CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Tuberculosis (TB) is a communicable disease of public health concern globally. Despite restructuring of TB services and implementation of Directly Observed Treatment Short Course (DOTS), the disease continues to be uncontrollable in most developing countries including South Africa. This study focuses on the Hillbrow Health Centre (HHC), an urban health facility in Gauteng Province that manages TB patients.

1.1.1 Overview of tuberculosis control globally and in South Africa

Globally, the prevalence and incidence of TB are highest in Africa and South East Asia. The World Health Organisation (WHO) estimates show that Africa with just 11% of the world's population, accounts for about a quarter of the TB burden, with an estimated 2.4 million cases and 500,000 deaths in the region every year. In sub-Saharan Africa, TB notification rates increased from around 200 to 500 per 100 000 population between 1990 and 2003 (1).

Twenty-two high burdened countries are responsible for 80% of global TB patients including South Africa. In 2002, the country ranked number eight out of 22 high burden countries with an estimated incidence of 536 TB cases per 100 000 population. In Gauteng Province, incidence rate for all TB cases increased from 255 to 374 per 100 000 population (1998-2003). The province maintained incidence rate of the third lowest province in the country throughout the five years (2).

Management of TB in South Africa was centralised in specialised hospitals until 1995 when it was integrated into the comprehensive primary health care package (3). Studies have shown improvement of treatment outcomes in some countries where decentralization was

implemented. For example, in Vietnam treatment success improved from 27% to 75% in four years (4). South Africa implemented the DOTS strategy in 1996, but continues to find it difficult to control the TB epidemic. Treatment outcome rates for new smear positive cases treated under DOTS in South Africa for 2002 indicated that 54% were cured, 13% completed treatment, 9% transferred (without follow up), 9% died, 13% interrupted treatment and 1% failed the TB treatment (1).

1.1.2 Overview of Gauteng Province

The 2001 census data showed that among the nine provinces in South Africa, Gauteng with a population of 8 837 178 had the second highest population after KwaZulu Natal (9 426 017). However, this province was the most densely populated in the country where 20% of the population of South Africa occupied 1.4% of the country. Gauteng had the highest proportion (64%) of population aged between 20 and 64 years and the only province with the peak age group at 25-29 in the country. This is the richest province in South Africa and attracts the economically active age groups. (5).

Gauteng Province is divided into three clusters (A, B and C). Forty four percent (3 908 837/8 837 178) of the population of Gauteng resided in Cluster A, followed by 37% (3 274 88/8 837 178) in Cluster B and 19% (1 653 460/8 837 178) in cluster C. Cluster A is subdivided into 11 regions. Region 8 is one of these 11 regions of cluster A. Region 8 had a population of 800 000, which was 20.5% of the population of cluster A in 2001 (5). This research focuses on the Hillbrow Health Centre, which is one of the public clinics situated in region 8.

1.1.3 Health facilities involved in TB management in Region 8

Region 8 has two public hospitals, six private hospitals and eight public health clinics. The clinics that report TB patients in region 8 are the Hillbrow Health Centre, Urban Health, Jeppe, Yeoville and Esselen. In addition, Directly Observed Treatment (DOT) or supervision of tuberculosis treatment services are rendered at three other clinics: Mayfair, Joubert Park, and Albert Street. All these clinics offer free health services and are run by Johannesburg Metropolitan Health Department, except for Hillbrow Health Centre, which belongs to the Provincial Health Department.

1.1.4 The study setting

The setting for the study, the Hillbrow Health Centre, is surrounded by blocks of flats and busy commercial centres. It is utilised by people from a diversity of nations working in the city centre and others living in the neighbourhood. It is the largest of all health facilities in region 8 in terms of size, infrastructure, staff complement and the profile of services rendered.

The services offered include those for TB, Human immunodeficiency virus (HIV) and Acquired immunodeficiency syndrome (AIDS), acute adult illnesses, chronic illnesses, family planning, termination of pregnancy, antenatal, maternity and obstetrics, emergency services, mental health, physiotherapy, occupational health, acute childhood illnesses, immunization and growth monitoring. In addition, there are services such as X-ray and medico-legal facilities. Specimens for investigation are transported twice daily to the National Health Laboratory Service, which is situated about 500 metres from HHC. This laboratory serves all the clinics in region 8. All services, including TB management, are available from 8h00 to 16h00 on weekdays. After hours, including holidays, only emergency

services are offered. The average number of patients consultations at the health centre was around 15 400 per month in 2002.

1.1.5 Management of tuberculosis at Hillbrow Health Centre

The Hillbrow Health Centre has a dedicated TB management unit that started in November 1999. The unit is staffed by one professional nurse, one staff nurse, and two assistant nurses. Since this unit is an integral part of the rest of the facility, most of the nurses rotate after six months and only the professional nurse or the staff-nurse remains.

Patients with suspected TB are referred from the other primary health care areas of HHC to its TB unit for sputum smear collection and newly diagnosed TB cases are immediately started on treatment. The unit also sees patients referred from other facilities and refers those who intend to continue treatment elsewhere.

Management of patients diagnosed with TB include recording of patients in the appropriate TB documents; patient notification; monitoring of sputum at the end of the initial and continuation phase; health education; identification and allocation of a community-based TB treatment or DOT supporter; supervision of patients on facility based DOT; completion, dispatch and receiving of forms for patients referred to and from the centre; dispensing of TB drugs and tracing of treatment interruptors.

Tracing of treatment interruptors is done telephonically in cases where the patient provided the contact telephone number, sending letters to the patient and visits by the community based TB treatment supporters to the residential address provided by the patient.

The community based TB treatment supporters are volunteers who ensure that TB patients swallow medication on a daily basis for the prescribed treatment duration in the community. Facility-based supervision occurs where a health worker ensures that a patient has taken treatment daily. This generally happens in patients who are on the retreatment regimen, which includes giving intra-muscular injections by the nurse together with tablets daily for two months. A few new patients find it convenient to take their medication under supervision at the clinic every day for at least two months of the prescribed treatment.

The sputum turn around time is defined as the time it takes from submission of the sputum smear specimen to receiving the results. In 2002, the turn around time of 3 days made up 46% and 5 to 7 days 47% of sputum smears submitted in region 8 (6), yet the laboratory is easily accessible.

The data for all TB patients registered in the facility is recorded in a paper based TB register and then sent to region 8 where it is captured and analysed using a computerized district Electronic TB Register (ETR). The district sent the information to the province, which in turn, forwards a collated provincial report to the National Tuberculosis Control Programme (NTCP). Data is sent from one level to another on a quarterly basis. Patients registered during every three months constitute a quarterly cohort that is followed up to the end of treatment.

1.1.6 Socio-economy and demography of the population living in Hillbrow Suburb.

The Hillbrow Health Center is situated in Hilllbrow, a suburb in the city of Johannesburg. Information obtained from Census 2001 indicated that the population of Hillbrow was 49 611 with 17 395 households. The male to female ratio was 1.2. The age group 20-49 made up three-quarters of the population and the majority (24.6%) was aged 25-29, which was also the

case with the City of Johannesburg Metro and Gauteng Province. Blacks formed 95.7% of the population, Coloureds 2.4%, Whites 1.5% and Asians 0.4%. Forty-three percent of the population was educated to Standard 10 (Grade 12), followed by some secondary education 34%, higher education 9%, complete primary 4%, some primary 5% and no schooling 5% (5).

In the Hillbrow Suburb, among the age group 15-65, the employed individuals constituted 53%, unemployed 28% and not economically active 19%. In the employed group, thirty six percent were market sales workers and 31% were employed in the wholesale and retail trade. The most common monthly salary-earning bracket was from R801 to R1 600. About 90% of the households lived in a block of flats. The proportion of households that used electricity for lighting was 99%, heating 98% and cooking 92% (5). Refuse disposal was removed by local authority in 98% of the households. About 99% households used flush toilets, 99.7% were supplied with piped water and 62% used a cellphone, indwelling phone or both. The proportion of households that owned a radio was 77%, television 67%, refrigerator 53% and a computer 6% (5).

1.1.7 Justification for conducting this study at the Hillbrow Health Centre

Reasons for conducting the study at HHC will emerge from what is known, followed by what needs to be known, why it is important and how the study will solve the problems.

1.1.7.1 What is known?

It is known that the TB incidence rate for Gauteng Province increased from 255 to 374 per 100 000 population between 1998 and 2003 (2); region 8 notified the highest proportion of all TB cases (10%) out of 11 regions in cluster A while HHC reported 34% of all TB cases in

region 8 in 2002 (7); the cure rate for smear positive cases in 2002 was 39% at HHC. This is below the 56.4% achieved by region 8 (3), 57.4% by Gauteng Province (2) and 54% by South Africa (1). Furthermore, no study has been conducted on TB at HHC since the services started in 1999, although data has been collected on routine basis.

1.1.7.2 What needs to be known?

What needs to be known are the trends for TB cases registered at HHC from 2000 to 2002. This includes the number of cases, type of TB, ages and gender of patients, bacteriological coverage, sputum conversion rates and treatment outcomes. Information is also required on completeness of data from recommended TB documents at HHC, areas of high volumes (hot spots) of TB cases and interruptors for patients registered at the facility during the period 2000 to 2002. There is a need to know the accuracy of routine data submitted by HHC and performance of TB control programme at HHC in comparison with the other four clinics in region 8.

1.1.7.3 Why it is important?

It is important to obtain reliable and accurate information that will show strengths, weaknesses, opportunities and threats in the TB control programme at HHC. The results will provide information on the TB situation in region 8, assist the decision makers to develop strategies for improvement, identify and disseminate good practices between clinics in region 8.

1.1.7.4 How the study will solve that?

The study will help to interpret results; identify groups at risk of TB disease; estimate the incidence of TB among patients in the neighbourhood of HHC using the facility data; test

validity of HHC results provided by region 8; compare performance of HHC with the four other clinics in the region; suggest further research to assist in improvement of TB control programme at the facility; provide results of the study to the management and staff at the facility. Hopefully, knowledge will translate to actions that will result in improvement of TB control at HHC and in region 8.

1.1.8 Statement of the problem:

TB services were started at the Hillbrow Health Centre in November 1999 and data collected routinely from the facility was submitted to region 8. However, the trend of TB control was unknown during the three years of delivering TB services; groups at high risk and areas with high volumes of the disease were not identified from the data collected at the facility; recommended TB documents were not reviewed for completeness of information; results of data provided by HHC and analysed by region 8 had never been evaluated for validity and performance of TB control programme at HHC had not been compared in depth with the other four clinics in region 8. All this information is required for improvement of the TB control programme at the HHC.

In summary, the background information highlighted the magnitude of TB in different areas including locally. The setting of the study was also discussed including the population living in the surrounding area. Justification for undertaking this study was discussed. The next section deals with literature review that will show information relevant to this research. The second chapter will be on research methodology including the aim and objectives that define the scope of the study followed by results. The last chapters will be on the discussion of the results, conclusion and recommendations for improvement.

1.2 LITERATURE REVIEW

Tuberculosis is one of the most important and common infectious diseases known globally including in South Africa, Gauteng Province and the Hillbrow Health Centre where this study was conducted. Although treatment for this disease has been available in the public sector for over five decades, the burden continues to escalate in most developing countries. This literature review highlights the history, status of TB and factors contributing to the gloomy picture of the disease.

Tuberculosis respects neither fame nor fortune. Every person is at risk of being infected with *Mycobacterium tuberculosis* regardless of age, sex, race and occupation (8). The disease knows no boundaries.

1.2.1 History

Egyptian mummies showed deformities caused by TB dating as far back as 1 000 B.C. However, it was only in 1882 when, Robert Koch discovered that TB was caused by *Mycobacterium tuberculosis* (8). Records on mortality studies demonstrated a decline due to industrial revolution when socio-economic conditions were improved in England and Wales from 1855 to the 1940s (9). The discovery of drugs saved lives; streptomycin was discovered by Schatz and Waksman in 1944; isoniazid and pyrazinamide followed in 1952, rifampicin in 1957 and ethambutol was the last TB drug discovered for first line treatment in 1961. Antimicrobial chemotherapy was hailed as the "Magic bullets" which reduces mortality (10).

Prevention, diagnosis and treatment used today have all been available for more than 50 years. The treatment of TB is six months for new cases, eight months for retreatment

cases and 18 to 24 months for Multidrug resistant tuberculosis (MDR-TB) patients. Despite achieved progress on chemotherapy, TB control and management still remain a big challenge. Although access to TB treatment has increased in industrialized countries it remains problematic in some developing countries. The disease is curable but associated with complex problems caused by barriers including cultural, social, economic, environmental and biological factors (11).

In South Africa, the history of TB dates as far back as the nineteenth century when it was introduced into the country from Britain and Europe. TB sufferers from Europe settled in Western Cape in search of a suitable climate for curing the disease and a sanatorium was established in this area to care for them. These two sources subsequently transmitted TB to their contacts in South Africa (12).

1.2.2 The burden of the disease

One third of the world population (about two billion people) are infected with TB bacilli, every year about nine million people develop active disease and two million lives are lost from the disease. One person suffering from TB can infect 10 to 15 people every year (8, 13).

TB is a global disease. "95% of all cases and 98% of deaths due to tuberculosis occur in resource poor countries" (1). Worldwide, the TB incidence rate is growing at about 1% annually. It is highest in developing countries especially in sub-Saharan countries and South Eastern Asia (1). In 2002, South Africa ranked number 8 out of the 22 high burden countries globally; Gauteng was the 4th province with the highest proportion of TB patients (14%) in the country after KwaZulu Natal, Eastern Cape and Western Cape (2) and HHC reported a third of all the TB patients in region 8 (3).

When the incidence of TB is 200 or more cases per 100 000 population, this is classified as a serious epidemic. South Africa has been reporting incidence rates of over 500 cases per 100 000 population annually and appeared among the three countries with the highest incidences of TB globally since 2000. However, an accurate TB burden is unknown in this country because of incomplete reporting (1).

The main problems contributing to the high incidence of TB in South Africa are the HIV/AIDS pandemic, inadequacies of the health services, health workers' lack of knowledge on the disease and how to manage it (14). Deoxyribonucleic Acid (DNA) finger printing has confirmed an important role played by person-to-person transmission in densely populated areas (15). Health care providers also contribute to the high TB burden by not testing TB suspects, delayed diagnosis, poor treatment monitoring and case holding of TB patients (16). Patients' beliefs about the disease impact on the control of the disease. The beliefs include the fact that TB is caused by breaking of cultural rules and that only traditional healers can heal as indicated by a recent study done in Limpopo Province, South Africa (17).

1.2.3 Case finding

The standard screening procedure recommended by World Health Organisation (WHO) for case detection of pulmonary tuberculosis (PTB) cases consists of history taking, clinical examination and microscopic examination of sputum for acid-fast bacilli (AFB) in TB suspects. Chest radiography and sputum smear cultures are required in some cases. Screening for extra pulmonary TB is done according to the affected organ.

Globally, from 1995 to 2002, case detection rates of all TB cases reported from DOTS and non- DOTS stabilised and the proportion of cases diagnosed smear positive increased (1). In

sub-Saharan Africa, TB case finding has increased due to the spread of HIV that has fuelled and changed the clinical course of TB epidemic (19). Case detection rate for new smear positive cases increased from 41% to 97% for the whole of South Africa during the period 1995 to 2002 (1). Gauteng has been reporting TB incidence rates of over 300/l00 000 population from 2000 to 2002 (2). This is one of the lowest provincial rates in the country. In 2002, HHC reported 834 TB cases and about two-thirds of them were new smear positive patients (7).

In developing countries, including South Africa, TB incidences are highest in the age group15-54 with a peak in the 25-34 in both sexes, and in addition, more men than women are diagnosed sputum smear positive PTB (1). A study done in Western Cape Province revealed a male to female TB ratio of 2.08:1 (20). However, in Western Europe, the majority of TB infections occur mostly in the age group 60 and above. The reason is that in developing countries, the risk of TB infection is higher because of a high case load and people get infected early and in large numbers. In developed countries the risk is low and the younger age groups hardly ever get the disease whereas the elderly population get it due to reactivation of infection acquired a generation ago when the risk was higher (21).

The disparity on notification between the males to females is often speculated to be marginalisation due to stigma, shame and disgrace attached to TB. In some cases sputum smear positivity is higher in men compared to women. The causes of this gender bias includes men having a higher risk to TB due to occupation hazards, health worker bias associated with low reporting of females or rather, most females presenting with low bacterial load but sometimes the causes contributing to these findings were not clear (22, 23).

1.2.4 Directly Observed Treatment Short Course (DOTS) strategy.

In 1991, WHO acknowledged the growing importance of TB by passing a resolution and setting targets which were to detect 70% of estimated new smear positive cases and to cure 85% of these patients by 2005. In 1993, TB was declared a global emergency by WHO and the DOTS strategy was adopted and recommended for control of the disease internationally (1).

Components of the DOTS strategy are as follows:

- sustained political commitment and resources for tuberculosis control
- access to quality assured tuberculosis sputum smear microscopy
- standardised short course treatment and directly observed treatment (DOT)
- uninterrupted supply of quality assured drugs
- standardised reporting and recording systems including assessment of outcomes (18).

About 20 countries had implemented the DOTS strategy globally in 1992. However, the number of countries reporting under DOTS increased from 55 in 1995 to 180 (out of 210 countries) in 2003. The proportion of countries reporting under DOTS in the African region increased from 63% in 1995 to 89% in 2002 (1).

South Africa adopted the DOTS strategy in 1996 and started reporting according to the DOTS protocol the following year. The country DOTS coverage was 13% in 1997, increased to 77% three years later and 99.5% in 2003. South Africa achieved 70% case detection target in 2000, which was five years before the deadline set by WHO (1). Gauteng started reporting according to DOTS strategy in 1998 (2). Hillbrow Health Centre began rendering the TB services following the DOTS strategy, at the end of 1999.

Apart from the DOTS strategy, the United States of America introduced innovative and enabling factors to achieve high treatment outcomes, which were not part of the strategy. These were tracing of interruptors, social worker assistance, provision of housing, food parcels and subway tokens. Law enforcement and contracts were also implemented to ensure adherence for patients at high risk (24). In Malawi, funds obtained from donors were used to provide incentives and rewards to the staff employed in the TB programme (25).

1.2.5 Directly Observed Treatment (DOT) or treatment support system

The treatment support system involves supporting a TB patient to swallow each dose under supervision until the end of treatment. This is a patient centred approach where a patient can drink his TB medication at a convenient place for him/her to promote adherence to treatment. According to WHO, family members are not recommended as treatment supporters because of family dynamics that affect compliance to TB treatment. Exceptions are bedridden patients and children (18).

Historically, treatment for TB patients was only available in hospitals. These services were later decentralised to clinics and the community based treatment support was introduced to help TB patients' complete treatment without frequent visits to health facilities. Like most countries, South Africa has also decentralised TB services to district and clinic levels. The country encourages community treatment support for their patients (3,4). The Gauteng Province, including HHC, uses treatment supporters.

1.2.6 Targets

Despite the introduction and implementation of the DOTS strategy, it is evident that most countries will not achieve the WHO targets for 2005, which are to detect 70% of new smear positive cases and cure 85% of these cases. According to WHO estimates, the majority of

high burden countries will only reach the targets in 2013 if no new strategies are introduced for acceleration of progress in tuberculosis control (18).

From 1995 to 2002, global case detection for new smear positive patients increased from 11% to 37%. During the same period in the African region, the figures rose from 23% to 67% and these were better than the East Mediterranean and European regions (26% and 10% respectively in 2002) and South Africa reached the global target of 70% case detection rate for new smear positive cases in 2000 (1).

Globally, the cure rate for new smear positive cases was 75% in 2002. The African and European regions achieved a cure rate of 60%, which was the lowest proportion in the six regions in 2002. The highest cure rate (74%) under DOTS in South Africa was achieved in 1998 at 22% DOTS coverage. However, in 2002, the cure rate for the country was 54% at 98% DOTS implementation. Gauteng Province reported a cure rate of 57% and HHC 39% in 2002 (1,7).

1.2.7 TB recording and reporting in South Africa.

In 1995, the Department of Health introduced an aggregated electronic TB Surveillance System (TBSYS) that lacked a linkage between case finding and treatment outcome and was not according to recommended international standards. Tracking of TB patients became essential from 1996 when South Africa adopted the DOTS strategy. The standardised reporting and recording, one of the five pillars of the strategy, involves surveillance of diagnosed cases. However, it was only in 1999 that a computer based Electronic TB Register was accepted as a district cohort surveillance system. This method was adopted from the Botswana BOTUSA version. The electronic TB register is linked to the paper based facility register. It assists in validation of data during data capturing and allows for follow up of

patients until the end of treatment and depends on a good paper based facility register and availability of a computer (26). Gauteng implemented the electronic TB register in the last quarter of 2001. All the provinces had implemented the upgraded electronic TB register called the ETR.Net version by the end of 2004 (27).

1.2.8 TB control programme treatment output/outcome measures.

The TB programme evaluates treatment outcomes for cohorts on a quarterly basis. The treatment output/outcome measures are divided into cure, died, treatment completion, success, failure, interruption and unevaluated. The definition of each outcome is found in the glossary of terms.

Cure rate is one of the most important indicators which determines performance of TB control programmes. It is evident that most developing countries will not achieve the 85% cure rate target set by WHO (1). Low cure rate is associated with high interruption and failure rates in most cases. Some of these patients subsequently develop MDR-TB. National TB Control Programmes achieving a high cure rate are associated with low drug resistance (18).

In 2002, the global cure rate for smear positive cases was 71%, the African and European regions achieved the lowest cures (around 60%) in the six regions, and South Africa reported 54% and Gauteng 57.4% cure rates. This province was the third best in the country after Western Cape and Free State (2). Hillbrow Health Centre achieved cure rate of 39% and this was the lowest among the five clinics reporting TB in region 8 in 2002 (7).

Completed treatment

During the period 2000 to 2002, global treatment completion rate ranged between 8% and 12%, in Africa it was from 12% to 13% and in South Africa it soared from 9% to 14% (1, 28) In Gauteng, treatment completion was between 5.6% and 9.6% during the three years while HHC reported 1% in 2002 (2,7).

Treatment interrupted

From 2000 to 2002, global interruption rates were between 6.0% and 6.5 %, Africa 10% to 11% while four countries (including South Africa) out of 22 high burden ones had interruption rates consistently equal or above 10% throughout the three years (1, 28).
In Gauteng Province, interruption rates ranged from 7.9% to 11.8% during the three year period. HHC had an interruption rate of 32% in 2002 and this was the highest among the five clinics in region 8 (2,7).

Death rate

The aim of treating TB cases is to prevent death (18). However, TB is the leading cause of death among adults in low income countries. Global death rates have been stable in the range of 4.4% to 4.5% while Africa had the highest death rates (7%) compared to the other six regions between 2000 and 2002. In South Africa, death rates increased from 6.6% to 8.5% during the three years (1, 28) and TB was the leading cause of death in males and females aged 15-49 years from 1997 to 2001 and they were secondary to PTB with sputum smear positive results (29). Death from TB may not have been documented as indicated by a study conducted at Chris Hani Baragwanath Hospital in South Africa (30). At Tintswalo Hospital in rural South Africa, inaccuracies associated with recording of TB mortality were reported

(31). Death rates in Gauteng were between 8.3% and 9.3% during the period 2000 and 2002 while HHC reported 1% in 2002 (2,7).

Transfer rate

From 2000 to 2002, the African region had the highest average transfer rate (7%) without follow up of patients' outcomes, which was double the global average of about 3%. South Africa had the highest transfer without follow up (12%) among the high burdened countries for the 2002 cohort. In Gauteng, the transfer rate decreased from 21.8% to 10.1% during the study period and at HHC, it was 27% in 2002 (2,7). A study conducted at Chris Hani Baragwanath Hospital (Gauteng Province) revealed a poor referral system between health facilities (30).

Treatment failure

The global treatment failure rate for new smear positive cases was between 2% and 2.5% from 2000 to 2002. However, the European region consistently had the highest rates, which were between 6% and 8% and Africa maintained 1% failure rate during the three years. However, Angola achieved an exceptionally high treatment failure rate of 26% in 2002. During the same period, South Africa had failure rates from 1% to 2% for new smear positive cases consistently for the three years (1, 28).

Unevaluated/Not evaluated rates

Global figures for the unevaluated were between 2.0% and 2.8% while in Africa it was from 1% to 4% between 2000 and 2002. In South Africa, the unevaluated rate increased from 1% to 2% during the three-year period (1). Gauteng reported unevaluated rate of 5.6% and HHC 0% in 2002 (2,7).

1.2.9 TB/HIV/AIDS

The HIV pandemic impacts negatively on TB control. HIV is the most important factor that increases risk of developing TB. Ninety-five percent of the global 40 million HIV infected cases live in developing countries (32). The highest burden of the TB/HIV co-infected population worldwide is in the age group 15-49. The highest global prevalence of TB/HIV co-infection (20%) occurs in sub-Saharan Africa. Proportions of co-infections of 50% and above are found in Southern Africa (1). The prevalence of HIV in South Africa is 22% in the adult population aged from 15 years old (33), while prevalence of HIV was 55% among TB patients according to a national survey conducted in 2002 (34). Mortality of TB/HIV co-infected patients is higher than in HIV negative cases according to a study conducted in Zomba hospital in Malawi (35). A study conducted in South Africa in 2002 showed that the highest prevalence of HIV was found in the KwaZulu Natal Province (40.7%) and Mpumalanga came second at 30.8% (36).

1.2.10 MDR-TB

Multi drug resistance tuberculosis (MDR-TB) has become a serious problem globally. MDR-TB is defined as TB bacilli resistant to at least isoniazid and rifampicin. MDR-TB takes long to treat, needs expensive second line drugs, which are associated with severe toxicity and results in higher case mortality compared to ordinary TB (37).

MDR-TB results from poorly managed TB treatment (18). A global drug resistance survey that was conducted in some countries and settings from 1999 to 2002 revealed that the highest prevalence of MDR-TB was found in the European region specifically in the former Soviet Union (14.2% in Kazakhstan). In the African region, drug resistance was generally low. The prevalence of MDR-TB in South Africa was 2% in new sputum smear positive cases and 7% in retreatment cases according to the global drug resistance survey (37).

A survey on TB drug resistance that was conducted in Gauteng Province from 2001 to 2002 revealed prevalence rate of 1.5% among retreatment cases compared to 5.5% in new cases (36). The province had a lower proportion of MDR-TB compared to the country.

1.2.11 Research methodologies relevant to the study

The Department of Health requests health facilities to provide timely and complete data at all levels of care, which will be used for decision making and planning (38). This research attempts to assess the status of TB data at HHC from 2000 to 2002.

Data is referred to as "the key strategy in improving services" (39). Other methods of collecting data for evaluation are descriptive study (40), detailed case review and structured observations of the services rendered to a patient and structured interviews of health workers (41). Descriptive studies include patient feedback questionnaires. However, a review of patients' records evaluates the technical quality of health care better than patients' questionnaire. Patients cannot evaluate technical quality of health care but may contribute significantly to a well designed questionnaire specifically tailored for them (42). The choice of using clinic data in this research was in view of the fact that it is more accurate on technical quality compared to getting the information from the patients.

Review of data assists in evaluation and performance of programmes such as the TB control programme. It also helps in planning of strategies. Evaluation requires a standard for comparison (43). In this research, results provided by region 8 on the routinely collected data were compared with the study findings using the same data. A gold standard would have been ideal for comparison, but there was none.

In summary, TB has been a global menace since ancient times. The disease is curable and better outcomes are obtained under DOTS strategy. However, many known barriers contribute to low treatment outcomes in most countries including South Africa. Gauteng Province and HHC have high proportions of interruption and transfer/move rates.

CHAPTER 2: RESEARCH METHODS

Research methodology defines the scope of the study, provides information on data collection and analysis. Since this study was about people, discussion also focuses on fulfillment of ethical obligations to ensure non-violation of human rights.

2.1 The aim and objectives

The **aim** of this study was to measure the number of registered cases, the profile of patients and the trend of outcomes at Hillbrow Health Centre, over a period of three years.

The study **objectives** were as follows:

- To describe, for tuberculosis patients registered at Hillbrow Health Centre in the three year period, 01 January 2000 to 31 December 2002, the following:
    - Ø Annual case finding which is comprised of numbers, categories, type of TB, bacteriological coverage, ages, gender and areas with high proportions (hot spots) of tuberculosis cases.
    - Ø Annual sputum smear conversion rates
    - Ø Annual treatment outcomes
    - Ø Areas with high proportions of interruptors
    - Ø The completeness of registration documents
- To compare research findings with results provided by region 8 on routinely collected data for TB patients at Hillbrow Health Centre.
- To compare results provided by region 8 for Hillbrow Health Centre with the other four health facilities in region 8 for 2002.

2.2 Study design

This is an observational, cross sectional descriptive study

2.3 Study population

The study population at Hillbrow Health Centre was all tuberculosis patients routinely registered at the facility during a three-year period from 01 January 2000 to 31 December 2002. For the other four health facilities, the population was all patients routinely reported from 01 January to 31 December 2002 (12 month period).

2.4 Study sample

Sampling for this research was not done; a census of the study population was done.

2.5 Measurement, tools and source of information

The study data for tuberculosis patients recorded at Hillbrow Health Centre was collected on data sheets and subsequently entered into an Epi Info 6.04b software programme by the researcher. Variables were registration numbers, patients (newly registered, moved and transferred), patient characteristics (age, sex, flat and street names together with the suburb), patient category (new, retreatment after cure, completion or failure), site of tuberculosis disease (pulmonary, lymph nodes, pleura and other respiratory organs, primary, meningitis, bones/joints, other organs and miliary), and treatment outcome (cure, treatment completion, treatment failure, death, treatment interrupted, transferred or moved and not evaluated). The source of data was the facility tuberculosis register (GW 20/11) and the clinic/hospital based cards (GW 20/12).

The electronic TB register was started in October 2001 for data capturing and analysis of paper based TB data from all facilities in region 8, including HHC. The region provided results for the five clinics in region 8, which were used for comparison of performance in TB control in this study.

2.6 Quality control

To ensure quality control, the researcher corrected observed errors in the TB register. Names of the streets and suburbs were checked using the map of Johannesburg and site visits were conducted to rectify the detected mistakes.

2.7 Data management

The Epi Info 6.04b software was used to analyse data obtained from Hillbrow Health Centre. The researcher then compared the study findings with the electronic routinely analysed data provided by the regional office for the facility. The routinely collected data was provided for each of the five facilities by the region 8 office.

2.8 Ethical approval

The Ethics Committee for Research on Human Subject at the University of Witwatersrand approved the study (Ethical approval Number M03-05-59). According to requirements, patients' names were not utilized in the study to maintain confidentiality. As a result, patients were identified by registration numbers allocated by the clinic at registration. **(Appendix A).**

Permission for conducting the study at the clinic was given by the Deputy Director for District Health Services in Johannesburg Metro District **(Appendix B).** The Regional Manager for Johannesburg Central Region 8 authorised utilisation of TB data **(Appendix C).**

In conclusion, the research methodology has indicates the direction that the research report will follow and the important components of the study. The information required in the research was obtained from different resources. The next chapter indicates how the data was used to get the results.

CHAPTER 3: RESULTS

The results are presented according to the study objectives. The first part of the results deals with TB cases registered at Hillbrow Health Centre from 2000 to 2002. The second part presents methods used for analysis of data obtained by the clinic in 2002 and the last part focused on results of TB data provided for the five clinics in region 8.

3.1 RESULTS OF DATA COLLECTED AT HILLBROW HEALTH CENTRE FROM 2000 TO 2002.

Data on TB patients was collected from the clinic/hospital record cards and the TB registers. However, from January 2000 to September 2001, data was only available from the clinic/hospital cards because the TB registers were not available. The number of missing cards was detected from a break in sequence of registration numbers. Fifteen cards were missing in 2000, 25 in 2001 and none in 2002. All patients with data from either the TB register or the clinic/hospital cards were included in this study.

3.1.1 CASE FINDING

3.1.1.1 The number of TB patients at the clinic increased from 470 in 2000, to 736 in 2001 and 862 in 2002. This is an increase of 83% in two years. The total number for the three years was 2068.

3.1.1.2 Category of TB patients recorded at Hillbrow Health Centre.

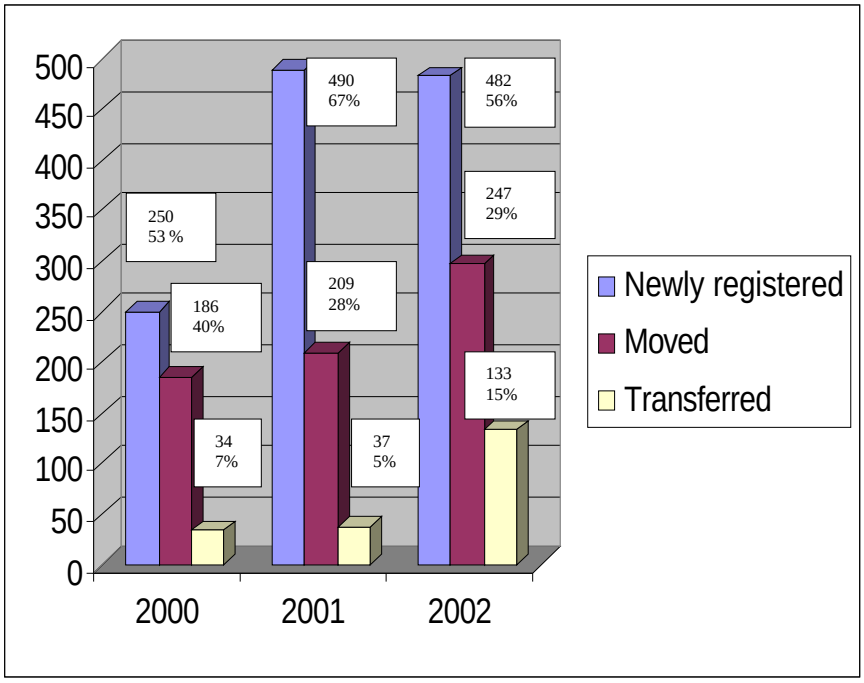


Figure 3.1 Source of registered TB patients during the three years

From 2000 to 2002, between 53% and 67% were new patients while 27% to 40% came from the other clinics in the district, and 5% to 15% were transferred in from outside the district for further management (figure 3.1).

3.1.1.3 Type of TB

The proportion of PTB patients increased from 67% to 83% and extra pulmonary TB decreased from 21% to 11% between 2000 and 2002 (table 3.1).

Table 3.1 Types of TB among registered cases: 2000-2002

	2000		2001		2002		Total	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
All PTB	316	67	583	79	712	83	1611	78
Extra pulmonary	98	21	86	12	94	11	278	13
Primary	23	5	30	4	26	3	79	4
Data not available	33	7	37	5	30	3	100	5
Total	**470**	**100**	**736**	**100**	**862**	**100**	**2068**	**100**

Extra pulmonary TB patients recorded during the study period 200-2002

The number of patients registered with extra pulmonary TB remained constant during the study period although the proportion decreased from 21% to 11%. Pleural effusion made up 53%, followed by TB meningitis 8%, miliary 8%, bone/joint TB 7%, lymph node TB 5% and other types 19% during the three years.

Pulmonary tuberculosis (PTB) patients

Trends of bacteriological coverage during the period of 2000 to 2002 for new and retreatment PTB patients were analysed (figure 3.2)

3.1.1.4 Tuberculosis bacteriological coverage

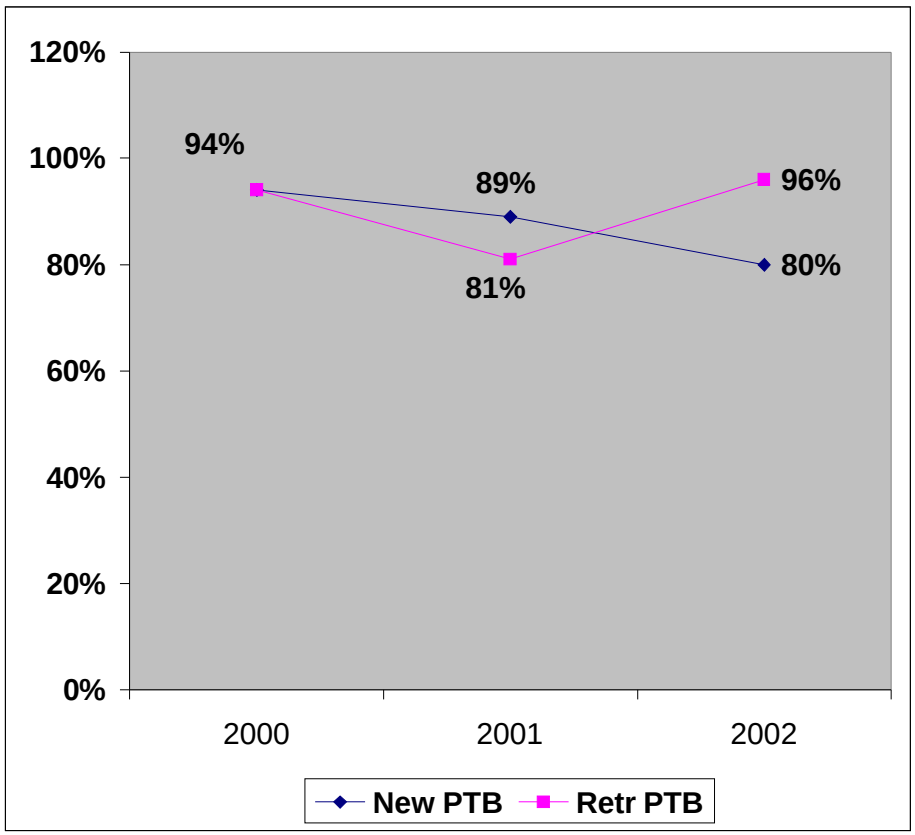


Figure 3.2 Bacteriological coverage for PTB cases: 2000-2002

A decline in bacteriological coverage for both new (5%), and retreatment PTB cases (13%) occurred from 2000 to 2001. However, among the retreatment PTB cases, the trend increased

by 15% the following year. On the other hand, coverage among new PTB cases continued to decline by a further 9% from 2001 to 2002.

For further analysis, the P-value was used to find out whether the annual differences observed in bacteriological coverage between the two categories were statistically significant at confidence interval (CI) of 95%. The analysis showed no difference over the study period; P-values 0.9916 (2000), 0.6633 (2001) and 0.3315 (2002), CI 95%.

In addition, comparison of findings within each specific category at the beginning and end of the study was done for new and retreatment PTB patients, and there was no difference; P-values 0.1000 and 0.886 respectively at 95% CI.

Tendency of health care workers on taking sputum smear samples from PTB cases

A comparison of the performance of health care workers with respect to adherence of TB management guidelines during the study period was done. An assessment was conducted in relation to decision on taking sputum samples from new and retreatment PTB cases. The Odds Ratio (OR) was used to find out the association of exposure. In analysis, the figures for 2001 and 2002 were compared separately against the baseline (2000), and there was no likelihood that the health worker would prefer to take sputum from one particular category of PTB cases; OR 0.95 and 0.87 respectively.

3.1.1.5 Case finding by age

During the study period, the proportion of TB patients in the age group 20-49 were between 85% and 88% of all TB cases, and 89% to 90% of all new smear positive PTB (Sm+PTB) and 56% to 95% of all smear positive retreatment PTB (Sm+retreatment PTB) during the

three years. The peak age group was 20-29 in all TB, all new Sm+PTB and all Sm+retreatment cases during the study period except for 2001 in which the peak age was 10-19 for all Sm+retreatment cases (Table 3.2).

Table 3.2 Tuberculosis case finding by age

2000						
Age groups	**All TB cases**		**All new Sm+PTB**		**All Sm+retreatment PTB**	
	n	%	n	%	n	%
0-9	29	6	0	0	0	0
10-19	9	2	8	3	1	3
20-29	194	41	109	46	14	36
30-39	170	36	85	36	7	18
40-49	38	8	18	8	13	33
50-59	17	4	7	3	4	10
60+	13	3	8	4	0	0
Total	**470**	**100**	**237**	**100**	**39**	**100**

2001

Age groups	**All TB cases**		**All new Sm+PTB**		**All Sm+retreatment PTB**	
	n	%	n	%	n	%
0-9	40	5	0	0	0	0
10-19	20	3	14	3	19	44
20-29	285	39	199	44	12	28
30-39	248	34	149	33	8	19
40-49	91	12	56	12	4	9
50-59	39	5	27	6	0	0
60+	13	2	9	2	0	0
Total	**736**	**100**	**454**	**100**	**43**	**100**

2002

Age groups	**All TB cases**		**All new Sm+PTB**		**All Sm+retreatment PTB**	
	n	%	n	%	n	%
0-9	36	4	0	0	0	0
10-19	24	3	15	3	0	0
20-29	383	44	237	47	16	40
30-39	278	32	162	32	12	30
40-49	103	12	60	12	10	25
50-59	26	3	18	4	2	5
60+	12	2	8	2	0	0
Total	**862**	**100**	**500**	**100**	**40**	**100**

3.1.1.6 Case finding by gender

The male/female gender ratio was 1.7 (1 290/778) for all TB cases during the study period. The gender ratio was 1.5 (706/483) in smear positive TB patients and rose to 1.6 (75/47) in retreatment smear positive cases and 1.6 (310/197) in extra pulmonary patients.

3.1.1.7 Sources of TB patients registered at HHC for the three-year period.

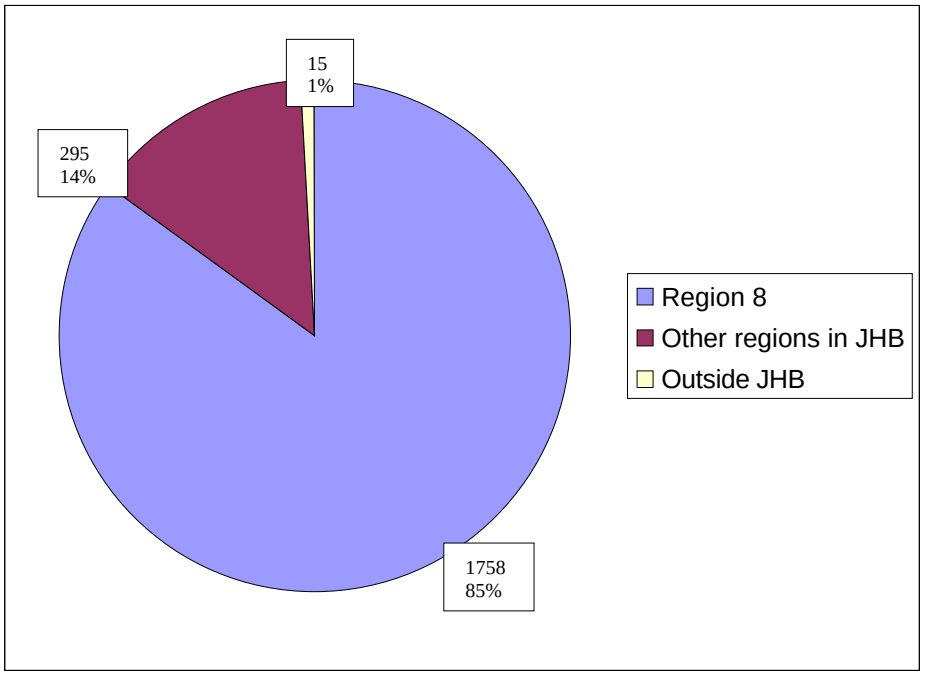


Figure 3.3 Residential addresses for TB patients registered at HHC: 2000-2002

Information on residential areas was available in the addresses of all TB patients (2068) registered at the facility during the three-year period. The proportion of these cases living in region 8 was 85% followed by 14% in other regions within Johannesburg and 1% outside the city (figure 3.3).

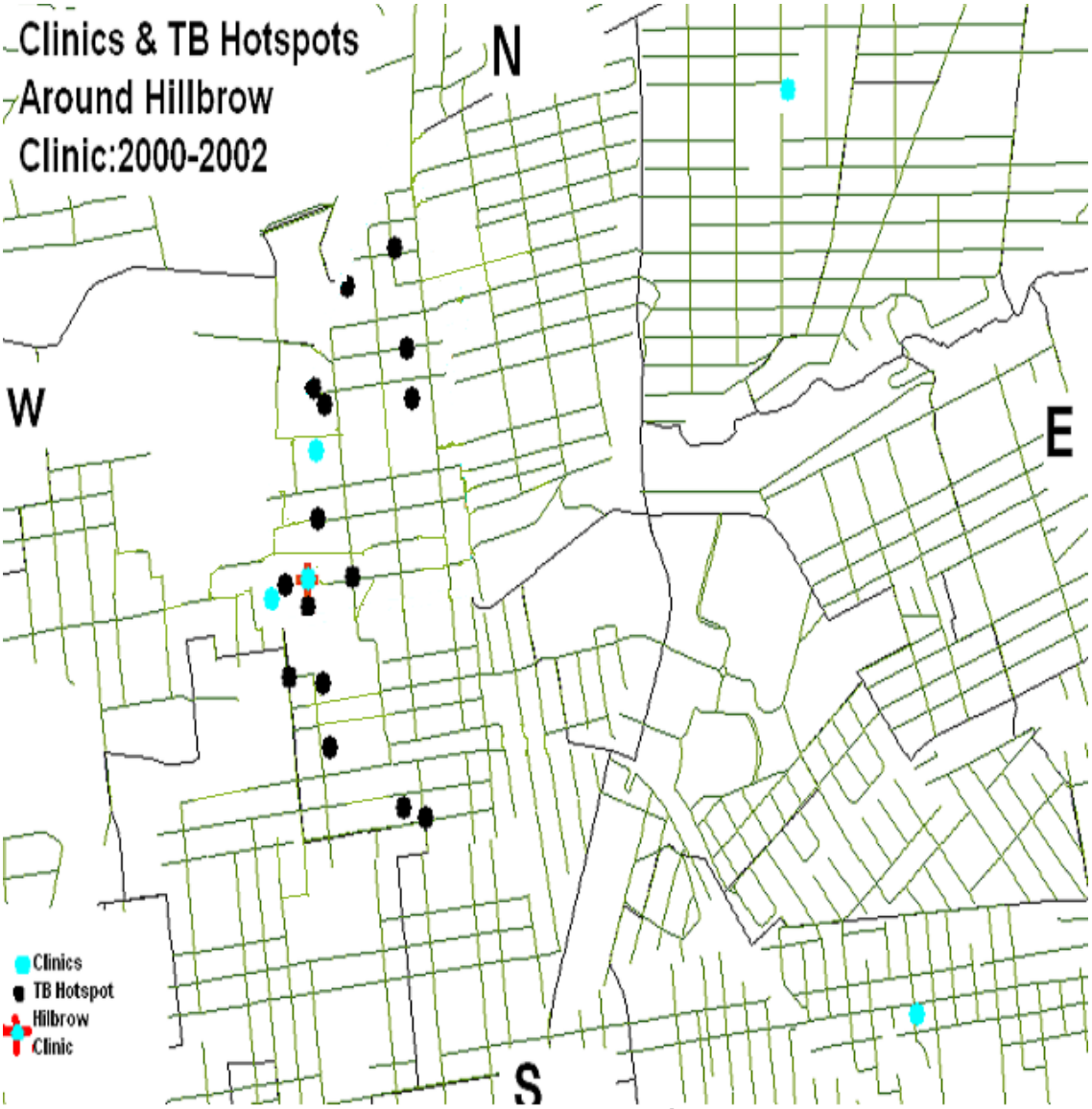
All TB patients in region 8 (1758) provided the names of their suburbs. Forty percent of these patients resided in Hillbrow followed by Joubert Park 18%, Berea 16% and, Johannesburg 8%. The proportion of TB patients living in the first three suburbs was 74%. Patients living in

Yeoville, Bertrams, Doornfontein, Braamfontein, Parktown and Jeppestown made 17% while 1% were from other suburbs in region 8.

The proportion of TB patients with recorded valid street names in legible writing was 94% (1650/1758). The proportion of these patients living in flats situated along Claim Street was 12% followed by Twist 11%, Quartz 8%, Wanderers 4%, Klein 4%, Edith Cavell 4%, Smit 3%, Tudhope and Wolmarans each had 2% and all the other streets each with less than 2% comprised 50%.

The proportion of patients with recorded, correct and clearly written flat names was 55% (960/1758). Among these patients, the Lake Success flat had the highest number of TB patients of 20, followed by Drill Hall and Novena with 17 each, King Ransom and Quartz Hill 16 each and East Gate 15. The other flats with 10 to 14 TB cases were Blouberg, Bremmer, Windsor, Sentinel, Senator, Pretoria Gate, High Point, Quartz Plaza and Dolphine Square.

The total number of flats with 10 to 20 patients was 15 and these were mapped (see figure 4). The proportion of flats with 10 to 20 TB cases represented 12% (209/1758) of all TB cases registered in region 8 with valid and clearly written flat names. Clinics such as HHC, Urban Health and Esselen are situated in the neighbourhood of the high volumes of patients diagnosed with TB at HHC as indicated in the map (figure 3.4).



*Scale: 1mm= 10meters

Figure 3.4 Map showing "hot spot" flats for TB and clinics reporting the disease in region 8 (2000-2002).

The map indicates the location of 15 flats with the highest number of TB cases (10 to 20 patients in each flat).

Case finding in flats with the highest number of cases

Ten flats with the highest TB patients were identified annually during the study period. Each flat had between three and eight cases in 2000, four and 14 in 2001 and five and nine TB cases in 2002 (**Appendix D).**

3.1.2 SPUTUM SMEAR CONVERSION AT THE END OF INITIAL PHASE OF TREATMENT

Smear conversion rates in new smear positive cases was 44% in 2000, followed by a decrease to 29% in 2001 and increased to 45% in 2002. In retreatment smear positive cases, the proportion decreased from 36% in 2000 to 28% in 2001 and increased to 47% in 2002. There was no significant difference in smear conversion rate among new smear positive patients from 2000 to 2002 (P-value 0.24016, CI 95%) and a significant difference was observed in retreatment cases (P-value 0.00065, CI 95%).

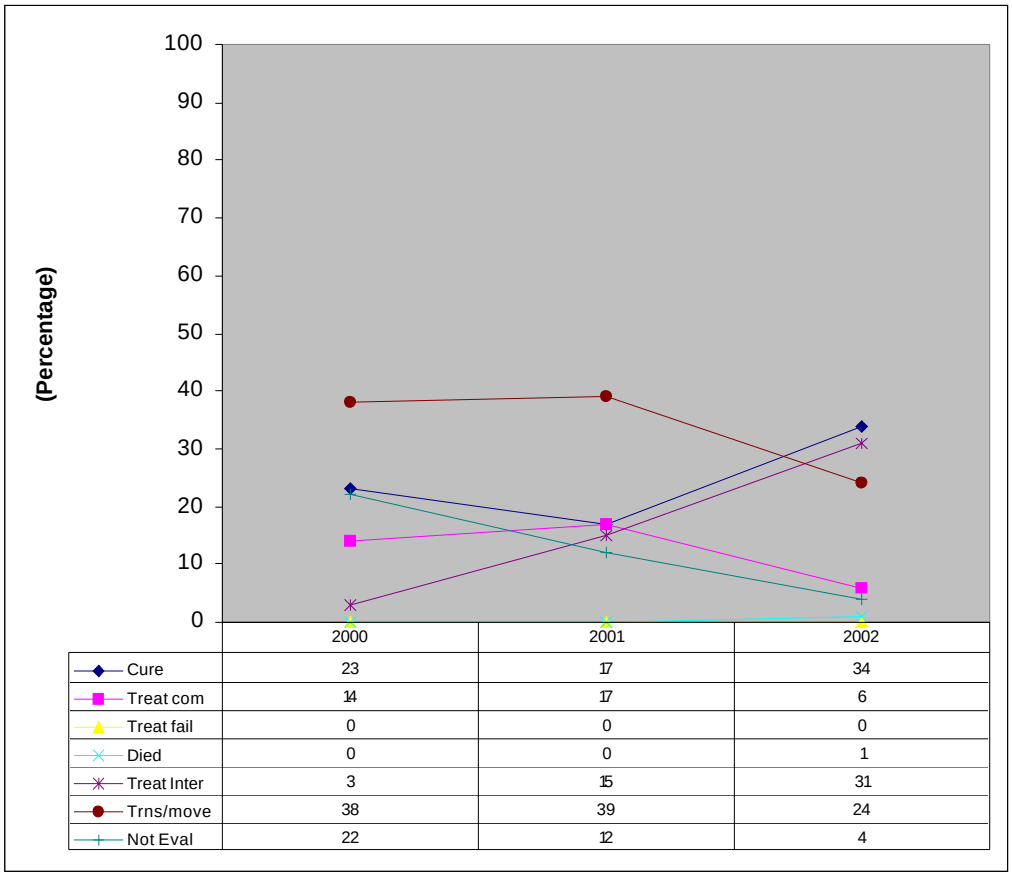
Annual comparison of sputum conversion rates between the new and the retreatment smear positive cases during 2000 to 2002.

An annual comparison of sputum conversion rates between the new and the retreatment smear positive cases during 2000 to 2002 was done. The findings showed no significant difference on sputum conversion rates between the two categories; P-values 0.5460 (2000), 0.9043 (2001) and 0.8501 (2002) at 95% CI.

3.1.3 TREATMENT OUTCOMES FOR SMEAR POSITIVE PTB CASES AT HHC: 2000 -2002

The treatment outcomes were poorly documented with about 5% of the patients recorded as cured without confirmation of sputum smear results at the end of treatment. The researcher re-classified them**.**

3.1.3.1 Treatment outcomes for new smear positive PTB cases: 2000-2002

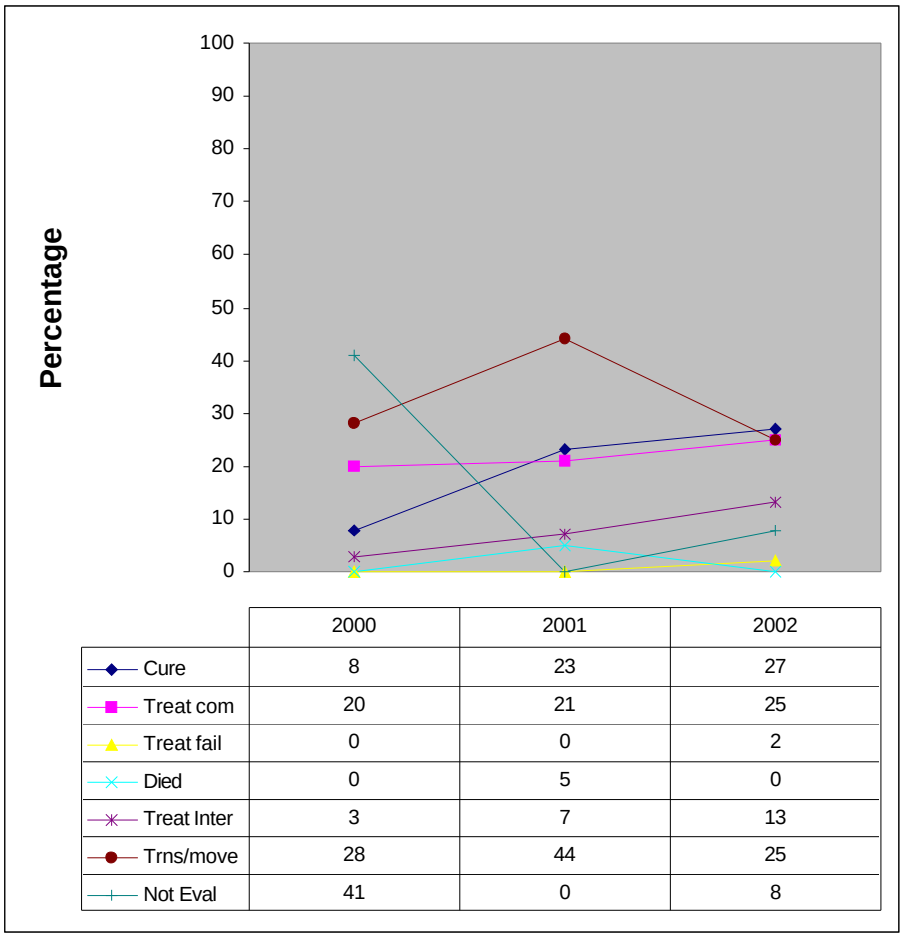


	2000	2001	2002
Cure	23	17	34
Treat com	14	17	6
Treat fail	0	0	0
Died	0	0	1
Treat Inter	3	15	31
Trns/move	38	39	24
Not Eval	22	12	4

Figure 3.5 Treatment outcomes for new smear positive PTB patients

At the end of treatment, which is six months for new smear positive patients, outcomes were evaluated. In general, the treatment outcomes were not good during the three years as indicated by cure rate less than 35% (expected 100%); treatment completed slightly increased (3%) in 2001, followed by a decline by 11% to a level below 2000; treatment interruption worsened when it increased 10 times from 3% in 2000 to 31% in 2002 and transfer/move without follow-up was generally high (ranged from 24% to 39%. However, the rate of cases not evaluated declined from 22% in 2000 to 4% in 2002. There was no treatment failure and deaths were also low.

3.1.3.2 Treatment outcomes for retreatment sputum smear positive PTB cases: 2000-2002



	2000	2001	2002
Cure	8	23	27
Treat com	20	21	25
Treat fail	0	0	2
Died	0	5	0
Treat Inter	3	7	13
Trns/move	28	44	25
Not Eval	41	0	8

Figure 3.6 Treatment outcomes for retreatment sputum smear positive PTB cases

Treatment outcomes for retreatment sputum smear positive cases were assessed after eight months of treatment. The findings showed poor treatment outcomes during the three years as indicated by cure rates below 30%; treatment completion without confirmation of sputum smears increased by 5% during the three year period; treatment failure was not recorded during the first two years and 2% was recorded in the last year; death rate was only recorded in one year (5% in 2001); treatment interruption increased four times from 3% in 2000 to 13% in 2002; transfer/move increased by 16% from 2000 to 2001 and then declined by 19% the following year, but it was consistently above 25% throughout the three years. Treatment

not evaluated was initially very high (41% in 2000), the following year no cases were recorded and there was an increase of 8% in 2002.

3.1.4 AREAS WITH THE HIGHEST NUMBER OF TB TREATMENT INTERRUPTORS.

During the three years (2000-2002), the proportion of interruptors among all patients registered at Hillbrow Health Centre was 13% (260/2068). Eighty eight percent of interruptors (228/260) were from suburbs in region 8. Hillbrow Suburb was home to 41% (107/260) followed by Joubert Park 17% (43/260), Berea 13% (35/260) and Johannesburg 7% (19/260). Twelve percent (30/260) of interruptors lived in Doornfontein, Soweto, Braamfontein, Bertrams and Yeoville. The rest of the interruptors (10%) were from other suburbs and each had less than three TB patients recorded during the study period.

3.1.4.1 Streets with the highest number of treatment interruptors

The highest number of treatment interruptors lived along Twist Street (28) followed by Claim 22, Quartz 21 and Smit 10 during the whole study period. The corresponding proportions were 11%, 8%, 8% and 4% respectively (Appendix D).

3.1.4.2 Flats with the highest proportions of treatment interruptors

During the three years, there were high numbers of interruptors in certain flats. The highest number of treatment interruptors in patients residing in one flat was found in East Gate flat where 27% (four patients interrupted treatment out of 15 recorded patients), followed by Drill Hall at 24% (4/17) and the other flats each had two or less treatment interruptors

3.1.5 Completeness of registration documents

The completeness of registration documents was covered under routine HHC records (Results of data collection at HHC from 2000 to 2002). The writing on some of the documents was illegible and not valid especially information on the name of the flat. The two sources of data helped in checking and comparing the information. However, in some cases the researcher had to check the recorded names of the streets against the map. A trip was taken around Hillbrow to correct the errors made in the names of the flats recorded.

3.2 COMPARISON OF TB IND ICATORS BETWEEN THE STUDY FINDINGS AND R ESULTS OF ROUTINE DATA SUBMITT ED BY HHC TO REGION 8 (2002)

Region 8 provided feedback results from data recorded in the TB registers and submitted by the HHC on quarterly basis for 2002. These results were compared with the study findings for data obtained from both the TB registers and the patients' clinic/hospital cards for the same year.

3.2.1 Case finding

The region 8 office reported 834 TB patients for HHC in 2002 of which newly registered cases were 467 (56%) and transfer 367 (44%). According to the study findings, HHC recorded 862 TB cases from TB registers and clinic/hospital cards in 2002. This figure is higher by 28 compared to 834 reported by region 8 for the same facility in 2002. These 28 patients were missing from the TB register and recorded in clinic/hospital cards. Half of them were allocated duplicated registration numbers and the other half were not recorded in the TB register for unknown reasons.

Newly registered cases constituted 483 (56%) in the study and 467 (56%) according to region 8. The proportion of transfer/move was 44% in both methods but the numbers were 379 according to the study findings and 367 was reported by region 8.

Tuberculosis bacteriological coverage for the new smear positive cases was 88% (434/493) according to the results from region 8 and 80% (400/500) from the study results at HHC in 2002. There was no significant difference on bacteriological coverage between the two methods (P-value 0.3086, CI 95%).

The proportion of new smear positive cases in all TB cases was 58% (500/862) according to the study findings, and 59% (493/834) was reported by region 8. The difference was not statistically significant (P-value 0.8128, CI 95%).

3.2.2 Sputum smear conversion after two months of treatment for new cases.

Study findings and analysed data from the region 8 office were not compared for sputum smear microscopy at HHC for 2002 because region 8 provided inconsistent information. The first inconsistency was the total of 444 smear positive patients reported under sputum smear conversion (table 3.3). Initially, 493 cases were reported under case finding. This indicated that the office did not account for the difference between 493 and 444 patients, which is 49 patients (10%).

The second inconsistency was the incorrect number of patients including the corresponding proportions for assessment of cases after two months of treatment. For example, the proportion of patients who converted to negative was recorded as 48%, which is not

equivalent to 237/444; the correct proportion is 53%. The sum of the proportions was 89% and not 100% as indicated under routine data in table 3.3.

The reason why the routine data column does not add up to 100% is unknown to the researcher because the data was submitted by HHC and the results were from region 8. However, this is an indication of poor patient follow up and data management by HHC. Region 8 also released the results of the data submitted by HHC without alerting the clinic and correcting it accordingly.

Table 3.3 Results of smear positive cases at the end of initial phase of treatment.

	Routine Data		**Study Findings**	
	n	%	n	%
Converted to negative	237	48	240	48
Resistant	17	3	42	8
Results not available	12	2	86	17
Died	3	1	3	1
Transferred	75	15	76	15
Interrupted	100	20	53	11
TOTAL	**444**	**89***	**500**	**100**

***The column on routine data added up to 89% and not 100% as expected because 49 patients were not accounted for according to the information provided by region 8.**

3.2.3 Treatment outcomes for new smear positive cases obtained from routine data and the study findings for patients registered at the facility in 2002.

Treatment outcomes for new smear positive cases from routine data and the study findings were compared. The findings showed no significant differences between routine data and the study findings on cure, treatment success died and transfer/move during 2002; P values 0.249, 0.994, 0.7466, and 0.4715 respectively at 95% CI. However, significant differences occurred on treatment completed and not evaluated; P-values 0.00004 and 0.00001 at 95% CI. See table 3.4 below.

Table 3.4 Treatment outcomes for the new smear positive PTB in 2002

	Routine		Research	
	n	**%**	**n**	**%**
*Treatment success	198	40	201	40
Cure	192	39	169	34
Treatment completed	6	1	32	6
Treatment failure	0	0	0	0
Died	6	1	5	1
Treatment interrupted	158	32	154	31
Transfer/move	131	27	120	24
Not evaluated	0	0	20	4
Total	**493**	**100**	**500**	**100**

NB: * Treatment success is the sum of cure and treatment completed

3.3 TB INDICATORS COMPARED BETWEEN HHC AND THE OTHER CLINICS IN REGION 8.

In this section, region 8 provided the routine data that was submitted by the five clinics (including HHC) reporting information on TB in region 8 for 2002.

3.3.1 Case finding

3.3.1.1 Number of TB patients.

During 2002, the five clinics in region 8 reported the following data on all TB patients: HHC reported the 834 TB cases, followed by Urban Health 623, Jeppe 391, Yeoville 333 and Esselen 285. HHC reported the highest proportion of all TB patients (34%) and Esselen the lowest (12%) among the five clinics.

3.3.1.2 Sources of TB cases at HHC compared to the other four health facilities.

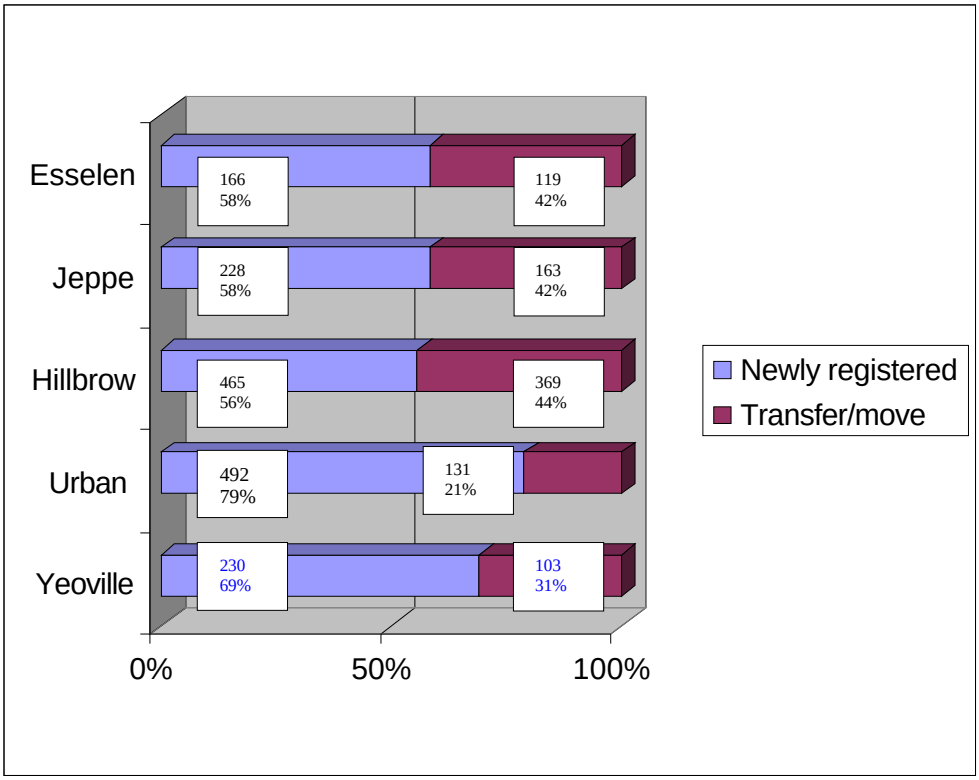


Figure 3.7 Sources of TB patients in the five clinics

The data in figure 3.7 shows that HHC reported the lowest proportion of newly registered TB cases (56%) and the highest proportion of transfer/move cases (44%) among all region 8 clinics. Urban Health, on the other hand, reported the highest proportion of newly registered cases (69%) and the lowest transfer/move cases of 31%).

Further analysis was done on newly registered patients and it indicated no significant differences on proportions of newly registered patients at HHC compared to Esselen and Jeppe; P-values 0.700 and 0.658 respectively at 95% CI. There were significant differences on newly registered patients between the HHC and Urban Health and Yeoville; P-value 0.00003 and 0.038 respectively at 95% CI).

In terms of transfer/move, there were significant difference between HHC and Urban Health and Yeoville Clinics; P-values 0.0000 and 0.0053 respectively (CI 95%). However, there was no statistical difference between HHC and Esselen and Jeppe; P-value 0.645 and 0.595 respectively (CI 95%).

3.3.1.3 Pulmonary Tuberculosis (PTB) cases

Among the five clinics, HHC reported the highest proportion (36%) of all PTB cases and Esselen the lowest (11%). See table 3.5.

Analysis on the proportions of PTB in the four clinics compared with HHC was done. The findings showed no statistical difference between HHC and Esselen, Jeppe, Urban Health and Yeoville; P-values 0.1309, 0.5918, 0.0924, 0.2707 respectively at 95% CI.

3.3.1.4 Tuberculosis bacteriological coverage.

Tuberculosis bacteriological coverage was highest at Esselen (96%) and the lowest was Yeoville (83%) in the five clinics (table 3.5). Comparison of bacteriological coverage between HHC and Esselen, Jeppe, Urban Health and Yeoville showed no significant differences; P-values 0.4700, 0.6489, 0.4843 and 0.6028 respectively (CI 95%).

Table 3.5 PTB patients and bacteriological coverage in the five clinics.

	All PTB cases		**Bacteriological Coverage**
	N	**%**	**%**
HHC	657	36	**88**
Esselen	191	11	**96**
Jeppe	293	16	**92**
Urban Health	440	24	**94**
Yeoville	235	13	**83**
TOTAL	**1816**	**100**	

3.3.2 Sputum smear conversion

The highest sputum smear conversion rate was recorded at Yeoville (68%) followed by Esselen 66%, Urban Health 62%, Jeppe 58% and HHC 48% in 2002. Statistical analysis showed a significant difference on sputum smear conversion rates between HHC and Esselen, Urban Health and Yeoville; P values 0.0366, 0.0357 and 0.0275 respectively (CI 95%). However, there was no significant difference on sputum smear conversion rates between HHC and Jeppe (P-value 0.18231, CI 95%).

3.3.3 Treatment outcomes for new sputum smear positive PTB cases

All the clinics reported cure rates above 50% except HHC, which had the lowest (39%) among the five clinics. HHC reported the highest treatment interrupted rate (32%) and Yeoville the lowest (19%). The difference between the transfer/move rate between Hillbrow and Jeppe was 13%. The two clinics reported the highest rates in this category among the five clinics (table 3.6). The treatment outcomes between HHC and the other clinics were compared for only cure, treatment interrupted and transfer/move. In terms of cure, there were significant differences between HHC and Esselen, Jeppe, Urban Health and Yeoville (P-value 0.0041, 0.0077, 0.000012, 0.00036 respectively at 95% CI.

In terms of treatment interrupted, further analysis showed a significant difference between HHC and Yeoville (P-value 0.032; CI 95%) and no significant difference when HHC was compared to Esselen, Jeppe and Urban Health; P-values 0.779, 0.205 and 0.2201 respectively at 95% CI. There was a statistical difference on proportions of transfer/move obtained at HHC compared to Esselen, Jeppe, Urban Health and Yeoville; P-value 0.0000,0.0371, 0.0000 and 0.0006 respectively at 95% CI. However, because of the small numbers of patients (less

than seven) obtained in the five clinics on treatment completed, treatment failure, and not evaluated and died, no statistical comparisons were made.

Table 3.6 Treatment outcomes for new smear positive PTB cases in five clinics

	Cure		***Treat. comp.**		**§Treat. failed**		***Died***		**#Treat. int.**		**¶Tran/ move**		**†Not eval.**		***Total***	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
HHC	192	39	6	1	0	0	6	1	158	32	131	27	0	0	493	100
Esselen	89	61	2	1	1	1	1	1	44	30	8	6	0	0	145	100
Jeppe	120	57	3	1	0	0	4	2	54	26	30	14	0	0	211	100
Urban Health	190	62	3	1	1	0	6	2	80	26	22	7	6	2	302	100
Yeoville	81	63	3	2	0	0	3	2	25	19	16	12	1	1	129	100

*Treat.comp. =Treatment completed. §Treat. failed=Treatment failed. #Treat. int.=Treatment interrupted. ¶Tran/move=Transfer/move. †Not eval.=Not evaluated

In conclusion, HHC reported an increasingly high number of TB cases during the study period. However, it failed to cure the majority of these patients who were lost to follow up and treatment interruption. Patients' information at HHC was incomplete. HHC had the highest number of TB cases compared to the other clinics in region 8. On the contrary, HHC reported the lowest cure rate, the highest treatment interruption and transfer/move rates in the region.

CHAPTER 4: DISCUSSION

In this chapter, discussion follows the sequence of the objectives. The first section deals with results obtained on management of TB control at HHC, followed by research findings compared to results provided by region 8 on routinely registered data for TB patients at HHC and finally, comparison between results provided by region 8 for HHC and the other four clinics in region 8 for 2002.

4.1 MANAGEMENT OF TB AT HILLBROW HEALTH CENTRE

4.1.1 Case finding

4.1.1.1 The number of patients registered at HHC was high during the study period. Four hundred and seventy TB patients were recorded in 2000 and the number almost doubled (862) two years later.

Among the TB patients registered at HHC from 2000 to 2002, between fifty and seventy percent were diagnosed at HHC while the rest were transfer/move from other health facilities annually over the three years. The reason for mobility of TB patients was probably the high number of patients presenting in neighbouring hospitals and later transferred/moved back to HHC for treatment follow-up due to decentralised TB services. (3). Another possibility is that the health workers at HHC lacked the knowledge on the disease and how to manage it (14). As a result, most patients may have been diagnosed elsewhere and referred to HHC for further management

4.1.1.2 Type of disease

The ratio of PTB cases increased from about seven to eight in 10 TB cases and in extra pulmonary patients. It decreased from 21% to 11% (reduced to about half) during the study period. The opposite results were expected in a country with TB/HIV co-infection of 55% (18, 36).

Proportions of new and retreatment smear positive patients among PTB cases were 73% and 92% respectively during the study period. These results comply with findings in well managed TB control programmes where smear positive cases represents two-thirds or more of PTB cases (18).

Half of the patients diagnosed with extra pulmonary TB had pleural effusion and studies have shown that this is commonest in young adults (43). However, this study did not determine the correlation between pleural effusion and patients' ages.

4.1.1.3 Tuberculosis bacteriological coverage

Tuberculosis bacteriological coverage was high among new and retreatment cases. Four in five PTB cases were investigated to detect the infectious (smear positive) patients in the two groups during the study period. Utilisation of sputum smears for diagnosis in retreatment PTB patients fluctuated, and in new PTB cases a decrease was observed over the three years. However, these changes were not significant. It is possible that the person who was trained on TB management did a good job initially but this was not sustained for some reasons. The health care workers took sputum samples from both new and retreatment PTB patients without preference of specific category.

4.1.1.4 Age and gender

Two thirds of all TB patients were males during the three years. About nine in 10 TB cases were in the economically active age group (20 to 49). Similar, findings were reported in the WHO TB report 2005 (1) and by Austin et al (27). The peak age group was 20 to 29 in all TB, new and retreatment sputum smear positive cases during the study period. The population of Hillbrow is young because three quarters of it is in the age group 20-49 (5). The fact that the proportion of this age group in the population is nearly the same as the group that was affected by TB is not surprising. This is a community of young people who are possibly passing the TB infection among them. But it is also possible that the risk is high since most of them may be immunocompromised (19). The other striking feature about the TB patients recorded at HHC was the low proportion of patients in the age group 0-19 years. These were between 7% and 8% of all the cases recorded at the clinic during the three years.

4.1.1.5 Areas with high numbers of TB patients

Almost 90% of TB patients recorded at Hillbrow Health Centre were living in region 8, while two in five of these cases were living in the Hillbrow Suburb during the three years. The flats with the highest volumes of patients diagnosed at HHC were situated near this clinic, Urban Health and Esselen Clinic. The distance between these flats and the three clinics was less than 500 meters. Long distances travelled by patients contribute to poor access to medical services (44). However, the study findings indicate that nearness to the clinics did not translate to real access. It is possible that other reasons contributed to reduced utilisation of the health services (13).

4.1.2 Sputum smear conversion

Sputum smear conversion rates were between 28% and 47% in new and retreatment cases, which were low because the expected rate is 100%. The activities and processes associated with taking sputum smears and documentation of the results from both categories seems to have been treated the same way by health care workers and the same standards were maintained during the study period. Since bacteriological coverage was very high, the low smear conversion rate could be an early warning sign indicating that patients interrupt treatment during the intensive phase of treatment. This is associated with poor follow up from the beginning of treatment. Another possibility is that patients smear results were not recorded in the TB register, which is used to submit clinic data for analysis at the regional level.

4.1.3 Treatment outcomes

Cure rates increased significantly in new and retreatment smear positive patients from 23% to 34% and from 8% to 31% respectively at HHC over the three years. In 2000, the province and the country reported cure rates around 55% (1, 2) which were higher than at HHC in the same year.

The low cure rates in new and retreatment categories, high treatment completion of up to 30% in retreatment patients, inability to identify treatment failure cases, high treatment interruption (increased significantly to ten fold among new smear positive patients and four times in retreatment smear positive cases over the three years) and unevaluated rates all indicate a possibility that the facility is a breeding ground for drug resistant TB. Without treatment, one quarter of patients gets cured, half of them die and a quarter remains chronic infectious cases by the end of 5 years (19). This implies that the clinic is preventing

immediate death but postponing it because these patients will ultimately end up with drug resistance TB, which is associated with high mortality rates (37).

However, HHC reported low mortality rates during the three years (0.4%), probably due to averted death by giving TB treatment or under reporting of death in patients on TB treatment. Most deaths were not reported as indicated by hospital-based studies conducted at Chris Hani and Tintswalo in South Africa (30, 31). Another possibility for low mortality rates is that some of the patients ended up being transferred and admitted in hospitals where they died. Due to poor treatment follow up of patients by the clinic, there is a possibility that death was under-reported and these patients were included among transfer/move and unevaluated.

4.1.4 Areas with high numbers of TB interruptors

About two-thirds of all treatment interruptors (150/260) were from Hillbrow and Joubert Park Suburbs. About one-third of treatment interruptors gave residential addresses along streets such as Twist, Claim, Quartz and Smit. All these streets are not more than 750 meters away from Hillbrow Health Centre. The flats with the highest proportions of treatment interruptors were East Gate and Drill Hall. The two flats are found along Twist Street and this is less than 10 minutes walk to HHC.

Tracing of interruptors at HHC must have been very weak because they failed to find treatment interruptors who were living near the facility. This may also indicate that patients' treatment was not supervised hence high interruption rate at the clinic doorstep (18).

4.1.5 Completeness of registration documents

Health workers at Hillbrow Health Centre completed the TB registers and the patients' clinic/hospital cards for almost all TB patients registered at the clinic as recommended by NTCP. However, the TB registers for HHC were not available for the year 2000 and for the first three quarters of 2001. The study revealed a weakness in the safekeeping of TB patients' records and failure to register some patients in the recommended TB stationery. Patients' information was well completed and without any gaps in areas such as category, type of TB, investigation results, age and gender. Information on addresses specifically on suburbs was well documented. In nine out of ten patients residing in region 8, there was no information on street name. In about one-thirds of patients who had provided street names, the flat name was not recorded. Unevaluated patients comprised 22% of patients recorded in 2000 but this improved to 4% in two years. Illegible writing was problematic in some cases.

4.2 COMPARISON OF TB IND ICATORS BETWEEN THE STUDY FINDINGS AND R ESULTS OF ROUTINE DATA PROVIDE D BY REGION 8 FOR THE SAME CLINIC (2002)

Routine recording at HHC indicated duplication of registration numbers and failure to register all patients in both the clinic/hospital cards and the TB register. Therefore, the number of all TB cases was under-reported in the TB register, which is used for submission of facility data to the district. However, there was no significant difference between the routine data and the study findings on number of all TB patients, number and proportion of smear positive cases and also on bacteriological coverage.

Recorded data on new sputum smear results after two months of TB treatment indicated poor case holding and lack of accountability for these infectious patients. However, the high mobility of TB patients may have contributed.

Treatment outcomes that showed significant differences when comparing the two methods were not evaluated outcomes and treatment completed. The rest showed no significant difference. The reason for the difference was due to misclassification of patients under outcomes. This occurred between blank spaces and interrupted/default and also between cure and treatment completion. The not evaluated and the treatment completed outcomes were small numbers that were affected by the misclassification. The corrections made by the researcher did not have an impact on large numbers such as the cure and treatment interrupted.

4.3 Hillbrow Health Centre compared with four facilities in region 8

4.3.1 Case finding and smear conversion rate

One-third of all TB cases in region 8 were reported by HHC. Seven out of 10 TB cases reported in the region were registered at Esselen Clinic, HHC and Urban Health in 2002. These three health facilities are situated at Hillbrow and Joubert Park Suburbs within a radius of about 300 meters. The total population in the two suburbs was 79 076 which is 10% of the population of region 8 (7). The incidence rate of TB in the two suburbs together was 2 203/100 000 in 2002. This exceeded the incidence rate of 300/100 000 for Gauteng Province and it was 2.5 times the rate of 900/100 000 reported in the Western Cape Province (the highest in the country) in 2002. Eighty percent of the population in each of the two provinces was found in the urban area (7).

Proportions of new and transfer/move categories during the initial registration of patients in the five clinics indicated the high mobility of TB patients and easiness of moving between health facilities. However, HHC was more affected than all the clinics. Possible reasons for these differences were that patients with symptoms of TB preferred Urban Health compared

to HHC, that health workers at Urban Health were better at diagnosis of TB compared to HHC, that hospitals preferred to transfer or move their TB patients to HHC for follow-up or that there was misclassification of newly registered, transfer or moved by the staff at either facility or both. There is also a possibility of duplication of patients' registration in these clinics given the proximity between them. The region may need a unique identifier to identify such patients.

All the five facilities reported tuberculosis bacteriological coverage above 80% for new smear positive cases and there was no significant difference between HHC and the other clinics. However, smear conversion rates were low for HHC (48%) and the highest was Yeoville Clinic (68%). The differences on smear conversion were significant between HHC and three out of the four other clinics. These three clinics were Esselen, Urban Health and Yeoville.

4.3.2 Treatment outcome

Although HHC reported the highest number of new smear positive cases, in region 8, followed by Urban Health, the cure rates were 39% and 62% respectively. HHC was the only clinic with cure rates below 50%. There was a significant difference in cure rates between HHC and the other four clinics. Three out of 10 patients registered at HHC interrupted treatment and an equal proportion was also transfer/move. These treatment outcomes were among the highest in the five clinics. The differences in proportion on transfer/move between HHC and the other facilities were significant. Urban Health Clinic, which has nearly the same number of TB patients as HHC, can disseminate the good practices to improve outcomes and TB control services at HHC.

4.4 LIMITATIONS

4.4.1 Information bias

The data recorded at HHC showed irregularities in registration numbers allocated to TB patients. In some cases, two patients were given the same number and only one of them was recorded in the TB register while the other was not. All tuberculosis patients recorded in the recommended TB stationery were included in the research.

Comparison of data at HHC and the other clinics was done for one year and this limits the research findings to the year 2000 because they cannot be generalised to the other years.

4.4.2 Selection bias

Missing facility registers for the year 2000 and also from January to September 2001 was a major limitation. In the absence of the TB registers, hospital/clinic cards were used and this was difficult. As a result, it took more time to collect the data. Illegible writing, gaps and inaccurate patients` profiles were other limitations observed in the study. In such cases, the hospital/clinic cards were used to counter check information from TB registers, when available, and this helped to reduce the number of irregularities. The process of finding the data from these two sources may have contributed to selection bias.

In summary, all the objectives were met despite numerous problems encountered during collection of data and analysis. In the process of overcoming the difficulties, a lot of time was wasted but the results were rewarding. Most of the results confirmed research findings that were done in the past both locally and internationally. The chapters on conclusion and recommendations will follow this discussion.

CHAPTER 5: CONCLUSION

The study findings showed that performance of TB control programme in region 8 was influenced by TB data submitted by HHC. The research highlighted good practices, weaknesses and trends on TB control at HHC from 2000 to 2002. It also managed to reveal what was not known about management of TB control programme at the facility for the first three years of rendering the services.

HHC was reporting TB patients on documents recommended by NTCP for almost all the TB patients registered in this facility. The problems were failure to keep the records, inadequate completion of patients' information, failure to record all TB patients in the clinic/hospital cards and in the TB registers. Region 8 showed poor validation of routine results before releasing them.

The caseload of TB patients registered at HHC increased over the three years. A high proportion of these cases was referred from other facilities. Half of the new smear positive patients ending up as interruptors or transfer/move without follow up could be due to poor follow up and high mobility of patients. Specific groups contributed to the high proportions of TB patients such as males and age group 20-49. However, they were following the population pattern of Gauteng Province. Geographic locations with high number of cases and interruptors were identified near the HHC, Esselen and Urban Health Clinics.

Comparison of the TB control programmes between HHC and the other four clinics in region 8 revealed that HHC contributed the highest proportion of patients and achieved the poorest treatment outcomes in the region for 2002. The study also indicated the high movement of

TB patients in the region. TB data at HHC was compared with other four clinics reporting TB in the region for 2002 and it showed areas that need to be strengthened particularly at HHC.

CHAPTER 6: RECOMMENDATIONS:

- The study noted that safekeeping and accurate recording were huge problems at the Hillbrow Health Centre. Therefore it is recommended that there should be strengthening of storage facilities and systems for records; training of health care workers on TB management especially recording and reporting patient's information.

  It is also recommended that monitoring of data submitted by the facility to the region must be strengthened. Training is recommended for data capturers and those who analyse the data. This will improve their understanding and management of TB information. Utilisation of data checks is recommended for detection of errors in submitted data

- The study found that the proportion of TB patients recorded at HHC was higher compared to all the other clinics in the region. However, the sputum conversion and cure rates were lower whereas interruption rate was higher at HHC than in all the other clinics. It is therefore recommended that good practices on TB management should be shared and disseminated through regular meetings between clinics in region 8.

- The study noted the elevated interruption rates in all the clinics even though it was highest at the Hillbrow Health Centre. It is recommended that treatment adherence should be strengthened. This can be accomplished by ensuring supervision of patient treatment intake daily. Measures must be taken to ensure that patients are well informed about TB through health promotion activities and on-going community

mobilisation campaigns. The clinic should be user friendly by creating a warm atmosphere for TB patients. All these approaches will contribute to improvement of adherence to treatment.

- The study noted areas with high numbers" hot spots" of patients at Hillbrow and Joubert Park Suburbs. Research is recommended to determine factors contributing to existence of these "hot spots", which were concentrated close to three clinics. Distance was not an issue in this case. The results of such research would assist in development of plans to wipe out these areas.

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