of DOTS

DOTS is the only method that can achieve and sustain a cure rate above 85 %. This cure rate of 85 % can be achieved in any part of the world. Because of the DOTS strategy, we now have the means of preventing up to 50 million deaths from tuberculosis in the next few decades (WHO Annual Report, 1997). For the first time, we have a winning hand to defeat TB in poor and wealthy countries alike. The DOTS strategy provides extraordinary benefits. No other TB control strategy comes close to being as effective and as affordable as DOTS. The advantages of DOTS are as follows.

2.8.1 Cures the Patient

No other TB control strategy has consistently demonstrated such high cure rates. DOTS produces cure rates as high as 95 percent, even in the poorest of countries. TB programs not using DOTS often cure only 40 percent of their patients (Stop TB at the Source, 1995).

2.8.2 Prevents New Infections

DOTS stops the TB bacteria at the source by curing the infectious patient. When an infectious TB patient is cured, that person can no longer pass the germ on to others thus the chain of transmission is cut. When a patient is not cured, he or she will infect, on average, 10 to 20 friends, family and co-workers each year. Once the people are cured of TB, they can no longer infect others. The source of infection is the sick and infectious patients who are not on treatment. The best prevention in TB control is curing the TB patients so that they can no longer infect others (Stop TB at the Source, 1995).

2.8.3 Stops Multi-drug resistance (MDR-TB)

The treatment provided through DOTS makes it virtually impossible for a person to develop incurable and ultimately fatal forms of TB. Other treatment strategies can actually cause (MDR-TB), and may be doing more harm than good (Stop TB at the Source, 1995).

2.8.4 Cost Effective

An eight month supply of medicines for DOTS costs only US $11 per patient in some parts of the world, and rarely more than $40. This can be less than the price of a few bottles of aspirin. The World Bank has ranked the DOTS strategy as one of the "most cost-effective of all health interventions in primary health care" (The World Bank, 1993). Treatment of infectious cases with DOTS costs between $1 and $5 for each healthy year of life (DALY, or Disability Adjusted Life Year) saved. Even at 50 times this cost, the DOTS strategy would still be extremely cost-effective.

Tuberculosis control is not only important because of the threat it causes to the public health, but is also a cost-effective strategy. Studies in several developing countries have demonstrated that short course chemotherapy, given under strict supervision, can achieve cure rates in excess of 85 % of patients treated (Annual Report on TB Epidemics).

2.8.5 Community Based

DOTS does not require hospitalization, a new technology or resources, nor the creation of a new health structure. Rather, existing health systems can use DOTS and rely on health workers and trained volunteers. It is possible to use the DOTS strategy in existing primary health care systems (Stop TB at the Source, 1995).

2.8.6 Extends Lives of AIDS Patients

Compared to currently available protease inhibitors, DOTS has been demonstrated to add many years of life to HIV positive people with TB in developing

countries. Yet, the medicines used for DOTS are only one-hundredth the cost of protease inhibitors (Stop TB at the Source, 1995).

2.8.7 Protects the Workforce

Nearly 80 percent of those inflicted with fever and coughing from TB are in their most economically productive years of life. This represents a very large workforce. Without the DOTS strategy, the TB epidemic will continue to burden the workforce and can reduce self-sustaining families to beggars or welfare recipients (Stop TB at the Source, 1995).

2.8.8 Protects International Travelers

There is no other feasible way to protect the world's 500 million annual international travelers. The only safeguard is to use DOTS more widely and reduce the number of infectious TB cases worldwide (Stop TB at the Source, 1995).

2.8.9 Proven Effective

The initial prototypes of the DOTS strategy were pioneered by the International Union Against TB and Lung Disease ten years ago. DOTS has been successfully implemented in a wide variety of conditions in Tanzania, Guinea, China, Bangladesh, New York City and Peru. Currently, nearly 70 countries have begun using DOTS and are achieving results. Last year, approximately one million TB

patients were treated under the DOTS strategy (Annual Report on TB Epidemics, 1997).

DOTS is the only TB control strategy to consistently produce 85 percent cure rates. WHO's TB control targets are to cure 85 percent of the detected new smear positive TB cases and detect 70 percent of estimated cases. DOTS is also one of the most cost-effective health interventions, compared to those available for other diseases.

2.9 Consequences of not using DOTS

DOTS can cut TB deaths in half (Annual report of TB Epidemics, 1997). Only about 10 percent of all TB patients were treated through the DOTS strategy last year (Annual Report on TB Epidemics, 1997). In Nepal DOTS is used only in few pilot sites. Though the results are very impressive and encouraging, there is a great deal of input to achieve these impressive results.

The consequences of not using DOTS more widely are alarming. Needless TB cases and deaths will certainly continue. The worst scenario, however, is that TB will eventually become untreatable due to multi-drug resistant TB. MDR-TB usually kills its host, but only after allowing the victim years of life to spread the lethal drug-resistant germs to family members and others in the community. Once MDR TB is unleashed, we may never be able to stop it. We will face a deadly infectious disease that spreads through the air, yet is virtually as incurable as AIDS or Ebola. This

frightening prospect must be avoided at any cost. Therefore, DOTS can cure the patients and stop the spread of MDR-TB.

2.10 Feasibility of DOTS

DOTS has been greeted in Nepal with great skepticism. The prospect that every patient could and would be observed taking every dose of medicine struck many as unrealistic. Professionals could not imagine taking on the extra responsibility. The health system could be flooded with up to 25,000 people seeking TB treatment. Most health professionals were skeptical that the strategy could be implemented. But the model demonstration sites have shown great success. But we must not forget these are model demonstration sites where extra input has been invested. The supervision to these sites are very frequent and the supervisor get paid extra. The health personnel get incentives. In other words these model demonstration sites are not the ordinary facility where the shortage of medicine, personnel and etc. exists. Therefore, the success at the demonstration sites cannot be implemented all over the country. So there has to be another method which can be feasible and applicable all over the rural Nepal.

2.11 Other strategies versus DOTS

Many TB control strategies, such as chemoprophylaxis, ventilation systems, and ultraviolet lights cannot significantly reduce TB infections, cases and deaths. Unlike DOTS, these strategies do not affect the source of the epidemic-the infectious person. Moreover, these strategies provide temporary and incomplete protection to

the fewer people and are far more expensive per infection prevented. Such strategies, while important in certain settings, should not considered the tools to fight the battle against TB (Groups at Risk, 1996).

2.11.1 BCG Vaccination

Over 80 percent of the world's children have been given the BCG vaccination against TB as a part of the United Nations' Expanded Program on Immunization. The BCG vaccination is relatively effective in preventing serious but non-infectious forms of childhood TB. The value of the BCG vaccination is limited to early childhood only, and its impact in preventing further worsening of the TB epidemics is minimal (Groups at Risk, 1996). The BCG vaccination does not cure a TB patient but it only protects the vulnerable group (children) from infection and serious forms of TB.

2.11.2 Chemoprophylaxis

Chemoprophylaxis is a strategy of providing anti-TB drugs to people infected with TB bacillus, before they get sick. It is not a substitute for curing those who have already become ill. If DOTS is already established in a community, it may be desirable to provide anti-TB drugs to people who are identified as HIV-positive and who are also infected with TB. These individuals will have up to a 50 percent chance of developing and spreading TB. In contrast, most other infected with TB will have less than 10 percentage chance of actually developing TB during their lifetime. This means that preventive treatment for those who are not HIV positive is unnecessary for 9 out of 10 infected people, making chemoprophylaxis many times less cost-effective than

DOTS. However, some developed countries like the USA are using chemoprophylaxis (Groups at Risk, 1996).

2.11.3 Ventilation Systems

One cough by a sick person with TB contains thousands of TB bacilli which are suspended in the air for over an hour. Good ventilation in crowded areas may reduce the risk of new infections by quickly dispersing the germs, and can often be achieved simply by opening windows and doors. Compared to DOTS, investments in ventilation and air filtration are not practical and cost effective use of public health funds to protect people from TB in most crowded situations, such as buses, jails, nightclubs, classrooms, office spaces and shopping areas (Groups at Risk, 1996).

2.11.4 Screening

Active case-finding and screening of selected groups such as factory workers or school children is not as cost-effective and practical as DOTS. This is especially true for the screening of travelers and immigrants as they enter a country. With people taking nearly a half billion international vacations and business trips each year, and with million of people immigrating from country to country, it would cost billions of dollars each year to even partially screen travelers for TB at airports, ports and border crossings. Even if this strategy were affordable, it would not be effective. It is very difficult to follow-up with people who test positive, since most accurate diagnostic tests take weeks to produce results (Groups at Risk, 1996).

2.11.5 Short course chemotherapy, Unsupervised

This is using the most potent drugs available without any treatment supervision. The patient is given the drugs and he is advised to take it regularly. The patient starts to feel better and eventually stops taking the treatment after taking it for some time. This practice causes more multi drug resistance (Groups at Risk, 1996).

2.11.6. Hospitalization

This is the best method available. But there are not enough TB beds available to admit all the TB. This is the ideal way to treat TB patients if resources are available. This would be very expensive. Scandinavian countries treat all TB patients by hospitalization. This why they have highest cure rates of 96 percent (Groups at Risk, 1996).

Therefore, the most important and effective way of preventing new TB infection is to treat a TB patient. Once the TB patient is treated (cured), he does not infect anyone. The most feasible way of treating the patient is by supervising the patients and ensuring that he completes the treatment is by using DOTS. Other above mentioned methods are not feasible, applicable, and affordable for the government.

2.12 Resurgence of TB due to HIV Infection

2.12.1 Deadly duet of TB and HIV

HIV damages the immune system and accelerates the speed at which TB progresses from a harmless infection into a life-threatening disease, changing a process that can take years into one that happen within weeks. It may also make those who are uninfected by TB bacterium much more vulnerable to this infection. The lethal relationship may also work the other way; TB may hasten the progress into AIDS.

The consequences of this relationship are already apparent. In sub-Saharan Africa at least 3.8 million people are infected with TB and HIV (WHO, 1996). Asia, where 1.1 billion people suffer from TB and the number of HIV cases is rising dramatically faces a devastating explosion of AIDS-related TB. The number of co-infected people in Asia is expected to multiply seven-fold this decade (The World Health Report, 1993).

In 1994, 5.6 million people were co-infected by both TB and HIV. By the end of the century, tuberculosis is likely to be the leading cause of death among HIV-positive people. If TB cases were properly handled, it is possible that one half of the future health care costs for AIDS patients could be avoided (WHO Fact Sheet 104, 1996).

2.12.2 HIV Pandemics

The growing pandemic of HIV threatens to overwhelm TB control programs throughout the developing world. A person infected with TB has a 10 % lifetime risk

of developing the disease (Styblo, 1991). However, the risk increases to 10 % per year if he or she is co-infected with HIV, the risk being greatest if the TB infection follows HIV infection (Selwyn, 1989). This diabolic duet has resulted in a rapid increase in the incidence of TB in many countries, particularly in Sub-Saharan Africa , but more recently in some countries of Asia, for example Thailand. Scientists have estimated that India will have more HIV cases than Thailand in the coming decade. With the open borders with India, Nepal will also suffer from this. Globally, the number of new cases of TB attributable to HIV was estimated to be 300,000 in 1990, equivalent to 4% of total new TB cases. This proportion is projected to increase to 14% by the year 2000 (Kochi, 1994).

2.12.3 HIV/AIDS in Nepal

The number of HIV/AIDS patients in Nepal continues to increase. The first case of AIDS was diagnosed in 1988 (HIV/AIDS Manual, 1994), and in the last year prenatal transmission was reported. This is a rapid progression through the epidemiological stage of the AIDS epidemics, suggesting a very rapid spread of HIV in Nepal. However, it is possible that this has arisen because of the high proportion of female cases of HIV/AIDS in the early stages of the epidemics, which is an unusual feature (Smith, 1996).

Tuberculosis is the commonest infection in patients with HIV/AIDS in developing countries. TB is the main cause of death in patients AIDS. About 75 % of

AIDS cases diagnosed so far in Nepal have had TB . This is similar to reported figures of 60 to 80% in other countries of the region (WHO, 1995).

With the spread of HIV in many developing countries, it is projected that the annual death toll from tuberculosis will rise to four million over the next decade (Annual Report on TB Epidemics, 1997).

2.13 Multi-drug Resistance

2.13.1. Magnitude of MDR-TB

The worsening global trends of TB are further complicated by the threat of the incurable multi-drug resistant TB (MDR-TB). Incomplete or inappropriate treatment of the disease has contributed to the development of strains that are resistant to drugs that once destroyed bacteria in 100 % of cases. Multi-drug resistant strain are as contagious as normal strains, but more lethal as only very few, and mostly expensive, drugs can kill them. MDR-TB is one of the greatest health challenges of the early 20th century.

A bad TB program with low cure rates can relieve the suffering for a short period and prolong the life of the patient up to 5 years but creates more drug resistant cases which will be a source of chronic multi-drug resistant tuberculosis. These people who fail to complete treatment regimens or have been improperly treated can remain infectious to other people. These chronic cases often carry bacilli in their lungs that have become resistant to anti-TB drugs, meaning persons whom they infect will have

the same drug-resistant strain. When the disease actually develops in such cases, it is much more difficult and expensive to treat than normal TB, and much more likely to be fatal. There is no cure for multi-drug-resistant strains of TB, and there is concern that they may spread rapidly around the world. While hard data remain scarce, researchers estimate more than 50 million people are infected with strains of TB that are resistant to source of at least one of the common anti-TB drugs (WHO Annual Report, 1997).

2.13.2 MDR-TB in Nepal

In Nepal multi-drugs resistance is also a great problem though not so many studies have yet been carried out. These results show an alarming situation and the available TB drugs may not be useful at all to fight against TB. The Table 2.2 shows that the number of resistance is on the rise.

Table 2.2: Drugs sensitivity patterns in patients with suspected drug resistance at the National Tuberculosis Center.

culture	number	resistance	number
Negative	**157 (46%)**	**fully sensitive**	**15 %**
Positive	**175 (51%)**	**drugs**	**27 (15 %)**
Contaminated	**13 (4%)**	**2 drugs**	**26 (15%)**
		3 drugs	**41 (23%)**
		4 drugs	**38 (22%)**
		all drugs	**27 (15%)**
Total	**345 (100%)**		**175 (100%)**

Source: NTC Laboratory 2051-4-1 to 2052-3-30. Cultures tested for resistance to Streptomycin, Isoniazid, Rifampicin, Ethambutol and Thiaceatzone

Drug resistance poses a major problem, because it is difficult and expensive to treat successfully. It is most commonly arises as a result of poor treatment regimens, often because doctors have failed to follow the national treatment guidelines. A study in India on patients treated in the private sector discovered that 100 private practitioners used a total of 80 different treatment regimens for patients with TB, most of which were both inappropriate and expensive (Uplekar and Rangan, 1993).

2.13.3 Global analysis of MDR-TB

On 22 October 1997 WHO released a Press Release on the extent of multi-drug resistance. The report alerts the world community that multi-drug resistance is spreading rapidly and if appropriate actions are not taken TB will be incurable for anyone who does not have access to the most sophisticated and expensive health care . In industrialized countries, MDR-TB can raise treatment costs 100-fold -up to US $ 250,000 per patient (WHO Press Release, 1997)

This report was based on worldwide survey and it did find evidence that the MDR-TB can be prevented by addressing the bad treatment practices which usually cause it. The report for the time link between poor treatment of TB and the spread of drug resistant strains. Conversely, where DOTS is used, the level of drug resistance is low. The report state that one third of the countries surveyed had MDR-TB level between 2 and 14 percent of all cases. While this study demonstrates a dangerous problem, it also directs us to a powerful solution known as DOTS, DOTS cures sick patients and prevents drug resistance.

2.13.4 Causes of MDR-TB

Inconsistent or partial treatment of TB is the root cause of MDR-TB. Many patients fail to take all their medicines consistently because of the extended treatment period or because they no longer have any of the outward symptoms of the disease. In addition, many doctors and health workers prescribe the wrong drugs or the wrong combination of drugs. DOTS can address many of these issues.

No one can afford to ignore the growing incidence of drug-resistant TB. An epidemic of drug-resistant TB will have global implications that all countries must immediately recognize. MDR-TB is an airborne bacterium that is spread just as easily as regular TB. An individual who is sick with any strain of TB will infect between 10 and 20 people each year with that same strain. The only way to prevent the spread of MDR-TB is to treat new TB cases correctly - and cure them. This prevents drug resistance from ever developing.

TB is different from almost any other disease in that cases of TB must be actively sought and treated to keep them from spreading to others. In most diseases the untreated case dies and harms nobody. In TB the untreated or improperly treated case becomes resistant and spreads drug-resistant TB until it is found and properly treated. We physicians love to blame our patients for non-compliance in taking drugs. However, our failure to deal with TB clearly rests with a lack of compliance on several levels; TB will never be eliminated until this lack of compliance on all levels is addressed and corrected at the providers and patient's level.

2.14 Conclusion

TB as we all know is a major public health problem causing great deal of suffering and economic loss to mankind for a very long time. Five decades ago powerful anti-TB medicines were discovered to fight the battle against TB. With these medicines developed countries had TB controlled. But with HIV/AIDS on the rise, the developed countries are also facing a great problem.

In the developing countries TB has always been a problem. TB was never under control, because of scarce resources and poor management. Due to the poor management of the TB program, the developing countries are facing a huge problem with MDR-TB. This MDR-TB is a man-made problem. Another threat is the increasing trend of HIV/AIDS.

TB is the commonest cause of death in adults aged 15 to 45 in Nepal. Nearly as many women die from TB as from maternal causes. These deaths have an enormous social impact on families and communities. Treatment of TB is highly effective. If patient takes the medicines properly, nearly 100% of them will be cured. Not all patients are cured though, some develop TB that is resistant to the drugs we use.

The best way to control and prevent TB is to cure the TB patients. If we do not act now, our children will suffer a lot. We have a powerful strategy known as

DOTS, which can cure 95% of all the TB cases. Now is time to use DOTS to fight the menace against TB. If we can use DOTS we can control and eventually eradicate TB.

References

Crofton, J., (1992). Clinical tuberculosis. IUATLD, Paris.

Davies, P.D.O., (Ed) (1994). Clinical tuberculosis. Chapman & Hall Medical,

Dolin, P., Raviglione, M., Kochi, A., (1992). Global tuberculosis incidence and mortality during 1900-2000. Bulletin of the World health Organization, 70(2): 213-220

Enarson, D.A., Grosset, J., Mwinga, A., (1995). The challenge of TB: statements of global control and prevention (Lancet conference). Lancet , 346: 809-817

Grzybowski, S., Enarson,DA., The fate of cases of pulmonary TB under various treatment programme. Bulletin of International Union of Tuberculosis (1978); 53; 70-75

Hausler, H.P., (1995). Assessment of TB management in community care projects in Sub-Saharan Africa. Geneva, WHO.

HMG, MOH, NTC. (1995). Annual report of national TB programme 1994/1995. Nepal.

Holger, S., Sukontha, Kongsin, Vallop Payanandana, Nunn, P., Raviglione, M.C., (1995). Costs and benefits improving TB control: the case of Thailand. Social Science Medicine 44: 12, pp. 1805-1816

IUATLD. Paris, France(1994). Tuberculosis Guide for Low Income Countries.

Pathania, V., Almeida, J., Kochi, A,. (1997). The behaviour and interaction of TB patients and private for profit health care providers in India. Geneva, WHO.

Payanandan, Vallop, et. al (1995) Information in preparation for an external review of the national TB programme, Thailand 1995. TB division, Ministry of Public health, Thailand.

Porter, J and McAdam, K. (Eds). (1994).TB: Back to the Future , London: John Wiley & Sons.

Questions Answers about the DOTS strategy. (1997) Geneva, WHO.

Reichman, L. & Dekker, M. (1993). (Eds). Tuberculosis: A Comprehensive International Approach . New York.

Sudre, P., Dam, G., Kochi, A., (1992). Tuberculosis: a global overview of the situation today. Bulletin of the World health Organization, 70 (2): 149-159

Toman, K.(1986). Tuberculosis Case-Finding and Chemotherapy: Questions and Answers. WHO, Geneva.

WHO, Geneva. (1993). Managing TB at district level: A training course.

WHO, Geneva. (1993). Managing TB at district level: A training course.

WHO. Geneva. (1993). TB: A global emergency. World Health

WHO. Geneva. (1994). The HIV/AIDS and Tuberculosis control. WHO/TB/ CARG (4)94.4

WHO. Geneva.(1994). TB: A global emergency, WHO TB programme document.

WHO. Geneva. (1994). Framework for TB Control. WHO/TB/94.179

WHO/8-25 Jan 1994. Press Release WHO predicts increase in TB deaths.

WHO. Geneva.(1995). DOTS Stops TB at the Source. WHO/TB/95.183,

WHO, Geneva.(1995). The world health report 1995: Bridging the gap.

WHO. Geneva. (1995). TB programme review of Thailand. WHO/TB/95.192

WHO, Geneva. (1996) Groups at Risk.

WHO/43-2 June 1995. Press Release TB has become world's leading killer of HIV-positive people.

WHO. Fact Sheet N104 (revised) March 1996. Tuberculosis.

WHO. Geneva. (1996). Tuberculosis -A global emergency. WHO/TB/96.197

WHO. Geneva.(1997). TB: A clinical manual for South-East Asia.

WHO. Geneva.(1997). TB: WHO report on the TB epidemics 1997.

WHO, Geneva.(1993). Treatment of TB: Guidelines for national programmes.