Prevention of development and spread of Multi-Drug Resistant (MDR) tuberculosis in Ohangwena region, Namibia

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Title

Prevention of development and spread of Multi-Drug Resistant (MDR) tuberculosis in Ohangwena region, Namibia

A thesis submitted in partial fulfilment of the requirement for the degree of Master of Public Health

by

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Declaration:
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This thesis **Prevention of development and spread of Multi-Drug Resistant (MDR) tuberculosis in Ohangwena region, Namibia** is my own work.

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Dedication

This work is dedicated to my wife Josephine, son Joy and two daughters Jane and Janet

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List of abbreviations

ACSM	:	Advocacy, communication and social mobilisation
AIDS	:	Acquired immune deficiency syndrome
ARV	:	Antiretroviral
CACOC	:	Constituency AIDS Coordinating Committee
CB-DOT	:	Community-based directly observed treatment
CBO	:	Community based organisation
C/DST	:	Culture and drug sensitivity test
COMBI	:	Communication for behaviour impact
DCC	:	District coordinating committee
DOT	:	Directly observed treatment
DOTS	:	Directly observed treatment short course
DST	:	Drug susceptibility testing
DTC	:	District TB coordinator
HIV	:	Human immune-deficiency virus
ICHD	:	International course on health and development
KIT	:	Royal Tropical Institute
KNCV	:	Royal Netherlands Tuberculosis Association
M/XDR-TB	:	Multidrug & extremely drug resistant tuberculosis
MDG	:	Millennium development goals
MDR	:	Multi-drug resistant
MDR-TB	:	Multidrug resistant tuberculosis
MGIT	:	Mycobacterium growth indicator tube
MOH	:	Ministry of Health
MTP-1	:	Mid-term plan 1
NGO	:	Non-governmental organization
NHLS	:	National health laboratory services
NTCP	:	National tuberculosis control programme
OPD	:	Outpatient department
PHCS	:	Primary health care supervisor
PMO	:	Principal medical officer
RACOC	:	Regional AIDS coordinating committee
RMT	:	Regional management team
SCC	:	Short course chemotherapy
SLD	:	Second line drugs
SRL	:	Supranational reference laboratory
STI	:	Sexually transmitted infections
TB	:	Tuberculosis
TBCAP	:	Tuberculosis control assistance programme
TSR	:	Treatment success rate
WHO	:	World Health Organization
XDR	:	Extensively drug resistant

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Abstract

Namibia has been treating TB patients with the second line drugs since 1999 when MDR-TB drugs were introduced. The magnitude MDR-TB is unknown but 254 cases were reported in 2007 of which 9 were from Ohangwena region. Ohangwena had 36 MDR-TB on treatment by the end of December 2008, suggesting the increase in prevalence. In 2009, 23 XDR-TB cases were reported in Namibia. No trend data available, and the first drug resistance surveillance survey was only done in 2008, results still unreleased.

This thesis aimed at exploring the factors that favour the development and spread of M/XDR-TB, recommended interventions and experiences by other countries in similar situations, as well as describing the current responses to prevent TB in Namibia. This was a desk review explorative study which used literature across the globe but looked closely at Southern African countries experiences. Two frameworks were used to describe the factors and to explore the recommended interventions and other countries' experiences and current responses respectively.

The major findings is that although there are many factors that fuel the development and spread of M/XDR-TB, inadequate implementation of DOTS and the high prevalence of HIV have serious impact on the development and spread of M/XDR-TB. Specific health related factors such as infection control in hospitals, availability and accessibility of diagnostic equipment and second line drugs as well as well trained staff are core in the prevention M/XDR-TB.

The thesis concluded that proper implementation of DOTS, DOTS-Plus and STOP-TB strategies improves TB treatment outcomes and subsequent reduction of development of M/XDR-TB strain, but it needs more resources. Recommendations include improvement in DOT, infection control and contact tracing.

Key words: *MDR TB, Southern Africa, TB treatment success rate, XDR TB, TB prevention, burden of MDR, management of MDR, drug resistant tuberculosis, TB in Namibia, epidemiology of tuberculosis, TB infection control, DOTS-plus, barriers in TB management, TB treatment, adherence to treatment, and the combinations thereof.*

[Word count: 14,074]

Introduction

Tuberculosis is one of the old diseases that still continue to claim world's lives. It is found in every region of the world and mode of transmission is the same – through inhaling mycobacterium bacilli from the infected person. By 1990 many countries in the world had registered multidrug resistant tuberculosis (MDR-TB). (1) Just over 15 years later, another resistant strain called extremely drug resistant tuberculosis (XDR-TB) was reported. (1) This strain (XDR-TB) is more fatal especially if the host is also HIV infected. (2;3) Each year almost 500,000 cases of MDR-TB in the world are reported, yet it is believed that the emergence of MDR-TB is a man-made phenomenon. (1) MDR-TB and now also XDR-TB are enjoying international attention because of their serious externalities. The Millennium Development Goals (MDG), STOP-TB Strategies and DOTS-Plus Strategies are some of the goals put up by the international organizations in order to guide national governments to prevent the emergence of M/XDR-TB.

Namibia has been treating cases of MDR-TB but the National TB Control Programme (NTCP) only started with MDR-TB programmatic activities after 2005 when the MDR-TB was included in the TB guidelines. (4) Eight cases of XDR-TB were reported in Namibia in 2008 but by March 2009, the country reported 23 XDR-TB cases of which 13 died. (5) Until 2008, there was no trend data on MDR-TB collected (4), however cases of MDR-TB continued to surface. Namibia has a generalized HIV epidemic and in 2008, the prevalence rate was 17.8%. (6) In 2008 TB and HIV co-infection was estimated at 59%. (4) Ohangwena region has reported 9 MDR-TB cases in 2007, but in December 2008, the cumulative number of 36 MDR-TB cases was on second line treatment of TB.

As a programme manager for both TB and HIV in Ohangwena region, I found it challenging to have increasing cases of MDR-TB every year, yet little is done to curb its spread. The problem of M/XDR-TB has a serious impact on public health in Namibia including Ohangwena region, more so because of high HIV prevalence in the community. The aim of this thesis is to explore factors that fuel the development and spread of M/XDR-TB in Ohangwena region with the intention to scale up the existing prevention strategies and come up with a responsive plan. The recommendations from this thesis are primarily targeting Ohangwena Regional Management Team (RMT) for implementation however the National TB Control Programme (NTCP) will be responsible for the recommendations which have policy implications.

Chapter 1: Background

This chapter dwells on the country profile and sheds a bit of light on the National Control Tuberculosis Programme. It also looks into a short profile of Ohangwena region and describes how the TB programme is working at regional level.

1.1 The country

Namibia is a sub-Saharan country which borders with South Africa, Botswana, Zambia, Zimbabwe and Angola (see Annex 1). It has a land surface are of 824,295 square kilometres. (7) The population of Namibia is now about 2.1 million according to the 2001 national census projections.

Namibia is classified as a low-middle income country and it is estimated that the people in the country who live below US$1 per day are 44%. (8) The unemployment rate is about 33.8%. (8)

The Ministry of Health (MOH) funds most of the public health care activities. The government through the MOH has 75% provision of health services, mission (fully subsidized by MOH) 20% and private only 5%. (8) There has been a critical shortage of health professionals in the country such as medical officers, registered nurses, pharmacists and laboratory technicians. In 2004 the doctor-patient ratio was 1:7,500, (8) but reduced to 1:2952 in 2008. (9)

1.2 The National Tuberculosis Control Program

The National TB Control Programme (NTCP) started getting off ground in 1991 shortly after independence. The Directly Observed Treatment Short course (DOTS) was adopted in 1995 followed by the introduction of technical guideline in 1996. (7) The tuberculosis programme is aligned with the de-centralized system of the Ministry of Health and Social Services to all the levels of care – see Annex 2.

Initially TB programme lacked external funding for service delivery however later, the MOH received about US$1.6 million for TB activities from the Global Fund Round 2 for the period 2004-2009, and also US$17.8 million from Round 5 (Global fund). (4)

By 1996 the national case detection rate was already at 75%, higher than the WHO target of 70%. (10) For the last 5 years period 2003 – 2006 the treatment success rate has increased from 70% to 76% (see trend Annex 4) which is a good sign considering high HIV prevalence in the country.

(4) Policy guideline was developed and distributed countrywide. In 2005 the policy was revised to include the management of multi-drug resistant tuberculosis. (7) This led to the first national TB training of medical officers in February 2005, including MDR-TB. (11)

1.3 Ohangwena region

1.3.1 General information

Ohangwena region is situated in northern Namibia bordering with Angola in the north, Okavango region in the east, Oshikoto and Oshana regions in the south and Omusati region in the west. Ohangwena is the third populous region in the country following Khomas (capital) and its western neighbour Omusati region. The region covers an area of about 10,703 square kilometres which makes 1.3% of the national surface. (12) It houses a proportion of 21.5% of the national population and has a highest population density which is 21 persons per square meter. (12)

In Ohangwena, life expectancy among male was 61 years in 1991 but by 2001 it went down to 43 years. For the female it was 64 in 1991 and it decreased to 45 years in 2001. (12) During 1999 – 2001, deaths in the region increased by 122%. (12) This was more among the adults than children. The possible explanation of increase in deaths could be due to HIV/AIDS as people who worked in other parts of the country come back home to die. This was the period Namibia recorded highest HIV prevalence among pregnant women (22% in 2002) and antiretroviral (ARV) treatment had not yet began. (6)

Ohangwena is one of the poor regions in the country. There is hardly employment opportunities for unskilled workers and the employment rate was 36% in 2003 (national was 31%). (12) The region is rated as 2nd least developed in the country and it is third in terms of poverty. (12)

1.3.2 TB in Ohangwena

The region has been reporting fluctuating data on TB causing the reliability of data to be questioned by the national level. (13) The trend data of new and re-treatment cases for 2003 - 2007 are presented in Annex 4.

Treatment success rate in the region was 76% in 2006 but trend fluctuates (see Table 1). Failure to treatment has been relatively low among new smear positive patients (Table 1) in comparison with re-treatment patients (Table 2). Treatment failure among the re-treatment cases reached the highest level in 5 years time as it records 24% in 2006

cohorts. (11) The region experiences also high rate of mortality both among new and re-treatment cases. The default rate in both new and re-treatment cases are below the national target of 5% (see Table 1 & 2). Absconding tuberculosis treatment has negative consequences such as creating TB drug resistance. Drug resistant tuberculosis is more difficult to treat than drug susceptible TB strain.

Table 1: Trend of treatment outcome for new smear positive tuberculosis cases in Ohangwena region for the period 2002 - 2006

Year	Cured No. & % (1)	Rx comp No. & % (2)	TSR No. & % (1+2)	Died No. & % (3)	Failure No. & % (4)	Default No. & % (5)	Transfer No. & % (6)	Total (7)
2002	261 (70%)	23 (6%)	290 (76%)	54 (14%)	10 (3%)	21 (5%)	8 (2%)	383 (100%)
2003	421 (72%)	31 (5.3%)	452 (77.3%)	88 (15%)	7 (1.1%)	24 (4.1%)	15 (2.5%)	586 (100%)
2004	348 (76.5)	28 (5.5%)	412 (82%)	69 (13.8%)	2 (0.4%)	10 (2%)	9 (1.8%)	502 (100%)
2005	323 (67%)	39 (8%)	362 (75%)	67 (14%)	14 (3%)	24(5%)	14 (3%)	481 (100%)
2006	340 (66%)	49 (10%)	389 (76%)	69 (14%)	17 (3%)	19 (4%)	17 (3%)	511 (100%)

Source: MOH 2006 (13)

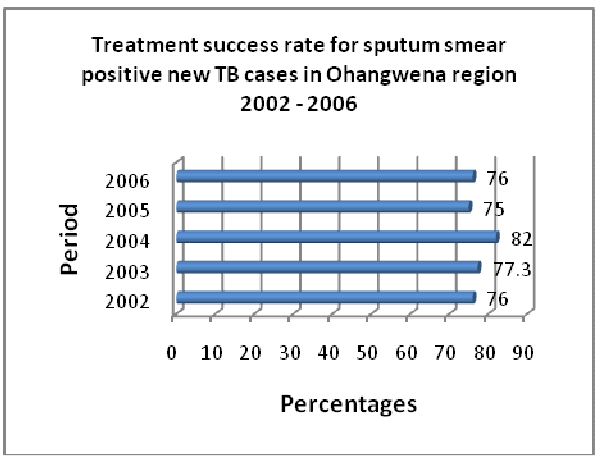
Table 2: Trend of treatment outcome for smear positive re-treatment tuberculosis cases in Ohangwena region for the period 2002 - 2006

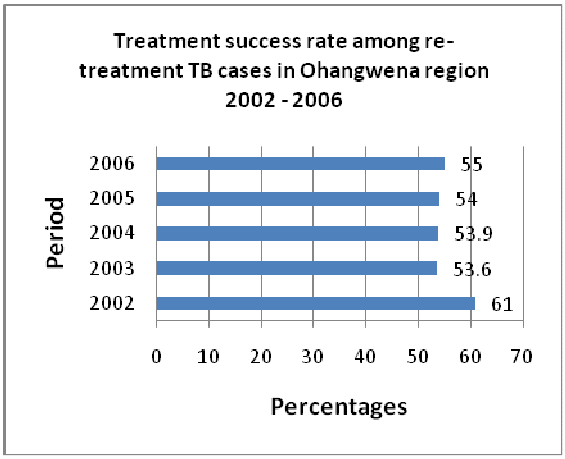
Year	Cured No. & % (1)	Rx comp No. & % (2)	TSR No. & % (1+2)	Died No. & % (3)	Failure No. & % (4)	Default No. & % (5)	Transfer No. & % (6)	Total (7)
2002	20 (25%)	29 (36%)	49 (61%)	18 (22%)	2 (2%)	8 (10%)	4 (5%)	81 (100%)
2003	28 (34.1%)	16 (19.5%)	44 (53.6%)	22 (26.8%)	1 (1.2%)	9 (11.1%)	6 (7.3%)	82 (100%)
2004	23 (25.8%)	25 (28%)	47 (53.8%)	26 (29.2%)	0 (0%)	14 (15%)	2 (2%)	89 (100%)
2005	12 (32)	8 (22%)	20 (54%)	9 (24%)	2 (5%)	3 (8%)	3 (8%)	37 (100%)
2006	24 (41%)	8 (14%)	32 (55%)	10 (17%)	14 (24%)	0 (0%)	2 (3%)	58 (100%)

Source: MOH 2006 (13)

Though the mortality rate among retreatment reduced from 29% in 2004 to 17% in 2006, (11) it is still unacceptably high and it has pushed the treatment success down. The possible explanation of high death rate and failure rate among re-treatment cases could be the HIV co-infection and MDR-TB.

Graph 2 & 3: Indicating the trend of treatment success rates of smear positive new cases and re-treatment in Ohangwena region 2002 - 2006





Graph 2: Source: MOH, 2006 (13) Graph 3: Source: MOH, 2006 (13)

The TB programme in the region is a part of Division Special Programmes which consists of HIV/AIDS, STI, Malaria and TB. The division is coordinated by a Chief and a Senior Health Programme Administrators. At district level, the District TB Coordinator (DTC) and Primary Health Care supervisor (PHCS) are the people responsible for the programme, supported by the Principal Medical Officer (PMO) who is in charge of the district. The DTC works with another registered nurse to man the Special Programme activities in the district (see Annex 2 & 3).

The health care services are provided in public facilities which consist of 3 district hospitals, 2 health centres and 26 clinics. (9) ARV services are provided in 3 separate clinics situated in the 3 district hospitals. The region has also 5 private medical practitioners and two private pharmacies. It is also recognized that there are many traditional healers in the region but their number and extent of their services are not well documented despite their popularity in the community.

The region has now two community based groups (CBO) that assist with educating the community about the spread of TB. Community based directly observed treatment (CB-DOT) is implemented by allocating every patient a guardian from his/her household or neighbourhood to supervise the treatment.

Chapter 2: Problem statement and methodology

Chapter two describes the statement of the problem and the study questions. It further describes the methodology used including search strategy and inclusion criteria. The aim and objectives of the study are also part of this chapter. The chapter ends with the justification of the study and the limitations.

2.1 Problem statement

Though the performance of the TB program has been improving steadily for treatment of new patients, there is now growing concern on the emerging MDR-TB cases. The exact magnitude of the problem is unknown but the national drug resistant TB survey was conducted in 2008 and the results are not yet released. However, at the end of the year 2007, the country had reported 268 cases of drug resistant tuberculosis of which 254 (95%) were multi-drug resistant tuberculosis. Of the 254 cases 9 were from Ohangwena region. (4) By end-December 2008, Ohangwena regional TB programme reported having 36 cases of MDR-TB on treatment. (14) In March 2009, the minister of Health and Social Services revealed data of confirmed Extensively Drug Resistant TB (XDR-TB) cases in Namibia. Twenty three (23) XDR cases were confirmed and thirteen (13) of them died. (5) The fatality rate was 57%. (5) The emergence of MDR and XDR-TB is a symptom of an earlier or recent failure of TB control. Addressing M/XDR-TB is a major challenge, both in terms of preventing its emergence and its spread, as well as providing services to those patients suffering from this complicated form of TB. Although Ohangwena region has also made good progress in TB control, it needs to address this particular challenge.

2.2 Justification/Rationale

Multi-drug resistance is a threat to public health in Namibia including Ohangwena region. Though the magnitude of the problem still needs to be determined, it is of importance to identify the pushing factors that favour the emergence of MDR-TB in Ohangwena region. Despite the absence of active MDR-TB monitoring system in the country, it is evident that cases are increasing. There was no study on MDR-TB conducted in Namibia hence this one will contribute to better knowledge on prevention of the MDR-TB. MDR-TB has devastating consequences to the patient, family, community and health care system. (3) The disease is difficult to treat and it requires long time treatment and yet it has worse outcomes. (15) MDR-TB requires massive resources to both patient and his/her family and also to the health care system. M/XDR-TB proved to be more lethal if

compared to drug susceptible TB strain. (16) With the high HIV prevalence (17.8% in 2008) (6) in the country and Ohangwena region (21% in 2008) specifically, and high number of TB patients co-infected with HIV (national 59% in 2007) (4), MDR-TB is really a threat in Namibia.

The result of this thesis is primarily targeting the regional directorate TB & Leprosy Program. The findings are expected to expose some issues that may be helpful for the program planning and eventually improvement in prevention and management of M/XDR-TB in Ohangwena region.

2.3 Aims and objectives

2.3.1 Aim

The aim of the study is to explore the factors that favour the development and spread of M/XDR-TB, possible prevention strategies against M/XDR-TB in Ohangwena region.

2.3.2 Specific objectives

1. Describe the factors that favour the development and spread of multi-drug and extensively drug resistant tuberculosis
2. Explore experiences of other countries in the prevention of development and spread of M/XDR-TB that are applicable in the Namibian situation
3. Describe the current strategies in place to prevent development and spread of resistant TB and identify gaps
4. Give recommendations that will help the regional directorate to better address the problem of MDR- and XDR-TB

2.4 Study questions

1. What are the factors contributing to the increase of M/XDR-TB cases
2. What preventive measures can be taken to curb the development and spread of M/XDR-TB in the region?

2.5 Methodology

This is a literature and desk review study. Information is collected through reviewing the existing literature on TB and M/XDR-TB from different sources via internet and other available data. Country information (available) will be used though Namibia has limited accessible information on the website. National TB Control Program reports are also used. Other

studies done elsewhere are also used. Internet search using Pubmed, Google Scholar, Scopus, KIT library and specific websites such as WHO, Stop TB partnership and the Union are used. Objective 1 is answered using an adapted framework of agent, host and environment while the second and third objectives were described following the DOTS-Plus Strategy framework of the WHO. The two frameworks were used as complementary in the discussion chapter.

Key words: MDR TB, Southern Africa, TB treatment success rate, XDR TB, TB prevention, burden of MDR, management of MDR, drug resistant tuberculosis, TB in Namibia, epidemiology of tuberculosis, TB infection control, DOTS-plus, barriers in TB management, TB treatment, adherence to treatment, and the combinations thereof.

2.6 Inclusion criteria

The literature search was limited to the last 10 years at the most. The search includes only the literature in English and with full text available. Literature was not limited to specific countries because of the commonality in the nature and spread as well as the management of TB including M/XDR-TB. Literatures which were already cited by others and relevant to Namibian situation were prioritized.

2.7 Limitations

The information collected for this study is limited to a literature review. Primary data collection could have given much more information but was not feasible given the time constraint and funding limitations. There are hardly scientific literatures on MDR-TB in Namibia, and if there are, they are not published. This made me to rely on international literature which could be relevant to Namibian situation but not always work because of differences in geographical, disease trends, health care systems and other factors.

2.8 Key concepts

Cure rate: A patient who is sputum smear negative in the last month of treatment and on at least one previous occasion (only applies to patients who were initially sputum smear positive) (17)

Defaulter/absconding: A patient who interrupts treatment for two consecutive months or more (17)

Failure (treatment failure): A patient who is sputum smear positive at five months or later during the course of treatment (only applies to patients who were initially sputum smear positive) (17)

Multidrug resistant tuberculosis: Resistance against both Isoniazid and Rifampicin which are the most efficacious anti TB drugs present, (1;17).

New (TB) cases: A patient who has never been treated for TB or who has been on anti-TB drugs for less than four weeks (17)

Relapse: A patient previously treated for TB who was cured or who had completed treatment and is now diagnosed with sputum smear positive or culture positive tuberculosis (17)

Treatment completed: A patient who completed treatment but who does not meet criteria to be classified as cured or failed. Also applies to patients initially sputum smear negative, patients with extra-pulmonary tuberculosis and patients who cannot produce sputum (17)

Treatment success rate: These are patients who have been cured and those who completed treatment (17)

Extensively Drug Resistant tuberculosis (XDR-TB) means that in addition to being multi-drug resistant (against Isoniazid and Rifampicin) the strain is further resistant to one of the fluoroquinolones (ofloxacin, ciprofloxacin, levofloxacine) and at least one of the three injectable second line drugs: capreomycin, kanamycin and amikacin, (1).

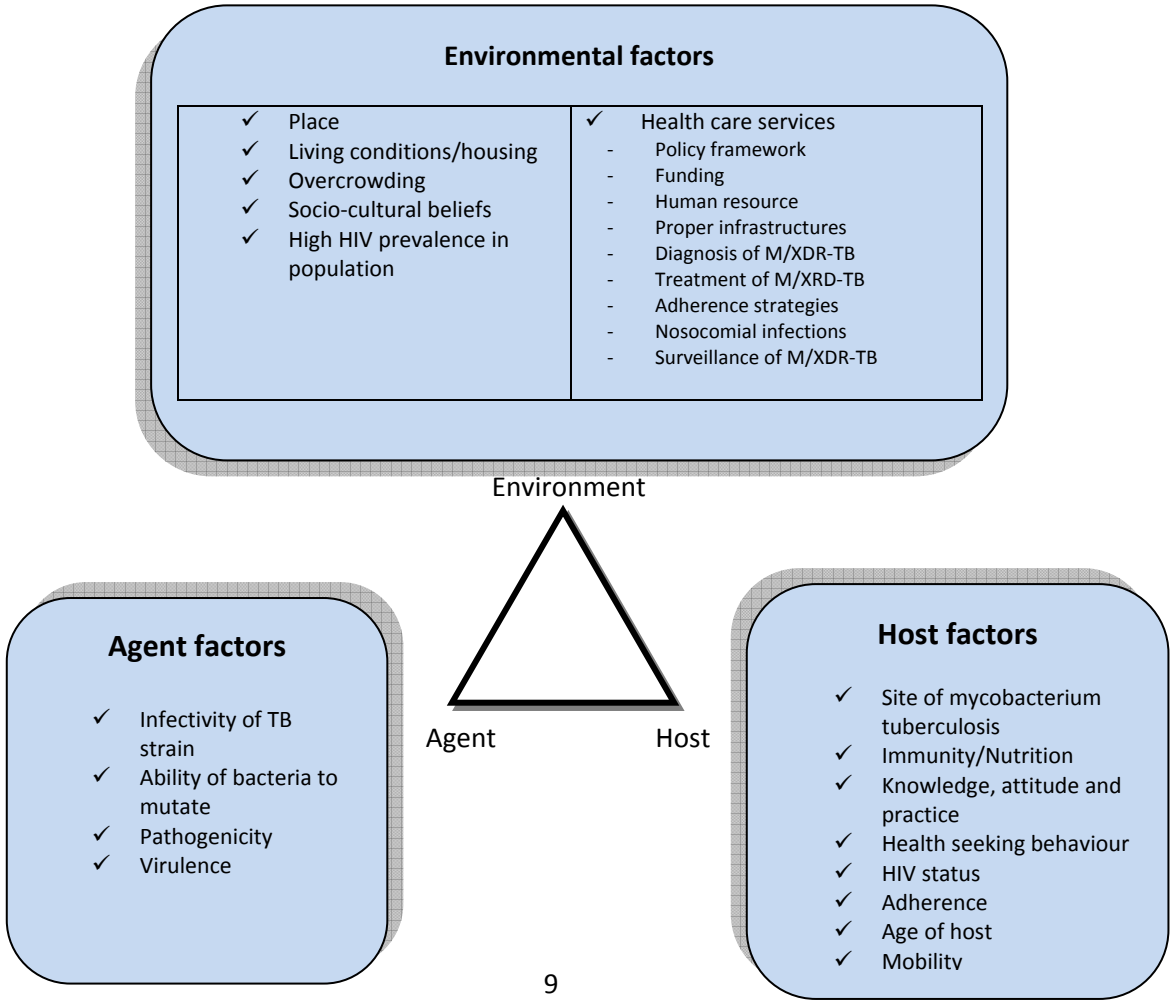
Chapter 3: Findings

The chapter describes the epidemiology of MDR-TB using the adapted explanatory framework which is organized under three factors i.e. agent, host and environment. Another framework is also used to cover objective 2 & 3 of the thesis i.e. exploring the recommended approaches and experiences from other countries as well as the current strategies done by Namibia including Ohangwena region in the prevention of spread and development of M/XD-TB.

3.1 Factors contributing to development and spread of M/XDR-TB

Tuberculosis is one of the oldest diseases that affected populations in all parts of the world. (18) It is caused by bacteria from the Mycobacteria group. The framework below explains the factors that favour the development and spread of M/XDR-TB (Figure 1). Each factor is explained individually on how it contributes to the emergence or spread of M/XDR-TB.

Figure 1: An adapted explanatory framework for the development and spread of M/XDR-TB (adapted from Nguyen & Pieters, 2009 (19))



3.1.1 The agent: Mycobacterium tuberculosis

Multi-drug resistant tuberculosis is caused by the same bacteria that causes drug susceptible TB. The resistant strain of Mycobacterium tuberculosis emerges with or without exposure to anti-TB drugs. The following factors are described to depict their contribution to the emergence of M/XDR-TB.

3.1.1.1 Infectivity of bacteria

The agent that causes TB is called Mycobacterium tuberculosis which is an aerobic pathogen. (20;21) The transmission mostly occurs through coughing up infectious particles from ill patients into the air and other people inhale it. (20) These bacilli can stay infective in suspension for hours, but they easily die if exposed to sunlight. For a person to be infected it depends on the "concentration of bacilli, aerodynamic features, ventilation rate and exposure period". (20) This is the same way M/XDR-TB develops and spreads. Amor adds to the argument that each MDR-TB patient infects approximately 20 more people. (22)

The bacteria has a strong characteristic of demonstrating the "ability to evade the defence mechanisms of human immune system" (19;20) making it live longer in human body and still able to cause disease (23) if the body immunity gets weaker.

3.1.1.2 Ability of bacteria to mutate

Nguyen & Pietes in their study indicated that there is growing evidence that pathogenic mycobacteria employ different tactics to recognize and defend themselves against antimicrobials. (19) The drug resistant mycobacteria remain infectious as long as it indicates sputum positive through culture test. (20) It is argued that MDR-TB episode could average around 1.64 years, (24) although the exact duration is still unknown. The frequent genetic changes of mycobacterium tuberculosis lead to the agent to be resistant to the most powerful anti-TB drugs i.e. Isoniazid and Rifampicin. (16) This also gives a challenge in the development of new anti-TB drugs.

3.1.1.3 Pathogenicity

TB bacteria infect many people but under normal circumstance where people have good immunity only about 10% of the people infected will develop TB disease in their life time. (20) However if a person is HIV positive, on average there is risk of developing disease is 10% per year. (25) Most of the TB infection happens between the beginning of coughing and the onset of treatment. (26)

3.1.1.4 Virulence

Whether the MDR-TB is more aggressive than drug susceptible one, it is still debatable. The review by Dye et al (2002) did not find any evidence whether MDR-TB strain is more virulent than that of drug susceptible TB. (27) However the virulence of the MDR-TB strain appears to be assisted by the presence of host factors such as HIV infection and/or low immunity. (27) M/XDR-TB is more fatal especially when the host is having AIDS. (21) In another study, Ducati (2006) highlights that virulence of mycobacterium tuberculosis depends on the genotype of specific strain (20). There is high death rate among MDR-TB patients who are HIV positive and one review found that the period between diagnosis and death is shorter, only 4 – 16 weeks. (20) Wells et al agrees that the drug resistant strain from Beijing genotype family is "more virulent and caused epidemic of MDR-TB" in different countries, (28) while in South Africa's well documented Tugela Ferry XDR-TB outbreak case, the genotyping found that 85% of cases were local (KwaZulu Natal), (29) which was also highly fatal.

3.1.2 Host

Despite the infectivity, ability of bacteria to mutate, virulence and pathogenesis of mycobacterium tuberculosis, it needs a human body to survive. (19) Being infected with M/XDR-TB comes in two ways. The first is when the person infected with mycobacterium strain was not well treated through receiving "monotherapy", inadequate treatment or was not well compliant to treatment. Secondly, a patient who never used TB drugs before gets infection by inhaling a resistant strain of TB bacilli and this mostly happen in overcrowded settings with poor ventilation. (30) The following are the issues that can put an individual at risk of developing and spreading MDR-TB.

3.1.2.1 Site of the mycobacterium TB in the host

Among all the forms of tuberculosis pulmonary TB is singled out as having serious externality. (31) When the diseased person coughs or sneezes without covering the mouth, he/she sends out infectious droplets that has ability to spread and infect other people, hence its importance in public health. (31) It is however known that in TB endemic areas, many people have latent TB infection which it is difficult to diagnose. (31)

3.1.2.2 Immunity

Generally, good immunity helps the body to fight diseases. MDR-TB strain like drug susceptible strain favours people with poor immunity. The updated review on MDR-TB (2007) indicated a link between development of MDR-TB and poverty. (32;33) Poor people do not have enough

resources to boost their immunity. Less virulent TB strains were found to be common among immune compromised people. (18) The host immunity determines the progress of the infection resulting in either immediate elimination of the bacilli, form latency or cause disease. (20) Latent TB awakens if the person's immunity is no longer intact. (34) Co-morbidity with other diseases and conditions that lowers the person's immunity such as diabetes mellitus, renal failure, chemotherapy for cancers and malnutrition, makes the host vulnerable to develop TB including MDR-TB disease. (35)

3.1.2.3 Knowledge, attitude and practises

Research found low educational status and lack of information as a risk factor for TB spread. (1) The systematic review by Storla et al (26) on the delay of seeking treatment among TB patients revealed that stigma plays an important role in patient's decision making to seek care. (26) Nowadays, HIV and TB are perceived as the same disease in the community and this means double stigma. Cultural beliefs in the community direct individual decisions. In some communities, TB is regarded as a result of evil spirit or witches. (26;36)

3.1.2.4 Health seeking behaviours

Communities have their norms on what to do when gets sick. They also have their criteria to determine which disease to take where and when. This is supported by Meintjies (36) who found that in South Africa, it is common that people first go to the traditional healers before they turn to the formal health care system. (36) The other risk factor for spread of M/XDR is the self medication with "over the counter" medications which may not be adequate or appropriate for the disease. (22) This causes delays in diagnosis and treatment, and in case of MDR-TB it creates more room for the spread of infectious TB to other people. Availability, accessibility and affordability of health care services influence the decision of a sick patient whether to seek treatment or not. (33;36) Immigration of sick people for different reasons can also have a negative influence on health seeking behaviours. (26) This can be viewed in terms of illegally migrants whose first priority is security and health comes last. In case of M/XDR-TB, this immigrant will infect many people around him/her before he/she gets diagnosed and receives treatment.

3.1.2.5 HIV status

HIV infection is the strongest factor to TB spread. (18) It is an undisputed fact that there is a relationship between HIV and the spread of

tuberculosis, including MDR-TB though "HIV in itself is not a risk for developing MDR-TB". (37) Jain et al (2) argues that a patient who is HIV positive has 5% - 15% risk per year of developing tuberculosis, as opposed to 10% risk in life time when the person's immunity is intact. (20) However, Donnelly was more cautious and reasons that the "dynamics of MDR-TB transmission" among HIV positive populations still need to be well understood. (3) Generally, it is observed that among individuals who are HIV positive, the prevalence of extra-pulmonary tuberculosis is higher. Resistance to Rifampicin is 7 times common among HIV positive patients who are also having TB. (16) The treatment of MDR-TB in HIV positive patient is more complicated due to drug interactions and side effects. (38)

3.1.2.6 Adherence to treatment

Adherence to treatment is influenced by many factors. The length of treatment alone has made some patients to stop TB treatment, leading to the development of M/XDR-TB strain. (31) Intolerance to treatment side effects, misuse of alcohol, use of habit forming drugs, psychiatric disorders are some of the factors found to have influence on adherence to TB treatment and pave way for the development of M/XDR-TB and its spread. (2;38) Jain et al (2) referring to this, quoted Sharma that immune-suppression, history of imprisonment and homelessness" caused patients to abscond TB treatment. (2;18) It was also found that symptoms relief, lack of transport, socio-economic barriers have a considerable bearing on non-adherence to TB treatment. (1) In South Africa, prolonged inpatient management of M/XDR-TB patients made the patients to be uncooperative, violent and abusive where they even started smuggling drugs and alcohol in the hospital. (39) Such unruly situation complicates the treatment of M/XDR-TB as patients refuse to take medications. It also violates the patients' rights.

3.1.2.7 Age and sex

Though many studies were not conclusive whether M/XDR-TB favours certain age group or sex, in Argentina, young people were significantly found to have MDR and it was more among women than men. (40) This however may differ from country to country and from place to place within the same country. Children are at risk of being infected by their infected parents or caretakers with either drug susceptible and M/XDR-TB. (41) This chance is significantly higher if a child is HIV positive. (41) In South Africa, studies found that 78% of children suffered from TB were exposed by infected parents or close relatives. (41) Though there is no

trend data on M/XDR in Namibia, the age group most affected by TB is 15 – 54 years and more men than women are affected. (4) This is the productive group which is also worse affected by HIV epidemic. (6) A systemic review (26) on delay to access treatment highlighted elderly people as at risk of developing TB due to their poor immunity and they are also likely to delay accessing treatment (26) because of their dependency to other people.

3.1.2.8 Mobility

M/XDR-TB does not know state borders as infectious patients continue to travel between countries using public transport. (3;37;42) In Argentina, studies found that new MDR-TB strains were introduced by migrants from neighbouring countries, (40) while in Lesotho, a country that is surrounded by South Africa, the cases of MDR-TB have been increasing and is blamed on daily mobility between the two countries. (43) Controlling cross border transmission of M/XDR-TB is difficult because the disease is air-borne and hosts are not identifiable on sight.

3.1.3 Environment

As the agent needs the host to survive, the host also need an environment to operate from. The environment of the human being is complex and influenced by many factors. The following factors are described in relation with the development and spread of TB.

3.1.3.1 Place

The spread of MDR-TB may differ from place to place, depending on the factors that favour the spread. In South Africa, it was found that some provinces have higher rates of MDR-TB than others. (44) More so, the spread of pulmonary TB favours congregate settings with limited ventilation. Habeenzu et al (45) found that in Zambia the spread of MDR-TB in the Zambian prisons is 10-fold that of the general population. (45) Ohangwena has 4 police cells for the awaiting trial inmates, these places are overcrowded and poorly ventilated and the access to medical care for the inmates is very limited. This is also a general problem in the country. This forms a potential breeding site for MDR-TB. Hospital wards, overcrowded waiting rooms in hospitals and clinics are regarded as potential places for the spread of M/XDR-TB. (46)

3.1.3.2 Living conditions

Improving living conditions of the populations is regarded as one of the long term dream that will reduce not only TB including M/XDR but also

other poverty related diseases. (47) Basic housing with well ventilation and sufficient space for the people is needed. Living conditions includes sufficient employment in order to earn income, good nutrition, availability, accessibility to, acceptability and affordability of health care services are some of the requirements of standard living. (3;47) In poor low and medium income countries, this is far from being achieved. People are flocking to towns in search of better living conditions and end up in slums as they cannot afford standard living conditions in towns. (9) This causes overcrowding and creates more health related demands.

Living conditions is also influenced by education. The people who are educated are usually having better jobs and better living conditions including better housing. (1)

3.1.3.3 Overcrowding

Overcrowding is a risk factor for the spread of TB including M/XDR. This is more pronounced when people gather in places with inadequate ventilation. Studies confirmed that places such as prisons facilitate the spread of airborne diseases. (45) Ironically, hospitals which were expected to restore people's health have also become source of M/XDR-TB because of overcrowding and poor ventilation and improper infection control strategies. (48) This is more common in areas where the people gather in waiting rooms for a long time while awaiting to be served.

3.1.3.4 Socio-cultural beliefs

Cultural practices are found everywhere in the world. Some cultural aspects are harmful to the health of the people who are practising it. Studies show that stigma led to delay to seek treatment among Malawians. (49) This same sentiment is also shared in China (50) but not in Syria. (51) This indicates cultural differences in seeking health care.

Misuse of alcohol is almost in every community. The effect of excessive drinking of alcohol has negative social consequences. Studies found that alcohol misuse led to delay to seek TB treatment among men (64%) and women (40%) in Syria. (51) In India, it was also found that alcohol led to 28% of patients abscond treatment. (52)

In many societies, caring for a sick person is culturally the women's responsibility. (53) It is expected that women be at additional risk of acquiring M/XDR-TB as in most cultures they take care of their sick people.

In some communities, people believe that TB is a result of witchcraft or due to a certain punishment. (26;36) This belief deters people from seeking health care on time. In case of witchcraft, culturally people seek help from traditional healers. (36) This delays early recognition of diseases such as M/XDR-TB and prompt initiation of treatment.

3.1.3.5 HIV prevalence in the community

HIV per se is not a risk factor for developing M/XDR-TB (37), but the fact that it reduces the host's immunity, it predispose a person to acquire the infection and develop the disease. (2) HIV activates latent tuberculosis infection to become a disease. (17) It is also documented that diagnosing TB in HIV positive person is difficult and it results many false negative outcomes during diagnosis. (38) Treatment of MDR-TB in an HIV infected person is also difficult because of drug interactions, high toxicity of drugs and serious side effects. (1)

In high HIV prevalence settings, MDR-TB spreads faster because of vulnerability of the people due to low immunity. (2) A study done in South Africa (2) indicated that M/XDR-TB was more prevalent among the HIV positive patients. It is further explained that with HIV, M/XDR-TB is more fatal. (48)

3.1.3.6 Health care services

- **Policy framework**

M/XDR-TB is now enjoying high international attention. The WHO and its partners in fighting TB have laid down general guidelines that would help national governments to develop their national policies on the prevention and management of TB including MDR-TB. The introduction of DOTS (Box 1) was the first guide that helped many countries to detect and treat more TB patients using the short course chemotherapy (SCC). It is unlikely that a given country in the poor resource setting has fully implemented the DOTS strategy. In the high prevalent MDR-TB countries there is also a way out, the DOTS-Plus Strategy (Figure 2). The adoption of Millennium Development Goals (MDGs), the STOP TB partnership goals (Box 2) and many international conferences including the recent Beijing "Call for Action" meeting (47) for the M/XDR-TB high prevalent countries, are all aiming to shape the policies on how to curb the development and spread as well as improve the management of TB including M/XDR-TB.

However, the policy framework at international level does not change how the countries operate. Political will and commitment, will help countries to

ratify the international policies into the national and operational form, including allocation of resources, (3).

Box 1 & 2 indicate DOTS and STOP-TB strategies for TB management

Box 1: Elements of DOTS strategy
-Political commitment
-Secure supply of medical and diagnostic materials
-Diagnosis and follow up based on sputum smear microscopy
-Treatment using short course chemotherapy
-Monitoring through proper recording and reporting

Source: WHO (1)

Box 2: STOP TB strategy elements
-Pursuing high quality DOTS expansion and enhancement
-Addressing TB/HIV, MDR-TB, XDR-TB, and other challenges
-Contributing to health system strengthening
-Engaging all care workers
-Empowering people with TB, and community
-Enabling and promoting research

Source: WHO (1)

The challenge remains the poor health systems and inadequate resources especially in poor resource settings. It is obvious that some DOTS and STOP TB strategy elements are easier to implement than others (see Box 1 & 2). Namibia has adapted DOTS, Millennium Development Goals and now the DOTS-Strategy. (9) Guidelines have been developed and the first Mid-Term Strategic Plan (MTP-I) for 2004 – 2009 was developed and implemented. (7;9)

Funding

For the TB programme to implement the provisions of the policy there is need for funds. Plans without funding will not bear fruits. TB programme in Namibia has been without funding for a long time. The yearly budget allocation from the Ministry of Health to the National TB Control Programme for operational activities has been fixed at N$50,000 (approx. US$5,900). (7) This state of underfunding of TB programme necessitated the development of MTP-I to use it as a tool to solicit for money. (11) Despite this low funding for the programme Namibia still claims that DOTS programme has been fully implemented in 1993. (9) Money was however secured through Global Fund and TBCAP to enable the implementation of MTP-I after March 2005. (11) This funding has made the programme to kick off at all levels, i.e. national, regional and district level.

In Zimbabwe, the economic breakdown led to "massive under-diagnosing and inappropriate treatment of MDR-TB", (42) while in Lesotho the increase in spending for the TB programme led to improved results in M/XDR-TB treatment outcome. (3) Funding is the key because every activity in the programme needs money for implementation.

Human resource

Human resources are vital for the implementation of programmes activities. (9) In Namibia, the NTCP has been manned by one person who is the Programme Manager. The Staff establishment did not give more posts. Only recently that the Ministry of Health created 3 more posts which are now filled and through the support of the Global Fund one additional nurse, a communication officer and a driver was recruited while TBCAP through KNCV Tuberculosis Foundation complemented the MOHSS staff establishment with 4 additional medical officers, 2 financial managers and one driver. (13) These additional staff assisted the programme to take shape and led to the implementation of MTP-I targeted activities both at national and regional levels.

At regional level, TB programme is a sub-programme under the division special programmes (HIV/AIDS, STI, TB, Malaria). (4) The division is run by two officers. This is also a barrier in the programme management as officers are trying to satisfy all the sub-programmes' demands.

Of importance for the development and spread of M/XDR-TB is the availability of skilled staff to diagnose and treat the patients. Regions have limited staff especially the medical officers. The NTCP annual report says that only a number of 38 staff members in the country consisting of medical officers, laboratory technicians and pharmacy staff have been trained in diagnosis and treatment of MDR-TB. (4) The gap in terms of quantity trained is still wide. The ideal situation is to have most of the nurses and medical officers in the districts trained so that they are able to recognise both drug susceptible and M/XDR-TB suspects and initiate the process of diagnosis that will lead to prompt treatment. Inadequate number of nurses and medical officers in the districts hamper the smooth implementation of programmes including TB.

Proper infrastructures

Lack of financial resources (18), inadequate isolation and ventilation measures in health facilities, (18;32;37), lack of supervised treatment and limited or interrupted drug supply (18) are some of the factors that lead to the emergence of M/XDR-TB. Andrews et al added to the list that poor health infrastructures and lack of trend data make it difficult to address the problem of MDR in Africa. (44) This is in agreement with the Namibian situation where there are no MDR-TB trend data and there is only one laboratory in the country that can diagnose MDR-TB. Lack of adequate infrastructures is a limiting factor in the prevention and management of M/XDR-TB in the region.

Diagnosis of M/XDR-TB

One of the core methods of fighting the spread of M/XDR-TB is the early recognition of the disease. This requires well trained and experienced medical officers and nurses to suspect M/XDR-TB cases and send specimen to the laboratory. (17) Delayed recognition of MDR-TB (18;32;37) has a negative effect on the prevention of M/XDR-TB. Health care system delay includes a situation where the patient presents him/herself with the symptoms but the health workers failed to recognise them and treated for something else. (17) The health system delays especially in terms of M/XDR-TB have a negative impact not only on the index patient but also to the community and to the health care system itself. (44) The availability of protocols and flow charts on M/XDR-TB is important because it guides health workers on how to help the patient. It is also important to note that the current practice of only suspecting M/XDR-TB among patients who failed category I treatment is a delay in recognising the disease early enough.

Recognition of the disease demands the availability of, accessible and affordable laboratory services that can perform culture and drug sensitivity tests. (1) It has also been documented that drug sensitivity testing (DST) for second line drugs (SLDs) shows poor reliability and reproducibility if compared to that of first line drugs. (1) This can lead to treating patients with non-effective drugs which further leads to MDR-TB infections and the development of XDR-TB. The laboratories also need to have knowledgeable and skilled staff capable of performing the required tests. (54) Delay in diagnosis could also be caused by patient self. (55)

Treatment of M/XDR-TB

Treatment of M/XDR-TB demands the availability of second line drugs (SLD). (1) The proper prescription and use of these drugs help lowering the bacteria load in the host and prevent further infections. Improper use of the SLD leads to the emergence of extremely drug resistant tuberculosis (XDR-TB) which is more dangerous and difficult to treat. (1;3) The treatment of the MDR-TB is long (24 months) (17), and this is in addition of the months a patient has already spent taking drugs for drug susceptible tuberculosis. The duration of treatment and severe side effects due to medications may tempt the patient to drop out.

Lack of supervised treatment and limited or interrupted drug supply (18) are some of the factors that lead to the emergence of M/XDR-TB.

- **Adherence to treatment**

From health care perspective it is also important to look at adherence as a factor in the development of M/XDR-TB. Irrational drug prescriptions, patient non-adherence (18;32;37), lack of patient follow-up, allowing self medication, absence of DOT programme, lack of financial resources (18), giving only one drug to treat TB, or drugs of the same type and inadequate drug regimen give the TB strain opportunity to form resistance against the drugs available. (20;44) Effective patient support through treatment counselling, easy access to medication, having understanding and supportive staff and use of DOT supporters led to better adherence to treatment and improved treatment outcome. (56;57)

- **Nosocomial infections**

Hospitals are places where MDR-TB can easily spread as indicated in the South African case where 67% of XDR-TB/HIV positive patients suspected to have acquired the disease while hospitalized. (29) Unavailability and poor implementation of infection control guidelines in hospitals can lead to practises that favour cross infection in the clinical settings. (58) Inadequate infrastructures in terms of quantity (not enough space) and quality (no respirators as required by WHO standard guideline) pave way for spread of M/XDR-TB in health care settings. (1;3) Laboratories need to comply to the standards of infection control to avoid spread of diseases such as M/XDR-TB. (1)

- **Surveillance**

Active surveillance plays also a role in the prevention of M/XDR-TB cases. (1) Knowing the epidemiology of the disease in terms of person affected, place where cases are coming from and timeliness of reporting helps the planners to put up responsive activities. (59) Non-availability of trend data on MDR-TB in Namibia hampers the proper preventive measures to be ensued. (4) Inadequate recording and reporting of cases especially in case of M/XDR-TB denies the disease to receive the attention it deserves and allows further spread. (1)

Of utmost importance is also drug resistance surveillance for MDR-TB in the country because it sheds light on the magnitude of the problem. This will help to plan for resources needed in order to prevent further spread of the disease. In Namibia drug resistant surveillance survey was only conducted in 2008 (4) and the results are still outstanding. In other countries where the same surveys were conducted, results indicated low

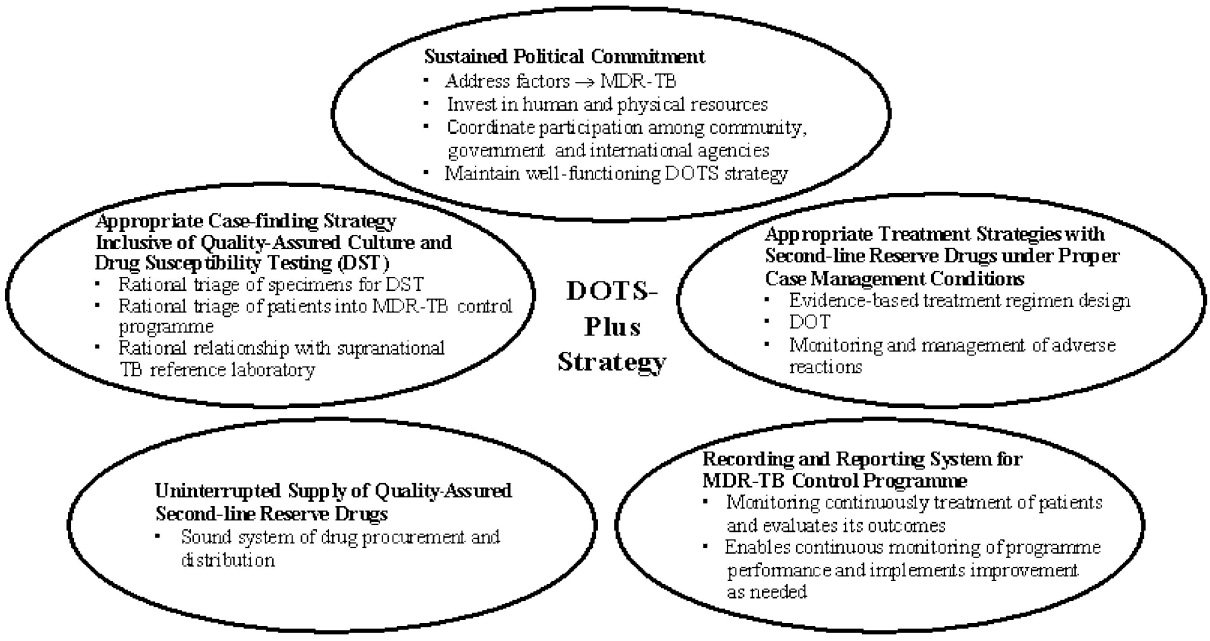
prevalence of MDR-TB among the persons never treated with anti-TB drugs before. (1)

3.2 Recommended responses and experiences of other countries on the prevention of M/XDR-TB

Many studies are in agreement that the best way to eliminate multi-drug resistant tuberculosis is to effectively implement the elements of tuberculosis control – the DOTS strategy. (15;27;28;60) WHO has also adopted a DOTS-Plus strategy that focuses on the effective prevention and management of MDR-TB, (Figure 2).

This section uses the DOTS-Plus Strategy framework to explore the recommended responses and lessons learned in the area of preventing the development and spread of M/XDR-TB. This framework is a comprehensive and targets all the components of MDR-TB. Therefore the model, in this section, will be used selectively and only the components that touch the prevention will be elaborated on.

Figure 2: Five components of DOTS strategy as applied to drug-resistant tuberculosis.



Source: Yew et al, 2007 (32)

3.2.1 Sustained political commitment

Tuberculosis programme has been running for years with little funding despite the heavy burden TB puts on communities and health care system. Political will and commitment to support the TB programme is the core for all the other components of both DOTS and DOTS-Plus Strategy (Figure 2). In Lesotho, where the DOTS programme was not well

functioning until around 2004, MDR-TB epidemic broke out. (3) With the minister of health leading the campaign, the programme started picking up as resources are mobilized, guidelines prepared, partners and community involved, laboratories revamped, staff trained, drugs made available, infrastructures renovated and surveillance strengthened. (3) This led to the reduction of infectious MDR-TB cases in the community and many lives were saved. (3) The starting point in MDR-TB prevention is always to have a functioning DOTS programme, and this is also a requirement for implementation of DOTS-Plus Strategy. (1) The national governments need to commit funding and mobilize resources, put up guidelines on how to prevent and manage M/XDR-TB, ensure that there are enough and trained human resources, and if need be seek assistance for external technical support. (1) It is also important that the health care system is strengthened (1) for it to be able to support the TB programme activities. Continuous monitoring and periodic evaluation helps to identify gaps and develop plans to address them. (1)

3.2.2 Appropriate case finding strategy (quality-assured C/DST)

Diagnosing MDR-TB cases is the first step in the effort to manage the disease and prevent further infections. Countries need guidelines on how to do this. The current practice is to test all patients who fail to convert after 2 months of taking first line treatment. (1) The limitations currently faced by governments are lack of proper infrastructures, outdated diagnostic equipment, long waiting period for C/DST results, inadequate laboratory staff. (1;20;54) In South African study on MDR-TB, Murphy concluded that to prevent diagnosis delays and improve on timely treatment they have to focus also on supporting laboratories (57) in terms of equipment, staffing and ability to perform required tests on time. This is important because MDR-TB treatment solely depends on proper diagnosis and drug sensitivity tests. Jain and Dixit (2) further argue that drugs (both 1^{st} line and 2^{nd} line) availability and their proper use and periodic drug sensitivity testing are prerequisite for reducing MDR-TB cases in the community. (2;60) The results of a systematic review remind that treatment delay is not only due to the unavailability of drugs and diagnostic equipment, but also due to patients factors. (26) This is a reminder that early initiation of diagnosis and subsequent treatment of M/XDR-TB is influenced both by the health care system and the patient.

The WHO further recommended the creation of supranational reference laboratories to help with diagnosing M/XDR-TB and provide technical support. (1) These labs are only in some countries and the neighbouring countries are attached to them.

3.2.3 Appropriate treatment strategies (both first line and second line drugs under proper case management conditions)

The use of poor quality anti-TB drugs and the irrational prescriptions causes the emergence on MDR-TB and equally the improper use of second line drugs leads to extremely resistant TB which is difficult to treat and has poor treatment outcomes. (37) The use of fixed dose combination drugs in TB treatment leads to better treatment adherence which in turn reduces the spread of infective drug resistant TB strain. (9) Proper management of side effect encourages the MDR-TB patients to complete treatment and become non-infectious. (1) Tailor-made treatment regimens are needed for special situations such as HIV positive patients, pregnant and lactating women, diabetes mellitus, renal and hepatic insufficiency, old people and the list continues. (47) As recommended by the WHO and its partners in fighting TB, directly observed treatment (DOT) is the key to adherence to lengthy treatments such as the one of TB including M/XDR-TB. (1;47) Other approaches found to be both cost-effective and successful is the use of community peer support. (28) This is also in agreement with the results of the study in one region (Omaheke) in Namibia which concluded that improved TB cure rates were significantly higher in community based supervised patients (community based DOT) than clinic or health workers supervised (health facility based DOT) patients. (56)

3.2.4 Uninterrupted supply of quality assured first line and second line drugs

For the treatment of MDR-TB to be effective, access to first line and second line drugs (SLD) is crucial. The availability of SLDs for MDR-TB depends on the political will and availability of money to procure them. (1) The WHO and its partners in TB organised a Green Light Committee which can assist governments to access quality assured SLDs at affordable price. (1) Of importance is that there should be a mechanism of stocking enough supply to avoid interruption of treatment. This requires a well organized national TB control programme.

3.2.5 Recording and reporting system for MDR-TB control programmes

The WHO recommends proper recording and reporting of all cases of TB including M/XDR-TB cases and the guideline is available to guide the national governments. (1) However availability of guidelines and registers do not in themselves improve recording. For instance in 2004 in Africa, among 46 countries whose MDR-TB records were examined for quality of data in registering deaths due to TB, 91% (countries) were rated “poor”.

(61) Consistence and completeness of information is required for comparisons and planning for prevention programmes. (61) M/XDR-TB can only be effectively prevented if there is reliable data to guide planning of interventions.

It is further required that the national TB programmes should be able to evaluate patient treatment outcomes. (3) Knowing the treatment outcome helps to identify people at risk of developing XDR-TB and the preventive measures can be employed.

3.3 Current responses to M/XDR-TB in Namibia including gaps identified

In this sub-section, the author describes how the NTCP Namibia addresses the issue of development and the spread of TB including M/XDR-TB. Gaps in the implementation of the programme especially at regional level have been identified and elaborated on.

3.3.1 Sustained political commitment

The National Tuberculosis Control Programme in Namibia has adopted WHO Directly Observed Treatment Short course (DOTS) strategy in 1993. (11) Currently the government is footing the bill of buying TB drugs (both first and second line), sputum examinations including C/DST, infrastructures and human resources, and providing free of charge treatment to patients. (4) All public health facilities implemented DOTS by 1995 and the first National TB Guidelines was introduced in the same year. (11) The TB guideline was later reviewed in 2005 in order to include MDR-TB and HIV/AIDS. (11) The first strategic plan namely Mid-Term Plan-1 (MTP-I) for 2004 – 2009 was only launched in March 2005. (11) The DOTS-Plus Strategy, though it was mentioned in the TB guidelines is only being closely considered now when cases of M/XDR-TB started increasing. (4) In Namibia the law that regulates drugs and related substances does not allow antibiotics to be sold in open market and by unqualified persons, as a result it is rare to find these drugs sold outside health facilities or registered pharmacies. The second line drugs are only available on public health facilities. (13)

Staffing has also been improving as the government took a step to employ expatriate medical officers to work in the regions on the two year renewable contracts. (9)

Funding has been secured through Global Fund and TBCAP to enable the implementation of MTP-I after March 2005. (11) This funding has made

the TB programme to kick off at all levels, i.e. national, regional and district levels. Training of staff on MDR-TB has started (4;62) but goes slowly. Nurses in TB departments are usually rotated after few months which disturb the quality and continuity of patient care.

The treatment success rate of the new patient has been stagnant at about 70% (national) and 76% (Ohangwena – see table 1) for the period of 5 years. (4) This is not a good outcome and is attributed to poor funding of the programme which resulted in limited activities for the prevention.

The TB programme in Namibia has partnered with multilateral, bilateral and international organizations and local NGOs. (4) In Ohangwena the programme collaborates with Red Cross volunteers and recently the communication for behaviour impact (COMBI) programme who with the support of the Global Fund, educate the community and trace defaulters. (4) The involvement and participation of community based groups and other stakeholders are important in terms of reaching out to the community and sharing of information.

Gaps: Sustainability of funding is not guaranteed, as the programme heavily relies on the donor support. The yearly budget allocation from the Ministry of Health to the National TB Control Programme for operational activities has been fixed at N$50,000 (approx. US$5,900). (7) Private health care providers in the region are not trained in the management of M/XDR-TB. No clear policy on managing TB including M/XDR-TB in prisons, especially in police holding cells for the people awaiting trial. TB (also M/XDR-TB) activities are not mainstreamed in HIV multi-sectoral structures such as Regional AIDS Coordinating Committee (RACOC). (10) TB/HIV collaborative activities are not fully implemented. (4) There is no plan for advocacy, communication and social mobilization (ACSM) in the region.

3.3.2 Appropriate case finding strategy (quality-assured C/DST)

Culture and drug sensitivity tests for MDR-TB are done in Namibia while the tests for XDR-TB are done in Supranational Reference Laboratory (SRL) in South Africa. The turnaround time for getting results for C/DST has been slightly shortened when the national referral laboratory acquired a new MGIT 960 BATEC machine which does liquid culture. (4) The solid culture was taking about 4 – 6 weeks while the liquid culture results cuts this to half (2 – 3 weeks). The quality assurance system has been in place and is done through National Health Laboratory Services (NHLS) from South Africa. (4) The private laboratories in Namibia perform rapid TB and MDR-TB testing using Line Probe Assays test. (4) This is however

expensive and needs sufficient resources if it is to be used in the public sector.

Gaps: Regions rely on the national reference laboratory which is over 800km away in terms of Ohangwena region. Delay in receiving results prolongs the period between the diagnosis and commencement of effective treatment. Inadequate infrastructures, equipment, funding and staff hamper the decentralization of C/DST services in the country. (4) Targeting only patients who fail the re-treatment regimen, relapses and those who return after default does not ultimately solve the problem of detecting M/XDR-TB early. The fact that there is high failure among re-treatment cases could mean that there is high primary resistance in the community.

3.3.3 Appropriate treatment strategies (first line and second line under proper case management conditions)

Since the introduction of DOTS in 1993, Namibia has been using quality assured drugs for drug susceptible TB and introduced fixed dose combination in 2006. (4) The second line drugs (amikacin, ciprofloxacin, ethionamide) were introduced in Namibia in 1999 and is now a part of revised TB guidelines. (17) According to the national TB guidelines, the second line drugs are to be prescribed only in the following situations: patients with evidence of MDR-TB, patient with poly-resistant TB and patient with severe drug reactions or metabolic complications (if the patient cannot get tailor-made combinations from first line regimen). (17) As per guidelines, an MDR-TB patient is to be admitted in hospital with isolation and trained medical officer and the management of side effects have to be monitored and addressed. (17)

Gaps: Regions including Ohangwena have been operating with very limited number of medical officers (62) making it difficult to treat TB because of lack of knowledgeable and skilful staff. MDR-TB patients haven't been monitored and sometimes they shared rooms with other people. (14) Infection control in all three hospitals in the region is not up to standard and nosocomial infections could have resulted from this. Contacts of MDR-TB patients are not traced. (14) DOT programme is not maximised and it needs to be improved.

3.3.4 Uninterrupted supply of quality assured first and second line drugs

Namibia purchases the first line TB drugs from so called "white listed" manufacturers that are approved by the Global Drug Facility. The NTCP is now busy applying to the Green Light Committee in order to get SLDs at

cheaper price. The private sector in Namibia buys their drugs from South African drug suppliers who also supply the South African public sector. Though there is no trend data found on the availability of second line drugs for TB, the NTCP annual report (2007) indicated no stock-out even for the first line drugs. (4) Currently, Namibia is busy applying from the Green Light Committee in order to access affordable drugs and technical support. (4) Uninterrupted supply of drugs is vital in the prevention of further resistance to second line drugs which can lead to the creation of XDR-TB.

Gap: The second line drugs are very few and forming resistance to one leaves even little option. The manufacturers are also very few and this gives them monopoly to the market and the inflation of the prices.

3.3.5 Recording and reporting system for MDR-TB control programmes

MDR-TB documentations were sent to regions as late as 2007, indicating a delay in prioritising MDR-TB. (4) MDR-TB registers, patient treatment cards, reporting forms and formats are now available in all the districts. The specific reporting system for MDR-TB was only put in place in 2007. (4) The absence of the reporting system made the planning difficult and MDR-TB cases might have been increasing unnoticed.

Gap: Completeness of registers and patient cards is still being experience, making it difficult when comparing data and reporting. This is also affected by shortage of staff as compared to the magnitude of the work they do.

Chapter 4: Discussions

In this chapter, the author discusses issues that emerged from Chapter three. The author discusses how different factors are interlinked and how they are relevant in the prevention of development and spread of M/XDR-TB. As far as possible, the discussions linked the findings with the Namibian situation including the gaps identified.

4.1 Factors that favour development and spread of M/XDR-TB

Tuberculosis is a disease with widespread externality. It affects people of all ages and races but it is more prevalent among poor people who have limited resources to meet their daily needs. TB is one of the oldest diseases that still cause deaths among the world's populace. Though scientists and researchers are making considerable efforts to understand TB better with the aim to develop effective measures for its prevention, it proved not to be that easy. The emergence of MDR-TB and XDR-TB indicates how complex mycobacterium tuberculosis is. However, it is important to first understand that the emergence of M/XDR-TB is influenced by many factors such as the agent that causes the disease, the host which is the person infected and the environment where the person lives.

4.1.1 Agent and host factors

Mycobacterium tuberculosis (agent) has proved strong fitness that enables it to live longer on earth despite all the efforts done to curb it. Its ability to change its structure and to live in a latency stage for a long period of time and still has the capability to turn into a disease has given it an advantage of living persistently. Though there is not much difference on how the drug susceptible and drug resistant tuberculosis spread, it seems that when a person is infected with HIV the likelihood of dying from M/XDR-TB is high. (16) In high HIV prevalent countries, M/XDR-TB takes advantage of spreading faster because people's immunity is low. Most of the countries with generalized HIV epidemic are low and middle income countries in Sub-Saharan Africa where poverty, unemployment, poor living conditions are rife. (3) This means that, even with the good performance of DOTS programmes in these countries, TB including M/XDR-TB will continue to exist (46) but it can be controlled. The Millennium Development Goal and Stop TB Partnership target of halving TB incidences by 2015 is good in terms of keeping momentum of commitment to fighting the disease, but the underlying factors that facilitated the existence of TB for so a long time until it has reached the third stage of extreme resistant TB strain need also to be considered.

It is important to note that development and spread of M/XDR-TB is not only limited to those who used TB drugs before, but also to other people who might have got it from the infected and diseased source (host). The essence of this is that it is vital to note so that the conditions that favour the spread could be avoided. However this is made difficult by the fact that there are still many people in the society that have MDR-TB strain that is not yet diagnosed, so it is just spreading unabated. Storla et al (26) confirms that most of the infections occur "between the onset of cough and the initiation of treatment". So, with inherent behaviours of a human being to delay treatment, M/XDR-TB is more likely to be spread by hosts who show symptoms but delay to seek treatment on time. It is also important to note that the prevention strategies for the two ways of developing MDR-TB differ. For instance, to prevent acquired MDR-TB the focus should be more on provision of quality assured treatment and making sure the patient has completed the treatment while the prevention of primary development of MDR-TB requires additional efforts such as proper infection control measures in congregate settings more especially where people have low immunity.

4.1.2 Environmental factors

Tuberculosis, including M/XDR-TB spreads fast where people gather together with the diseased person (M/XDR-TB) for a longer period of time. This is further amplified by presence of high concentration of TB bacilli in poorly ventilated area. (1;55) Studies reported high chances of getting TB (including M/XDR-TB) in congregate settings such as prisons, outpatient department (OPD) waiting rooms and other places where people gather for a longer period of time. Prisons in Namibia have their independent health care services but this does not cover the inmates in police holding cells. During the visits to all 3 main police station cells in Ohangwena region in 2007, it came out that the cells are overcrowded and there is no sufficient ventilation, the health conditions of some inmates are bad and they also complain of not being given their medications by the police officers. The possibilities are that if there is a TB patient in the cell, there is likelihood of developing MDR-TB while in these cells and if so, many people will be infected at the same time, causing the outbreak of MDR-TB in the area. There is also no linkage of released inmates to the health care system for follow up. The involvement of the Ministry of safety and security at policy making level into the issue of how to handle and manage communicable diseases including M/XDR-TB could be the starting point if prevention strategies are to be planned.

Contact tracing for sputum positive both for drug susceptible and M/XDR-TB patients in Ohangwena region is not done. Close contacts of positive TB including M/XDR-TB are regarded at risk of being infected. (2) Neglecting the contacts may fuel the emergence of M/XDR-TB in the community. Spouses of the diagnosed M/XDR-TB patients, children under the age of 5 years, old people and HIV infected people in the family may be at increased risk if exposed due to their low body immunity. (63)

Namibia with 44% of people living below US$1 (2004) and unemployment rate of about 38% (8) and yet high prevalence rate of HIV (17.8%) (6) has conditions that favour TB spread. The improvement of living conditions of the community is however beyond the capacity of NTCP.

Most of the health related environmental factors are discussed under the current strategies (Sections 4.3).

4.2 Recommended strategies and experiences from other countries in prevention of M/XDR-TB

Political commitment

There are sufficient strategies laid down by the WHO and its partners in order to fighting TB and prevent emergence of resistant TB strains such as MDR-TB and XDR-TB. Programmatically, the first step in the prevention of M/XDR-TB is for countries to adapt and fully implement DOTS. DOTS is regarded as a foundation for other strategies such as DOTS Plus and STOP TB strategies. These however are the wishes. At country level, implementation of these strategies is hampered by many country specific factors or limitations. Some countries have failing health care systems due to different reasons and hence implementing DOTS is just impossible. In Zimbabwe, TB programme which was achieving progressive results sank when the Zimbabwean economy collapsed due to the government failure. (42) In South Africa where there are better infrastructures the support to laboratory services was not adequate and this pushed the TB programme down. The lesson learned here is that health system strengthening (1) is important for the TB programme to bear favourable fruits.

Political commitment as a component of DOTS and DOTS-Plus Strategy is the core for all other sub-components. Commitment of money to TB programme facilitates the implementation of all other components such as building laboratories, ensure the availability of both first and second line drugs, recruiting sufficient staff and training them and having all the necessary documents in place. (1) However it is unlikely that all these

components are simultaneously fully implemented due to different conditions the national governments find themselves in. Improvement of political commitment has brought good outcomes in TB programme in Lesotho. (3) This gives an indication that even if the national government cannot afford the programme activities, if there is a will to improve, resources can be sourced from outside and inside the country.

Laboratories and diagnosis

Early recognition and prompt diagnosis is regarded as one of the core strategies in preventing M/XDR-TB. As Dr. Raviglione (director of Stop TB department at WHO) emphasizes that for us to win the battle of M/XDR-TB spread we need to "turn the tap off". (3) For us to be able to do this, we need to proper and timely diagnose the M/XDR-TB cases. Currently, Namibia has only one national laboratory that does C/DST for the whole country. Though the national laboratory has acquired a new diagnosing machine that reduces the turnaround time to below 4 weeks, the demand from the regions and the number of staff members at the national laboratory is still a challenge in terms of completing the testing timely. Delay in diagnosing both of TB and M/XDR-TB is a long chain, starting with the patient self, the health care workers and the health care system including then the laboratory. It should also be noted that quality of laboratory services can have serious implications to patients. For instance if they produce results of false positives, they expose the patient to unnecessary toxic drugs and consequent side effects while in case false negative given to patients, these patients will go free and infect others and worse they will be put on wrong treatment and die. The argument that the current diagnostic methods are outdated, takes too long time and expensive is valid, however it is hoped that developments of new products will be successful and will lessen the turnaround time for diagnosis.

TB drugs and treatment

There are also issues that are crucial in the prevention of M/XDR-TB which need to be tackled at international level. It is appreciated that guidelines have already been developed for adaptation by the national governments. However the use of very old TB drugs and diagnostic equipment needs to be urgently looked into. Most of the new diagnostic equipments seem to be very expensive, limiting their accessibility and use by poor countries where most of the TB including M/XDR-TB cases are more prevalent. The arrangement to make SLDs more accessible through the GLC is also a welcome move, but this again depends on the success of the DOTS programme in a specific country. The poor countries which are already

struggling to get their DOTS programme on the rail will still continue having problem accessing SLDs through the GLC.

The length of treatment is regarded as a stumbling block in the way of adherence to treatment by patients. The international TB organizations under the umbrella of the WHO need to work towards the solution of finding newer drugs as the current ones continues to lose efficacy. The most fear in the TB circles is the limited varieties of SLDs. Getting resistant to one of the SLD, is already a threat because there are no many varieties to choose from.

Experiences from other countries

In the literatures accessed, there was no evidence of Southern African countries that have a well running DOTS-Plus Strategy programme for M/XDR-TB. Each country is however doing something to curb the spread. The speed of implementation depends on the resources and capacity of the country. (3) This could be due to the fact that earlier drug resistant surveys indicated that M/XDR-TB was not so much prevalent in Sub-Saharan African countries (3) hence there were no much activities done. However, the high prevalence of HIV in Sub-Saharan Africa was not considered. It seems that cases of M/XDR-TB have been emerging and might have now gained roots in the communities. The outbreak of MDR-TB and XDR-TB in South Africa (44) and MDR-TB in Lesotho (3) is an example of late response.

Surveillance

Surveillance of M/XDR-TB does not only rely on the availability of guidelines and protocols but by the ability of laboratories to do the tests. The creation of supranational laboratories and the decision to do TB drug resistance surveys in some countries especially those with high HIV prevalence including Namibia, (4) will add value to the surveillance of M/XDR-TB, which in turn will help to put up relevant and effective plans to prevent the disease.

Length of hospitalisation

It is sometimes observed that TB patients who stayed too long in hospitals refuse to take their treatment because of frustration of being kept for so long. This goes along with Yew et al findings that improved counselling and education, as well as close patient support rather than hospitalization, yielded positive outcomes among M/XDR-TB patients. (32) Though the keeping of the patient until the sputum converts is good in

terms of prevention, some authors argue that home care is more beneficial, (38;63) however it can also be argued that each patient needs to be assessed and treated according to the personal situation, for instance, a patient who is unlikely to get food at home and/or complete treatment, can be admitted in the hospital for him/her to get a better care. It is important to note that the idea of treating patients home has its merits, for instance, keeping the sputum positive patients in the hospitals can transmit TB to other patients. This is even more serious in case of M/XDR-TB patients and where the prevalence of HIV in the community is high. Some people can enter the hospital with drug susceptible TB and get infected with drug resistant strain. So, unless the health facilities have complete isolation facilities for each individual, preventing infection in health facilities become very difficult and hospitalization of patients for a long time becomes risk for infection to the patients.

TB infection control

Health care settings need to have well established and functioning infection control programmes to prevent nosocomial infections from M/XDR-TB. Infection control is a crucial part in the prevention of communicable disease in general and specifically M/XDR-TB. Health workers are equally at risk of acquiring M/XDR-TB, hence measures need to address both patients and health workers equally. The information that South Africa has lost two health workers due to nosocomial XDR-TB infection is scary and it needs to be avoided at all costs. In high HIV prevalence countries such as Namibia, efforts need to be done to avoid mixing HIV positive people with M/XDR-TB patients, this includes staff members. However, infection control is also hampered by the fact that a person is not known whether is having M/XDR-TB until he/she fails the initial treatment. The unidentified M/XDR-TB patient continues to infect others unknowingly. Literature indicated that another important factor that is crucial in the prevention of further spread of M/XDR-TB is proper isolation rooms with ventilators. (28;57)

4.3 Current responses in place to prevent the emergence and spread of M/XDR-TB in Namibia

The Namibian Ministry of Health created NTCP as a coordinating body for all TB activities in the country. The DOTS has been implemented in 1993 and the programme has been struggling to reach the WHO targets of 85% TSR by 2005. (10) Despite the willingness to improve the programme, there have been limitations on funding, staffing, proper infrastructures and many others. The policy guidelines and later the first strategic plan

were introduced. The guideline has covered how to prevent, diagnose and treat MDR-TB but the strategic plan has not sufficiently cover this. This led the implementers to focus only on the drug susceptible TB activities.

Funding

The money allocated to TB programme by the MOH has been very much limited and there where hardly programme activities at community level especially in the regions where there are no community based organisations working on TB. This might have given chance to the emergence of MDR-TB because there were neither DOT supporters nor training for health workers on TB including M/XDR-TB.

The recent acquisition of money to the TB programme has positive outcomes but the question of sustainability of funding is still standing, and it can only be adequately answered if the MOH prioritises TB and commits more funds for operational TB activities. Regions are currently supported with Global Fund money and they can now implement some of their activities. Supervision has improved, training has improved and is still continuing, and surveillance for DOTS has improved, but this is going slowly for MDR-TB. The funding has also made it possible to hold quarterly TB review meetings which bring together health sector and NGOs working on TB. However, in all these activities, there is no much focus on the emergence and the spread of M/XDR-TB and more so in Ohangwena region.

Staffing

Improvement of NTCP staffing started in 2007. This may be linked to the financial support from both Global Fund and through TBCAP (4) to the TB programme. This however would have been good if it improved staffing also at regional and district level where the implementation takes place. Staff shortage remained high at district level.

The shortage of nurses and the frequent rotation of staff between TB units and general departments might have compromised the TB programme outcomes.

Despite of many TB trainings done in the country, training on M/XDR-TB is less frequent. The country has only 38 staff members (doctors, pharmacists, laboratory technicians) trained in MDR-TB. (4) The training goes slowly if compared with the impact M/XDR-TB has on the population. Training in M/XDR-TB is even more needed because most of the medical officers in Namibia are working on contracts and the attrition rate is high.

(9) The second reason why it is critical to enhance training is that M/XDR-TB is fairly new to most of the health care workers. The need for well trained health workers in order to improve the prevention of M/XDR-TB through early diagnosis and effective treatment was also echoed in the resolutions from the health ministers "Call for action" meeting in Beijing in 2009. (47) The Beijing report, to qualify this claim, indicated that only 3% of MDR-TB cases are currently managed according to the WHO standard, hence the need to commit more funds on training health workers. (47)

TB drugs

The MOH buys all the TB medications including the SLDs. (4) This is a good sign of political commitment and will to fight the disease. NTCP has not been reporting stock out of medications, (4) but the use of single dose drugs until 2006 might have made patients to drink tablets selectively, creating the chance for drug resistance. However, with the increasing number of MDR-TB cases and the emergence of XDR-TB cases the cost may increase and the need to apply to the GLC for subsidised SLD becomes obvious. DOT has been officially implemented but not practised to every patient. In Ohangwena region, it was observed that even the patients who were hospitalized, they were found with some tablets under their pillows, indicating that DOT did not work. (14) This however means that political commitment in terms of writing guidelines and purchasing anti-TB drugs does not necessarily solve the problem of developing and spreading of TB including M/XDR-TB.

Namibia seems to be doing well in terms of controlling the TB drugs. Unlike some other countries, it is very rare to find antibiotics sold in open market, and even in the private pharmacies, antibiotics are only issued on doctor's prescription. (9) This however does not solve the problem of accessing wrong treatment because private doctors may prescribe inadequate dosage or regimen, but with the current initiative of involving and training private medical officers in the country, this problem may be minimized. The length of MDR-TB treatment is still an impediment. Completing treatment requires a lot of effort on the patient side, more especially if it is coupled with some side effects. Namibia has a policy of keeping the patient in the hospital until the sputum culture converts. (17) It is expected that patients with MDR-TB in Namibia are most likely the ones that have been hospitalized for a long time awaiting their sputum to convert. This literally means that the patient will remain in the hospital for over a year. This has some repercussions such as high opportunity costs to both the patient and the family members who are either staying in

neighbourhood of the hospital to look after the patient or commute almost every day to visit the patient. Keeping infectious patients long in the hospital without proper infection control measures in place such as guidelines, masks for staff and isolation rooms may lead to nosocomial infections to other patients and staff.

TB/HIV collaboration

TB/HIV collaborative activities have been implemented in the country as well as in Ohangwena region. Patients in TB units are all offered counselling and testing for HIV, and HIV patients attending ARV clinics are also tested for TB. The loophole is in general health care system such as OPD and clinics where patients do not generally get this offer. This creates a chance for missed opportunity to diagnose TB among HIV positive and vise versa, and also leads to the spread of undiagnosed TB including M/XDR-TB.

Advocacy, communication and social mobilisation (ACSM)

Advocacy, communication and social mobilisation (ACSM) is an important approach in educating the community on the danger of TB including M/XDR-TB. Currently in Ohangwena region, these activities are only limited to community meetings. The use of printed media and electronic media could be of advantage in terms of reaching more people. The issues of healthy living, health seeking behaviours and adherence can be addressed through this approach.

COMBI volunteers and Red Cross TFPs could also be utilized for M/XDR-TB awareness creation at the community level. Integrating TB activities in RACOC could add value to the prevention of M/XDR-TB in the regions. This is also a missed opportunity which needs to be tackled between National AIDS Committee and NTCP. It requires the RACOC to be given a responsibility of aligning TB activities with HIV/AIDS. Mainstreaming TB and M/XDR-TB into RACOC will help engaging all line ministries, NGOs and other sectors at regional level. This is a well represented structure in terms of geographical area coverage and sectors. The other advantage of mainstreaming TB prevention activities into RACOC is that it can filter through to RACOC sub-structures at lower level in the community where other bodies such as Constituency AIDS Coordinating Committees (CACOCs) can take part.

Health system strengthening

Though the DOTS-Plus Strategy (Figure 2) does not elaborate on the need to strengthen heath care system, the STOP-TB Strategy (Box 2) does, and it is important to note, because TB programme cannot run vertically without integrating in other existing programs, especially at district level. This is beneficial especially in areas where resources are limited. Strengthening the district budget makes it possible to perform better and use all available opportunities to integrate M/XDR-TB activities into other prevention programmes. This helps also in providing comprehensive preventive messages to patients.

Chapter 5: Conclusions and recommendations

5.1 Conclusions

The development and spread of TB including M/XDR-TB is a complex disease which is facilitated by interwoven factors. The interaction of these factors made it to survive for a long time and it is also difficult to eliminate, leading to further spread and infect new hosts.

HIV facilitates the spread of TB and M/XDR-TB and this negates the gains of the DOTS program. Improving on infection control measures and improving on HIV/TB collaborative activities will prevent further spread of M/XDR-TB in clinical settings.

Proper implementation of DOTS, DOTS-Plus and STOP-TB strategies significantly improves TB treatment outcomes and subsequent reduction in the development and spread of drug susceptible TB and M/XDR-TB. For the implementation to be effective, sufficient resources targeting both TB programme and health system strengthening must be made available.

The improvement of NTCP targets or indicators is only possible if the deficiencies in the programme are identified and followed by the implementation of action plan targeting the deficiencies.

5.2 Recommendations

These recommendations are divided into two sections according to the level where action is going to take place.

1. *The following recommendations need to be implemented by the regional TB control programme through the Regional Management Team.*

- **Infection control in health facilities:** The Chief and Senior Health Programme Administrators for Special Programmes in the region should organize an orientation meeting with core members of District Health Coordinating Committees (DCC) from all 3 districts and agree on the plan of implementation of infection control in clinical settings. The plan of implementation should include the monitoring and the progress should be reported in the quarterly review meetings. The meetings should be in November 2009.

- **Contact tracing of M/XDR-TB contacts:** It has been noted that contact tracing for MDR-TB patients is poorly done in the region. It is therefore recommended that each district starts with contact

tracing in order to investigate the risk of infection in people who live closely with the MDR-TB patient. A monthly monitoring form will be developed in November 2009 for use by the DTCs in all the districts.

- **Completeness of records:** Proper record keeping is essential for surveillance and follow-up of patients. It has been noted with concern that records of MDR-TB patients are not up to standard, making it difficult to trace patient information when needed. It is therefore recommended that a one day workshop be organized to train TB staff from districts on the proper keeping of records and agree on the plan of action. This should be done by March 2010.

- **Directly observed treatment (DOT):** Though community based DOT has been in the region for some years now, there are still many patients that are on self-administered treatment. It is recommended that to strengthen DOT and expand it to every patient, each patient need to choose a person to serve as DOT supporter. Both the patient and the DOT supporter should undergo a counselling session which focuses on role of DOT in the treatment of TB. District will be required to submit the list of patients on self-administered treatment and the reasons why. This is the responsibility of DTC in each district and should be started by December 2009.

- **Engage stakeholders in M/XDR-TB prevention activities:** It has been a missed opportunity that information on M/XDR-TB was not integrated into community targeted interventions. To improve the situation, a one day meeting will be organized for TB stakeholders in the region to discuss the prevention of M/XDR-TB in the community. This should be done by April 2010.

- **Advocacy, communication and social mobilization (ACSM):** These activities have been limited in the region. It is therefore recommended that a plan of action be put up in a stakeholder meeting for the year 2010/2011 planning calendar. The meeting should be organized in February 2010.

- **Research:** There is need to conduct a qualitative research on the TB programme review and the perception of community and health workers on tuberculosis. This will help shape the understanding of the situation better and come up with targeted interventions. This should be planned for the financial year 2011/2012.

2. *The next recommendations are to be implemented by the NTCP national level.*

- **Decentralization of C/DST:** The NTCP should speed up the establishment of multi-regional laboratories that can do C/DST. This will help to shorten the delay in the diagnosing of MDR-TB patients.
- **Funding:** The NTCP should negotiate with the Ministry of Health to increase the funding for TB operational plan. This will ensure sustainability when the donors stop their support.
- **Policy on admission of M/XDR-TB patients:** Keeping patients for too long in a hospital just to wait for the culture conversion is costly to both the health care system and patients. It is recommended that the Ministry of Health through the NTCP consider making a policy of treating M/XDR-TB patients who do not have serious complications as out-patients in order also to prevent further infections in the clinical settings.
- **Involvement of private practitioners:** NTCP through the Namibia Health Council should put up a plan for orientating private practitioners in the regions regarding the prevention and the management of M/XDR-TB in the country.
- **Prisoners in police holding cells:** Conditions of police holding cells for the suspects awaiting trials are favourable for spreading TB including M/XDR-TB. It is therefore recommended that NTCP through the permanent Secretary of Ministry of Health advice the Ministry of Safety and Security to make a policy on how to prevent TB including M/XDR-TB, and other infectious diseases.

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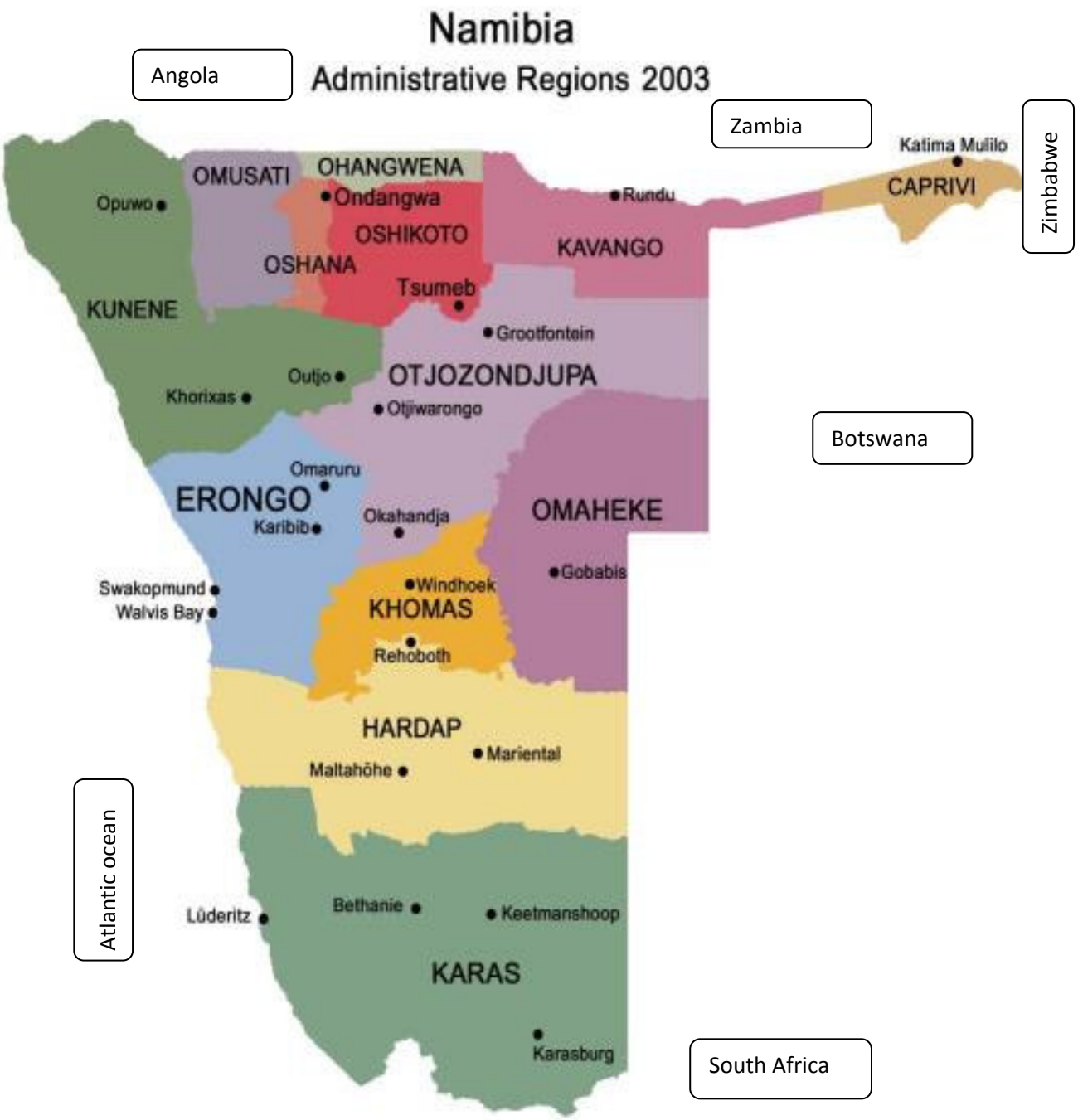
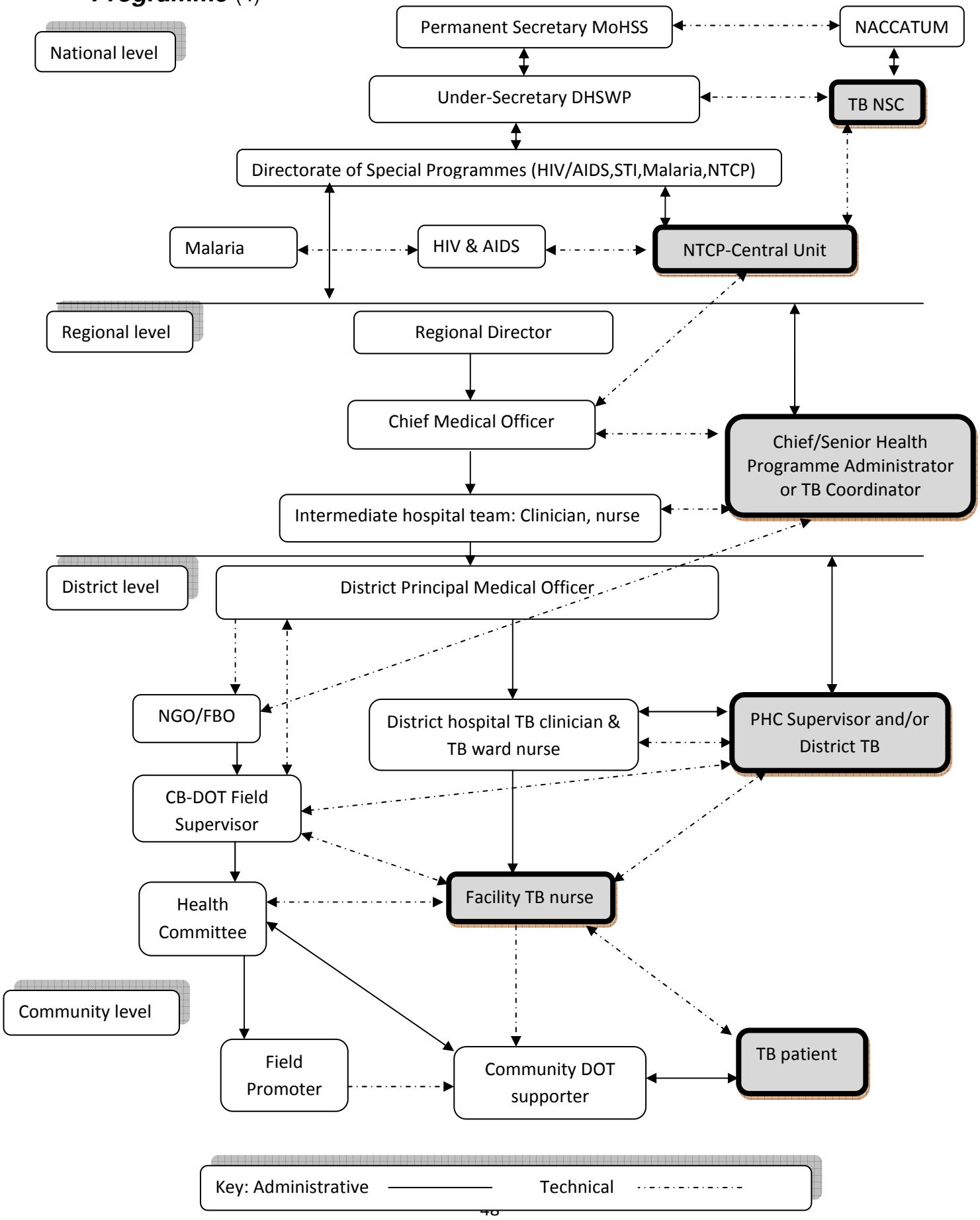
Annexes

Annex: 1: Map of Namibia



Annex 2: Organogram of the National Tuberculosis Control Programme (4)



Annex 3: Structure of National Tuberculosis Control Programme

Level	Responsibility description	Constraints
National level	Formulation of policy guidelines, coordination, monitoring, evaluation of TB programme. TB programme is within the Directorate Special Programmes with a director and two deputy directors and three chief medical officers each for the national programmes of Malaria, TB and HIV/AIDS respectively. There is also on Chief Health Program Administrator for coordinating TB activities in the country.	It is only recently that the full staff establishment of 4 MOHSS positions has been filled. This is still inadequate as evidenced by the fact that: 1) KNCV Tuberculosis Foundations complements MOHSS staff establishment with 4 additional medical officers, 2 financial management staff and one driver; 2) Global Fund funds one additional position of a nurse, a communications officer, and one driver.
Regional level	Planning, coordination, monitoring and evaluation of Malaria/TB/HIV/AIDS and STIs programme in the region. Supporting implementation of activities of the three diseases in the districts. Two programme officers (Chief and Senior Health Programme Administrators) are in charge.	This structure of two posts at regional level is not adequate. These programs have many activities that need proper coordination at this level.
District level	Functioning under the authority of District Coordinating Committee (DCC), the Principal Medical Officer and Primary Health Care Supervisor support the Special Programme Nurse to coordinate Malaria/TB/HIV/AIDS and STIs activities in the district. The coordination is done with other Non-governmental organizations (NGOs), Community Based Organizations (CBOs) and other stakeholders. Currently the Red Cross provides TB Field Promoters (TFP) and Community Counsellors (CC). The TFPs educate the community on tuberculosis and trace interrupters and defaulters and compile monthly reports. The CCs counsel and test tuberculosis patients for HIV. The CCs and TFPs are paid by the Red Cross.	Inadequate support of tuberculosis activities by the DCCs. District TB Coordinators are given other work rather than coordination e.g. put to work in TB clinic or TB ward or in counselling room. DTCs practically find themselves with two supervisors at the same time, a hospital nurse manager allocates them but they are technically supervised by the Primary Health Care Supervisor – this creates confusion.
Health Centre	This is a primary entry point for tuberculosis patients. Nurses are trained in TB	The TFPs have also a challenge reaching out to the far villages due

and clinic level	management. They collect sputum to suspected tuberculosis patients and send it to the district hospital laboratory. Upon receiving smear positive result they initiate patient on 1st line TB treatment if the patient does not have other complicated issues. Else they refer the patient to the medical officer at the district hospital. It is at this level where most of the TFPs and CCs are working.	to transport unavailability. There is only one vehicle for TB activities in each district which is also used other administrative, outreach programmes both for immunization and ART. Sputum usually delay to reach the laboratory, results delay to reach the health centre or clinic and patients get frustrated as they do not get their sputum results on time. The diagnosis is therefore also delayed.
Outreach teams	Identifying TB patients and follow up on those who are already on treatment and giving health education. Patient education and information is done by the TFP.	Current outreach services do not do active case findings for tuberculosis as it is done in fixed health facilities. This is a missed opportunity for diagnosing tuberculosis.
Local Authorities and Regional Councils	Mainstreaming HIV and TB in the workplace and dissemination of information. Both Local Authorities and Regional Council in Ohangwena are members of the Regional AIDS Coordinating Committee (RACOC) which was supposed to discuss also TB issue.	Tuberculosis does not feature much on RACOC agendas. RACOC was only designed for HIV activities because HIV and TB are parallel programs at national level. Stakeholders such as Local Authorities and Regional Councils have limited information on tuberculosis
School Health Services	Health education on prevention of TB and treatment of children who are already infected. School health in the region is done on ad-hoc basis and sporadically when there is a need.	There is no TB activities taking part in schools but there is much about HIV. Lack of coordination for HIV and TB activities in programme planning in the region.

Source: National TB Guidelines (17)

Annex 4: Trend of TB in Ohangwena region and Namibia and treatment outcomes

1. **Trend of TB <u>new and re-treatment cases</u> in Ohangwena region 2003 - 2007**

Period	2003	2004	2005	2006	2007
New sputum smear positive PTB	584	505	481	509	551
New sputum smear negative PTB	555	559	808	436	573
Extra-pulmonary TB	12	1	31	71	147
Re-treatment TB	43	49	35	71	104
Others	72	39	25	28	43
All forms of TB (Total)	1266	1153	1380	1115	1418

2. **Trend of TB <u>new and re-treatment cases</u> in Namibia 2003 - 2007**

Period	2003	2004	2005	2006	2007
New sputum smear positive PTB	5487	5155	5222	5356	5114
New sputum smear negative PTB	6713	7614	6942	5852	4952
Extra-pulmonary TB	1474	1506	1906	2450	2687
Re-treatment TB	816	751	849	1312	1433
Others	1180	1130	974	801	1058
All forms of TB (Total)	15670	16156	15893	15771	15244

3. Trend of treatment outcome for **<u>new smear positive</u>** tuberculosis cases in Namibia 2002 - 2006

Year	Cured No. & % (1)	Rx comp No. & % (2)	TSR No. & % (1+2)	Died No. & % (3)	Failure No. & % (4)	Default No. & % (5)	Transfer No. & % (6)	Total (7)
2002	2509 (56)	575 (13)	3084 (68)	372 (8)	95 (2)	638 (14)	327 (7)	3516 **(97)**
2003	2618 (53)	828 (17)	3446 (70)	416 (8)	69 (1)	639 (13)	364 (7)	4934 **(90)**
2004	2506 (50)	1018 (20)	3524 (70)	391 (8)	99 (2)	660 (13)	370 (7)	5044 **(98)**
2005	3063 (59)	835 (16)	3898 (75)	368 (7)	95 (2)	516 (10)	336 (6)	5213 (100)
2006	3318 (64)	636 (12)	3954 (76)	368 (7)	134 (3)	436 (8)	285 (6)	5177 **(98)**

NB: Percentages are in brackets! Percentage under total indicates that some patients were not evaluated at the end of treatment!

4. Trend of treatment outcome for smear positive **<u>re-treatment</u>** tuberculosis cases in Namibia 2002 - 2006

Year	Cured No. & % (1)	Rx comp No. & % (2)	TSR No. & % (1+2)	Died No. & % (3)	Failure No. & % (4)	Default No. & % (5)	Transfer No. & % (6)	Total (7)
2002	395 (42)	209 (22)	604 (66)	109 (12)	32 (3)	120 (13)	67 (7)	932 **(115)**
2003	345 (37)	201 (22)	546 (59)	137 (15)	32 (3)	157 (17)	61 (7)	933 **(115)**
2004	318 (29)	275 (25)	593 (54)	173 (16)	48 (4)	220 (20)	80 (7)	1114 **(73)**
2005	178 (17)	474 (45)	652 (62)	139 (13)	55 (5)	147 (14)	69 (6)	1062 **(125)**
2006	629 (46)	201 (15)	830 (61)	173 (13)	121 (9)	154 (11)	75 (6)	1353 **(103)**

NB: Percentages are in brackets! Percentages under total indicate that the number of patients evaluated at the end of treatment exceeds the number of those registered in the previous year (exception of year 2005 were some registered patients were not evaluated). The excess could be from misclassification between new and re-treatment cases (See no. 3 table above!).

Source: MOHSS 2007 (4)

Annex 5: Problem tree