

CHAPTER 2

Literature review

2.1 INTRODUCTION

A literature study is the focused attempt to become more familiar with what has been done in the area from documented information. The review of literature involves the systematic identification, location and analysis of documents containing information related to the research problem. It is the critical summary of research on a topic of interest (Polit, Beck & Hungler 2001:464).

In the previous chapter, an overview of the dissertation was given. In this chapter a literature review is given on aspects pertaining the control of TB, such as research done on TB as a health problem and the DOTS strategy as a possible solution to this problem.

2.2 TUBERCULOSIS AS A HEALTH PROBLEM

TB as a disease was historically known as an indicator of low socio-economic status, though it affects everybody today. TB has been a health problem from time perspective. The serious extent of a TB epidemic in the world, especially in South Africa has alarmed health professionals for several decades (Glatthaar & Barends 1995:179). The World Health Organization (WHO) estimates that 1,7 billion people carry the tubercle bacillus. The incidence rate per 100 000 in 1993 was as follows:

- Hungary 38 new cases per 100 000
- Venezuela 44 new cases per 100 000
- Chile 67 new cases per 100 000

- Malaysia 67 new cases per 100 000
- South Africa 250 new cases per 100 000

On 23 April 1993 the WHO declared TB a global health emergency (Glatthaar & Barends 1995:179).

The seriousness of TB in South Africa has been reflected by the following figures below.

- Infected cases 10 million +
- Infectious cases 150 000
- New cases 90 000 +

Table 2.1: Incidence rate per 100 000 in South Africa

The incidence rate per 100 000 in South Africa is as follows:

PROVINCE	1995
Northern Transvaal	53
North West	82
Eastern Transvaal	84
KwaZulu-Natal	115
Gauteng	191
Eastern Cape	280

TB statistics were discussed in chapter 1 for 1994, 1997 and 2001. TB incidence in 1995 was much better than other years, though Eastern Cape, Gauteng and KwaZulu-Natal Province had elevated numbers.

TB was the leading infectious cause of death worldwide, being responsible for three million deaths annually. Among these, aged over a five years period, TB killed more people than AIDS (Zumla & Grange 1998:1).

2.3 IMPACT OF HIV/AIDS ON THE INCIDENCE OF TUBERCULOSIS IN SUB-SAHARA AFRICA

Studies indicated that HIV infections and TB were increasing worldwide. Persons with HIV infection were at high risk of active TB as HIV attacks the immune system. Of the people who were co-infected with HIV and TB, about 50 percent might become ill with TB (Department of Health 2000a:38). The impact of HIV on TB was reflected by rapid increases of TB notifications worldwide as indicated by the statistics above. TB was considered the most important opportunistic infection among HIV.

Colebunders and Lambert (1995:4) stated that a third of the 36 million people living with HIV worldwide were co-infected with the mycobacterium TB, 70 percent of these co-infected lived in Sub-Saharan Africa.

HIV/AIDS has greatly uplifted the TB statistics. Though anti-retroviral therapy is used in certain cases, the use of condoms and education continues – this problem still exists and appears to be increasing gradually. The study revealed that TB patients who were HIV negative responded better to treatment when under DOTS strategy than HIV positive patients. HIV positive patients were more likely to be young and unemployed. This problem of HIV and TB has greatly affected the whole world economically, as the government has to develop many programmes to fight the spread of the disease. The impact of HIV on TB differs according to different countries, depending on the total population. Estimated numbers of the TB epidemic and of the impact of HIV infection on TB in SA are indicated in table 2.2 below.

Table 2.2: Projected impact of HIV+ cases on tuberculosis

	1995		2000		2005	
	Number of cases	Incidence per 100 000 (% HIV+)	Number of cases	Incidence per 100 000 (% HIV+)	Number of cases	Incidence per 100 000 (% HIV+)
Scenario 1 Current						
TOTAL	141 187	341	273 365	600	637 999	1 285
HIV+	32 709	79 (23,4%)	130 304	286 (47,6%)	450 323	907 (70,6%)
Scenario 2 (Improved HIV control only)						
TOTAL	141 095	341	267 245	586	379 700	765
HIV+	32 688	79 (23,4%)	124 045	272 46,4%)	192 084	383 (50,6%)
Scenario 3 (Improved HIV control only)						
TOTAL	141 187	341	171 516	376	223 527	450
HIV+	32 709	79 (23,4%)	81 653	179 (47,6%)	157 959	318 (70,6%)
Scenario 4 (Improved HIV control only)						
TOTAL	141 095	341	167 676	368	133 030	268
HIV+	32 688	79 (23,4%)	77 915	171 (46,4%)	67 011	135 (50,6)

(Colebunders & Lambert 1995:4)

The above table has indicated how serious TB with HIV is. The incidence of HIV positive TB patients is increasing according to the above table though many programmes had been implemented.

2.4 EXTENT OF THE TUBERCULOSIS HEALTH PROBLEM

The extent of TB worldwide is alarming. Ginsberg (1998:1) states that currently available weapons for fighting TB are inadequate. Researchers are still using their knowledge to find out the actual strategies

which can be pursued to combat this problem. Notifications of TB have also risen in Britain since 1987 with drug resistant isolates increasing from 8 percent in 1987 to 14 percent in 1991 (Stoker 1994:1). The high rates of squatter settlements being over-crowded also contribute to TB. TB as a health problem has now complicated to MDR TB. The researcher states that primary MDR TB is higher than secondary MDR TB, which indicates that TB is a serious problem which needs strategies to fight it. Although South Africa was known to be the country with the highest TB rates in the world, TB remained a serious problem internationally. The following countries reflected how serious TB was:

- In Portugal TB was the leading cause of death, the incidence of the disease remained higher than in any other European Union Country, with 53 cases per 100 000.
- London had an average of two deaths and 50 new cases reported each week. Rates in London were 2 per 100 000.
- In Britain, Portugal and France, the disease was linked to immigration from areas where TB was still at epidemic levels such as Africa and the Indian subcontinent.
- In Eastern Europe, Romania was the worst country with the highest TB rates, with 114 new cases per 100 000.
- In Russia 10 percent of one million of the prison population were infected with TB, one third were suffering from MDR TB.
- In Estonia the incidence of MDR TB increased nearly by 5 percent in one year to 18 percent of all TB cases (TB and Health News 2000:10-11).

TB is really a leading cause of death in the world especially when there are also MDR TB strains, as this type of TB is strong and needs its own special drugs. The drugs for MDR TB are known to be very expensive in comparison with treatment for an ordinary TB patient. The questions which comes to mind are, if the incidence of TB is high in other parts of the world, what is the situation in Africa which consists of developing countries with less resources.

◆ **South Africa**

In 1999, South Africa reported 129 487 new pulmonary TB cases. Of these reported cases 84 857 were sputum smear positive.

◆ **Zimbabwe**

In 1987 the notified TB cases were 5 848 and in 1999 the number of new notified TB cases increased drastically to 50 138. The cure rate was 50 percent in 1998.

◆ **Tanzania**

In 1999 Tanzania had 52 237 new reported TB cases of which 46 percent were smear positive.

◆ **Mozambique**

In Mozambique the statistics for 1999 indicated that reported new smear positive cases were 80 percent of the total population. Case notification of all forms of TB was 21 329. New pulmonary smear positive cases were 12 825, new pulmonary smear negative cases were 4 730, relapses were 888, extra pulmonary cases were 2 131.

◆ **Malawi**

In 1999 the case detection was 24 396, of this number of 8 132 (33 percent) TB cases were smear positive, 10 013 (41 percent) were smear negative PTB, 5 583 (23 percent) were extra pulmonary TB. Relapse PTB was 668 (3 percent).

◆ **Mauritius**

In Mauritius, the statistics for 1999 showed that there were 154 new pulmonary TB cases. Of these cases, 122 were smear positive, 32 were smear negative and 20 were extra pulmonary TB (Tuberculosis 2000:6-8).

◆ KwaZulu-Natal

In 1999-2000 the number of notified TB cases were 26 291. Of these TB cases 13 172 were smear positive irrespective of culture results, 347 TB cases were smear positive and culture positive, 498 TB cases were smear negative and culture negative. In 2 810 TB cases the culture was not done as a result no results were available, in 3 975 of those TB cases bacteriology was not done.

◆ North South Central Health district

In 1999-2000 the number of notified TB cases were 5 302. Of these TB cases, 3 909 TB cases were smear positive irrespective of culture results, 268 TB cases were smear positive and culture positive, 292 TB cases were smear negative and culture negative. In 514 TB cases bacteriology was not done (Health Information Bulletin 1997-1998:5).

The above statistics showed that TB is a global problem. According to these statistics, TB has increased drastically. The following section discusses treatment that was previously used to treat TB and why this treatment was not successful.

2.5 TREATMENT OF TUBERCULOSIS (FOR ADULTS IN 1997)

◆ Schedule 1

Isoniazid (INH)	400 mg (daily)
Streptomycin	1 g (daily for 5 days per week)
Rifampicin	450 mg (daily)

Pyrazinamide 2 g (daily)

Duration: 2 months

- After two months the treatment was changed to schedule 2 for the following four months.
- No follow-up treatment was necessary.

◆ **Schedule 2**

Isoniazid 400 g (daily)

Rifampicin 450 g (daily)

Pyrazinamide 2 g (daily)

Ethambutol 20 mg/kilo (daily)

Duration: 6 months

Isoniazid was given as prophylactic treatment for TB contacts for three months. All drugs were given per kilogram of body weight (Department of Health 1997:28).

Table 2.3: Current tuberculosis treatment

REGIMEN 1: NEW ADULTS TB TREATMENT		
TWO MONTHS INITIAL PHASE	PATIENT UNDER 50 KG	PATIENT OVER 50 KG
Combination tablet – Rifa-four	4 tablets	5 tablets
FOUR MONTHS CONTINUATION PHASE		
	PATIENT UNDER 50 KG	PATIENT OVER 50 KG
Combination tables	3 tablets	2 tablets

REGIMEN 2: RETREATMENT ADULT CASES		
TWO MONTHS INITIAL PHASE	PATIENT UNDER 50 KG	PATIENT OVER 50 KG
Rifa-four	4 tablets	5 tablets
Streptomycin	750 mg	1 000 mg
THIRD MONTH (FIVE TIMES A WEEK)		
Rifampicin – 120 mg	1 tablet	2 tablets
Isoniazid – 60 mg	3 tablets	4 tablets
Pyrazinamide – 250 mg	250 mg	500 mg
Ethambutol – 200 mg	200 mg	400 mg
FIVE MONTHS CONTINUATION PHASE (FIVE TIMES A WEEK)		
Rifampicin – 150 mg	3 tablets	
Isoniazid – 100 mg		
Ethambutol – 400 mg	2 tablets	
Rifampicin – 300 mg		2 tablets
Isoniazid – 150 mg		
Ethambutol – 400 mg		3 tablets

(TB Control Programme 2000:47)

2.6 REASONS FOR FAILURE OF TUBERCULOSIS TREATMENT IN THE PAST

A major reason for the failure to cure TB patients successfully was that many patients failed to complete their prescribed course of treatment, and this resulted in transmission of infection. There was no follow-up or tracing of TB defaulters.

Glatthaar and Barends (1995:180) stated that in the metropolitan area of Cape Town, only 60 percent of adult pulmonary TB patients took 75 percent of the prescribed medication and the seriousness of TB was due to the following:

- Emerging MDR TB.

- Poor management despite the availability of TB drugs.
- Increasing HIV infection.
- BCG which was used as a TB vaccine had limited disease control, as its protective efficacy varied considerably, from 0 percent to about 8 percent and when effective it could afford a high degree of protection against the post-primary forms of the disease due to endogenous reactivation or exogenous re-infection responsible for transmission of the disease (Zumla & Grange 1998:3).
- Increased population rate despite high rates of unemployment. Poor housing resulting in overcrowding (SANTA TB 2000:20). The drug resistant isolates were identified from patients taking Isoniazid chemotherapy as now having patients with MDR TB. Some other countries had no TB treatment such as Zambia, TB patients were obtaining TB treatment from other countries like South Africa.
- Poor compliance also resulted in TB treatment not being successful.

Seeing that all the measures failed, the DOTS strategy was implemented as a solution to the problem. The strategy is discussed below.

2.7 THE DIRECTLY OBSERVED TREATMENT SHORT COURSE

The DOTS strategy has certain advantages which had an impact on the economy of countries, health practitioners and the health of the patient.

2.7.1 Advantages of the directly observed treatment short course strategy

The DOTS strategy was implemented because it has certain advantages, which were expected to make a difference in combating TB. The following could be seen as advantages of the DOTS strategy:

2.7.1.1 Global recognition

According to Matsha (1998:3), the DOTS strategy was the only globally recognised strategy for effective TB control. This strategy fights the spread of TB by making sure that each TB patient takes his TB treatment under supervision and completes his six months course of TB treatment and be cured. DOTS is an internationally recognised strategy and is the best available for fighting TB. There has been evidence of success in combating TB in many countries through supervised TB treatment. The DOTS strategy is of great importance for the WHO. The DOTS strategy is one of the five key elements in the WHO global TB programme control strategy (Garner 1998:1). The DOTS strategy fights the spread of TB by ensuring that infectious TB patients are identified and cured by using standardised drug combinations.

2.7.1.2 Reduces treatment interruption rate

The DOTS strategy leads to the reduction in treatment failure and relapse and the ultimate development of drug resistance (Rashidi & Bottmic 1997:1) because the treatment supporter is always supportive, and uses the initial period to bond with the patient (Department of Health 2000d:10). This encourages a TB patient to take his/her TB treatment.

In a study conducted in America in 1996 on effectiveness of the DOTS strategy, the self-administered therapy was a standard practice accepted for patients who were known to be unreliable. One group of TB patients was on self-administered therapy and a small group on the DOTS strategy. The DOTS strategy was successful in widely dispersed urban and rural areas in Denver, Mississippi, Texas and Baltimore where it resulted in reduction in overall rates of TB (Morse 1996:2).

In the Sancet study (Garner 1998:1) that aimed at comparing the DOTS strategy with self-administered therapy, it was found, however, that sixty percent of the TB patients completed self-administered therapy and a smaller proportion did so in the DOTS group. In this study the conclusion was that self-

administered therapy was one option for the management of TB (Garner 1998:2). It is therefore clear that some patients might prefer the self administration method and do well on it.

2.7.1.3 Easy to implement

The DOTS strategy is easy to implement. The DOTS strategy can be implemented in the office, clinic, hospital, school and can be community-based.

2.7.1.4 Enhance patient support

The support given to the patient enhances the curability of the patient because there is a strong relationship, which enables the patient to believe and trust the treatment supporter. The relationship between the treatment supporter and the patient can contribute to the effectiveness of the DOTS strategy because there is a strong bond between them, as a result both the patient and the treatment supporter become committed to the patient's health by making sure that a patient takes his TB treatment daily.

2.7.1.5 Affordable

The DOTS strategy is more effective and more affordable than any other measure to combat TB as the cost for treating an ordinary TB patient is R3 000,00, being much less than the R60 000,00 for treating one with MDR TB (Matsha 1997-1998:9). The DOTS strategy is less costly compared to other measures of treating TB. The DOTS strategy has shown its success in many countries. No other TB control strategy comes close to being as effective and as affordable as the DOTS strategy.

Researchers, such as Sell and Strang (1996:1) stated that the DOTS strategy is more effective than self-administered therapy because of the outgoing support and encouragement from the treatment supporter. Whatever problems the patient encounters, they are resolved promptly because of effective

communication between the patient and his/her treatment supporter. With self-administered therapy, there is no outgoing support and motivation, no prompt feedback from the patient to the treatment supporter concerning her progress.

In a study conducted in the USA in 2001 Desvarieux and Pape (2001:1) evaluated a total of 194 patients (152 HIV sero-positive, 42 HIV sero-negative) who received daily unsupervised triple-drug therapy for four to eight weeks, followed by twice-weekly two-drug therapy for six months. The DOTS strategy was deferred until initial of the twice-weekly phase. A total of 169 of 194 patients (87 percent) completed the six months course. The DOTS strategy had an effectiveness of 85 percent. The overall-cost was reduced by approximately 40 percent.

The DOTS was considered too costly and labour intensive in a study done by Denver, Mississippi, Texas and Baltimore to be widely used (Morse 1996:2). It was starting to be accepted as the standard of care in the United States when TB statistics increased due to HIV and MDR TB. It was discovered that spending money on the DOTS strategy became easy to justify when the \$200 000 cost of treating one patient with MDR TB could provide the DOTS strategy for 700 patients, and where one outbreak worker would have to prevent only two hospital admissions for TB (Morse 1996:2). Though the DOTS strategy needs involvement of many supervisors and being known to be cost-effective, it becomes worse with MDR TB, as its treatment is very expensive and it also needs the DOTS strategy.

The DOTS strategy is even more expensive when well trained professionals are used as treatment supporters, but could non-professionals be used for this purpose? In another study conducted by researchers from the United States on the DOTS strategy for TB, in a rural area in South Africa during 1991-1994, Wilkinson, Davies and Cormally (1991-1994) reviewed the treatment completion rate between TB patients supervised by volunteers and those supervised by health workers. The study was conducted in the Hlabisa Health district, KwaZulu-Natal, SA.

Monthly admissions in this study increased from 34 per month in 1991 to 66 in 1994. Of the 2 186 TB patients managed at Hlabisa, 1 903 (87 percent) received DOTS therapy. Of those receiving DOTS therapy, 1 034 (47 percent) were supervised by volunteers, 743 (34 percent) were supervised by storekeepers. Among patients managed locally, 1 679 (85 percent) of 1967 surviving patients completed treatment. The completion rate for patients supervised by health workers and non-health workers were the same (Wilkinson et al 1991-1994:1). The conclusion was that the DOTS strategy could achieve high treatment completion rates for TB even in resource poor settings and even when supervised by non-health workers.

2.7.1.6 Increases knowledge

In a study done in the United States in 1994 among injection drug users (IDUs) on implications of the DOTS strategy in TB control, it was found that many IDUs were uninformed about TB and often misinformed about their personal TB status (Curtis, Friedman, Jose, Goldstein & Des Jarlias 1994:1). The researchers felt that the DOTS strategy would be an ideal solution to this problem as the DOTS strategy increases knowledge on TB.

2.7.1.7 Acceptability by the TB patient

The question is, however, how acceptable is the DOTS strategy for the TB patient? In a study conducted in the United States in 1998 Heymann, Sell and Brewer (1998:3) examined how patients' acceptability influenced the effectiveness of the DOTS strategy for TB. It was found that the DOTS strategy discouraged 6 percent of initial TB patients from seeking care. They also found that the DOTS strategy was more effective than repeated self-administered therapy in cases where patients initially avoided seeking care. The researchers concluded by stating that patient acceptability should be taken into consideration before selecting public health strategies (Heymann et al 1998:1). This study indicated how important it is to know whether the programme has been accepted by its user, or not before it is considered as being effective or not.

The literature review indicated that the DOTS strategy has been evaluated in other countries but its effectiveness was never evaluated in the North South Central Health district of KwaZulu-Natal province. The programme was implemented in 1996. The researcher felt that it would be ideal to evaluate the effectiveness of the DOTS strategy in the North South Central Health district of KwaZulu-Natal, in order to make suggestions to improve the DOTS strategy and hopefully improve the mortality and morbidity rates.

2.8 SUMMARY

The literature review has revealed the extent of TB as a health problem worldwide, in South Africa and in the North South Central Health district in KwaZulu-Natal in particular. The statistics for TB as a problem is shown in section 2.3 above. The effectiveness and success achieved with the DOTS strategy in the control of pulmonary TB in other countries was also discussed.

The methodology used to collect data for this research will be discussed in chapter 3.