FACTORS ASSOCIATED WITH OCCURRENCE OF MULTI DRUG RESISTANT TUBERCULOSIS IN HARARE CITY, 2015

BY

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DECLARATION

This dissertation is the original work of Tichaona Fambirai. It has been prepared in accordance with the guidelines for MPH dissertations in the University of Zimbabwe. It has not been submitted elsewhere for another degree at this or any other university.

Name of student: ___________________________________

Signature: _____________________________ Date: ______________

I, having supervised and read this dissertation, I am satisfied that this is the original work of the author in whose name it is being presented. I confirm that the work has been completed satisfactorily for presentation in the examination.

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ABSTRACT

Factors Associated with Occurrence of Multi Drug Resistant Tuberculosis in Harare City, 2015

Introduction: Multi drug resistance tuberculosis (MDR-TB) is a form of tuberculosis (TB) caused by bacilli resistant to Isoniazid and Rifampicin. Rifampicin and Isoniazid are the two most important first line anti TB medicines. The World Health Organisation has declared MDR TB a public health emergency of global concern. Drug resistance can either be primary or acquired during TB treatment. The MDR TB notification rate has been increasing in Zimbabwe since 2010. New MDR TB cases have also been on an increase from a low of 42 in 2011 to a high of 60 in 2014. Annual newly notified drug susceptible TB cases have been on a decline over the past five (5) years. A study was carried out to determine the major risk factors associated with occurrence of MDR TB in Harare, Zimbabwe.

Methods and Materials: An unmatched case control study was conducted in Harare City. The outcome of interest in the study was MDR TB. A semi structured interview guide questionnaire was used to collect information on exposure from the respondents. A case was a TB patient confirmed by Gene Xpert and Drug Sensitivity Test (DST) to have resistance to Rifampicin. A control was a TB patient who had completed treatment and had a recorded cured outcome. A checklist was used to assess case detection activities in the TB service at health facilities. Data collected were entered into the EPI Info 3.5.4. The same software package was used to calculate frequencies, means and odds ratios. Stratified and forward logistic regression was carried out to determine independent risk factors associated with MDR TB.

Results: A total of 42 cases and 84 controls were enrolled in to the study. A total of 5 polyclinic Presumptive TB registers and Health Facility TB registers were reviewed. There was no delayed case finding for risk MDR TB presumptive case in Harare. The significant risk factors...
in the study were having a history of previous TB treatment (OR=65.9 95% CI 19-223), having been a TB contact before (OR=2.56 95% CI 1.06-6.15), history of stopping TB treatment in previous category (OR=6.62 95% CI 1.91-23). Smoking, alcohol use, HIV (OR=1.13 95% CI: 0.3-2.76) and diabetes mellitus (OR=1.15 95% CI=0.21-10.00) were not significantly associated with MDR TB in Harare. A history of travelling outside the country was associated with less risk of having MDR TB (OR=0.66 95% CI: 0.3-1.4). Those who were employed were less likely to have MDR TB (OR=0.12 95% CI 0.04-0.29). There was a significant difference in knowledge on risk of defaulting TB treatment (p=0.02) and treatment completion (p=0.007) between cases and control.

**Conclusion:** History of TB treatment was the leading risk factor. A history of being a TB patient contact, a history of stopping TB treatment were significantly associated with having MDR TB in the City MDR TB. HIV and diabetes mellitus were not significantly associated with having MDR TB. Based on the findings of this study MDR TB in Harare City is likely to be acquired than primary, as those who had prior exposure to anti-TB medicine were more likely to have MDR TB. There was no delayed case finding for high risk presumptive MDR TB patients. Those who were employed were less likely to have MDR TB.

**Key Words:** Case control study, Multi Drug Resistant Tuberculosis
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Tichaona Fambirai

University of Zimbabwe, August 2015
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<tr>
<td>MDR TB</td>
<td>Multi Drug Resistant Tuberculosis</td>
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<tr>
<td>MTB</td>
<td>Mycobacterium Tuberculosis</td>
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<tr>
<td>H</td>
<td>Isoniazid</td>
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<td>R</td>
<td>Rifampicin</td>
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<tr>
<td>ART</td>
<td>Anti-Retroviral Therapy</td>
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<td>DST</td>
<td>Drug Sensitivity Tests</td>
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<td>DMO</td>
<td>District Medical Officer</td>
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<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<td>WHO</td>
<td>World Health Organisation</td>
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<td>DOTS</td>
<td>Direct Observed Treatment Short Course</td>
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GLOSSARY OF TERMS

**Multi Drug Resistance:** a form of TB resistant to two main first line anti-TB drug: Isoniazid and Rifampicin

**Cured TB patient.** A TB patient who was initially sputum positive at start of TB treatment and has turned sputum negative at end of treatment.

**Previously treated case (Category 2):** A patient who has received 1 month or more of anti-TB in the past.

**DST:** a test done on sputum specimen to determine the susceptibility of TB bacilli to various anti-TB medicines

**Gene Xpert MTB/RIF:** is a diagnostic test that can identify *Mycobacterium tuberculosis* DNA and resistance to Rifampicin.

**Measures of Association:** a statistical calculation that establish a statistical relationship between two variables.

**Presumptive TB case:** A patient who presents with signs and symptoms of TB.
CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION
Multi drug resistance Tuberculosis (MDR-TB) is a form of tuberculosis (TB) caused by bacilli resistant to the two most potent anti-TB medicines, Isoniazid and Rifampicin\(^1\). The global TB control programs face a potent threat from two fronts: HIV/AIDS and MDR TB.\(^1\) Drug resistance can be primary or acquired. Primary resistance is drug resistance in patient without prior exposure to anti TB drugs whilst acquired MDR TB is drug resistance among previously treated TB patients\(^2,3\). Host genetic predisposition can also be a basis for development of MDR TB.\(^4\)

1.1 Epidemiology of MDR TB
The true global extent of MDR TB is difficult to quantify due to inadequate diagnostic capacity of most African countries and lack of proper MDR TB surveillance systems\(^1\). In 2013, an estimated 480 000 new cases of MDR-TB were reported worldwide, with approximately 210 000 deaths reported. Of the global MDR-TB cases reported in 2013, 80% were from the European Region, Asia, China and South Africa.\(^1\)

The prevalence in the African region varies within the sub-regions, from 10.4% in Southern African region to 17.7% in Central and East African region. Higher resistance rates of 13.5 % have been observed in countries with HIV prevalence lower than 5% compared to countries where HIV prevalence was higher or equal to 5%.\(^13\) An estimated 60,000 MDR-TB cases occur annually in the Sub Saharan region which translates to 14% of the global burden. Countries such as Cote d’Ivoire, Democratic Republic of Congo, Kenya, Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe have a combined annual MDR-TB incidence of 11000 cases.\(^6\)
Rifampicin resistance has been utilized as a successful surrogate marker for MDR TB in TB patients. Most rifampin-resistant bacilli strains have mutations in an 81bp region of the rpoB gene that encodes the RNA polymerase β subunit. The virulent Beijing genotype family, which includes the Wild strain of *M. tuberculosis* has been linked to MDR TB outbreaks in USA and South Africa. The Beijing genotype family has been associated with anti-TB medicines resistance in Cuba, Estonia, Russia, Vietnam, and South Africa. The Latin America Mediterranean (LAM9-c1) and KwaZulu Natal (KZN) strain have also been implicated in TB drug resistance occurrence globally.

Global attention to multi drug resistance began in the early 1990’s, when publications of outbreaks among HIV-positive subjects in the USA emerged. The wide publicist of the outbreaks drew wider attention and this culminated with WHO in 1993 declaring TB a global emergency. In 1994, WHO set up the Global Surveillance Project on Anti-tuberculosis Drug Resistance, to measure the prevalence of combined MDR-TB. Recent outbreaks of MDR TB and XDR TB in KwaZulu Natal, South Africa associated with extremely high case-fatality rate also brought renewed attention to drug resistance TB worldwide.

Because treating MDR-TB requires a long treatment duration of >20 months compared to drug susceptible TB which requires at least 6-8 months of treatment, the cost of treating MDR TB is expensive compared to that of treating drug susceptible TB. The cost of treating a drug susceptible TB with first line drugs cost approximately US$20 for 6-8 months compared to about US$5000 for treating an MDR-TB case for 20-24 months. The Global Plan to Stop TB estimated that financing the MDR-TB control program globally in 2015 would cost US$16 billion, about 16 times higher than what it was in 2010. In addition to high treatment costs for MDR-TB, treatment outcomes are also poor, as shown by the low cure rates and high mortality.
Zimbabwe has not conducted a national survey of MDR TB since the last sub national MDR TB survey in 1995. Basing on the results of that survey at least 1.8% of all notified cases had MDR TB. The prevalence of MDR TB among retreatment patients in Zimbabwe was estimated to be 8.3% and annual incidence of 970 cases per 100,000 population [95% CI: 406-1980]. Data from the National Microbiology Reference Laboratory (2008 -2011) revealed an MDR TB prevalence of nine percent (9%) among TB retreatment cases.

1.2 Study Setting
Harare has a recorded population of over 2 million people (Census: 2012). It is a metropolitan settlement composed of urban and peri-urban settlements. Harare has a mixture of low, medium and high population density suburbs. The City is an industrial hub with a high concentration of various industries. It is therefore a destination of choice for the country population looking for employment and services. The major Government offices are located in the City. The majority of the population reside in the high density suburbs. The old high density suburbs such as Mbare, Mabvuku, Tafara Dzivarasekwa and High fields are characterized by high population density, overcrowding and deteriorating infrastructure. The city is currently facing challenges in emerging residential suburbs which lack essential utilities. These conditions have seen the emergency of disease linked to poor water and sanitation such as cholera and typhoid.

The HIV prevalence in the City is estimated to be 13.4 % (Zimbabwe Demographic Health Survey: 2010-11). HIV prevalence among TB patients is also estimated to be as high as 71%. TB is the leading cause of morbidity and mortality among people living with HIV in Zimbabwe and Harare. HIV-1 has been driving the incidence of TB locally since the early 1990s. Harare City Health Department provides TB services as mandated by the Ministry of Health and Child Care through National TB Control Program. The City commenced programmatic management of MDR TB in October 2010 utilizing the new MDR TB management guidelines. Over 200 MDR TB patients have been notified in Harare City since 2010. At least 80% of the City TB
and MDR TB notifications originate from the high density areas. Harare city contributes 15% of the national TB burden. The researcher conducted a secondary data set analysis of MDR TB notifications from 2011-2014.

1.3 Problem Statement
The number of newly notified drug susceptible TB cases have gone down from 6700 in 2011 to 5100 in 2014 whilst the number of notified MDR TB cases have been on an increase from a low of 42 in 2011 to a high of 60 in 2014. The MDR TB notification rate has been increasing in Zimbabwe since 2010 (Figure 1) as well as MDR TB notification rates in the City (Figure 2).

![Figure 1: Multi Drug Resistant Tuberculosis Notification rate, Zimbabwe, 2010-2014](image1)

![Figure 2: Multi Drug Resistant Tuberculosis Notification Rate Harare City 2011-2014](image2)

Secondary MDR-TB data analysis for Harare City showed that the majority (84%) of patients were previously treated TB cases. The likelihood of retreatment patients receiving Category 2 anti TB medicines which the MTB has already developed resistance to is high. In addition, other known risk factors for MDR-TB development like poor patient adherence to treatment, inadequate case holding and treatment monitoring activities in Harare City may be responsible for increased MDR-TB occurrence. The MDR TB notification registers do not capture
information on other immune suppression co-morbidities such as diabetes and other chronic infections, history of migration and incarceration, themselves potential risk factors for MDR-TB transmission. The major risk factors for increased MDR TB in Harare City’s population has therefore not been described.
CHAPTER 2

LITERATURE REVIEW

2.0 Literature Review
This chapter dealt with literature review based on global, regional sources. It also highlight the health system, treatment and patient related factors associated with MDR TB.

2.1.0 Global Epidemiology of MDR TB
The magnitude of MDR TB globally, is difficult to quantify. This is largely due to the fact that only a few countries have proper MDR TB surveillance systems in place. Only 144 countries by 2014 had data for MDR TB. In 2013, there were an estimated >400 000 new cases of MDR-TB globally, and approximately 210 000 deaths linked to MDR-TB. Of the MDR-TB cases reported globally in 2013, 80% were from the European Region. The majority of notifications emanate from European Region, India and South Africa. A global increase in notifications of MDR-TB has been noted as from 2009. Significant increase of 23% were recorded between 2012 and 2013. The biggest increases between 2012 and 2013 were recorded in India, Ukraine and Uzbekistan. Despite progress in the detection of MDR-TB cases, a major diagnostic gaps still remain where an estimated >50% of reported TB patients estimated to have MDR-TB were not detected in 2013.

2.1.1 Regional and Local Epidemiology of MDR TB
The African region records the lowest notifications of MDR TB in comparison to other regions. The low notifications should be taken with caution due to lack of comprehensive national drug resistance data in most African countries. Prevalence varies among new cases from 10.4% in Southern region to 17.7% in Central African region. Among previously treated MDR TB cases, the prevalence has shown variations; from East Africa region recording highest prevalence of 29.2% to Southern Africa with lowest prevalence of 24%. MDR TB among new
cases is estimated to be lowest in Central Africa 1.2% and highest in West Africa at 2.3%. Higher resistance rates of 13.5 % have been observed in countries with HIV prevalence below 5% in comparison with countries with HIV prevalence equal to or higher than 5%.  

The number of notified MDR TB cases in Zimbabwe has been rising from a single recorded case in 2007, to 118 in 2011 and finally a high of >500 in 2014. Results from an MDR TB survey in Harare among 240 recruited patients, showed that 25% of the examined sputum positive were MDR TB. Based on WHO estimates MDR TB prevalence in Zimbabwe among new case is 1.8% and 8.3% among retreatment TB patients.

2.1.2 Socio-demographic factors
In a study in Mumbai the majority of MDR TB patients were observed to be in the 15 to <40 years age group. In Iran Merza et al found out that those who were < 45 years were likely to be MDR TB compared to >45 years age group. Merza et al found out than males were greater risk of developing MDR TB as compared to females. Low socio- economic status, poor living conditions, having a history of migration, lack of formal education and changing place of residence during treatment have been shown to be risk factors for developing MDR TB. 

Poor socio-economic status present challenges in accessing health services. Lack of formal education has been shown to be a risk factor for MDR TB. High literacy has been shown to lower the likelihood of having MDR TB as literacy may lead to improved health perception.
2.1.3. Treatment Related factors
Prior exposure to TB treatment has been cited as the single biggest risk factor in various literature.\textsuperscript{2, 9, 17, 30, 34, 35, 39} Previous exposure to TB medicines and subsequent development of MDR TB has been linked to treatment interruption, poor adherence and poor treatment observation. Poor drug quality and supply also increase chances of poor outcomes in TB treatment.\textsuperscript{17} Interrupting treatment may increase the likelihood of MTB bacilli to develop resistance. Studies in China and Brazil have shown that having more than one prior episode of TB treatment is significantly associated with MDR TB.\textsuperscript{9, 28} TB treatment defaulting is one of the serious challenges that is encountered in TB management.

2.1.4 Diabetes Mellitus and MDR TB
Diabetes Mellitus (DM) has potential to alter the immunity system of individuals affected.\textsuperscript{19, 20} Patients become susceptible to bacterial infections which may also include MTB. Latent TB cases are also prone to activation and relapse due to DM. In Korea, diabetics were found to have a 5 times risk of developing TB than non-diabetics.\textsuperscript{19} In a study in the city of New York, diabetics were found to be 8.6 times more likely to develop MDR TB than non-diabetic patients.\textsuperscript{20} In Texas patients with DM were 2 times more likely to have MDR TB whilst in Mexico, diabetics were found to be 1.8 times likely to develop MDR TB.\textsuperscript{21} In Taiwan diabetes was associated with Isoniazid resistance\textsuperscript{22} and not MDR TB among new and repeat TB cases.

2.1.5 Migration and MDR TB
In Africa, Kenya has recorded significant cases of MDR TB of Somalian origin. The majority of the patients come directly from Somalia and not from refugee camps.\textsuperscript{23} Results from a study in California revealed that a majority of the MDR TB clusters occurred among patients of foreign origin.\textsuperscript{24} In Canada as from 2001-2011 MDR TB was associated with new immigrants arrivals in that country. A significant increase in incidence of MDR TB in Canada was observed among foreign migrants from Philippines and Vietnam.\textsuperscript{25} In Switzerland the
majority of MDR TB recorded in the country from 2006-2012 were imported MDR TB cases than local.26

2.1.6 Prisons and MDR TB
Prisons have been cited as major point source of transmission of TB and certain strains of MDR TB. The existence of conducive environment for spread of TB such as: higher contact rate, poor ventilation. Releasing of prisoners into the community before completion of treatment may increase chances of TB patients developing MDR TB. Unhealthy lifestyles and inadequate nutrition in prisons also increase the likelihood of contracting TB. 27 Da Silva et al in Brazil observed higher resistance rates to anti TB medicines among prisoners than in the community. 28 In South Africa overcrowding in prison cells resulted in an increase in the yearly TB transmission risks by over 80%.29

2.1.7 Health system related factors associated with MDR TB
Practises during TB management such as use of inadequate regimen at first line ant-TB treatment and failure to identify pre-existing resistance have a contributing factor to development of MDR TB.3 The attitude of health workers is a key factor in health service provision. Favourable health outcomes may depend on it. In a study in 8 provinces in South Africa, the respondents cited health workers attitude as a barrier to effective treatment and care.32 Counselling of patients is crucial element in patient care. In that study respondents reported not to have received adequate counselling and were likely to be MDR TB positive than those who received adequate counselling. 32 In a cross sectional study in Maseru by Malangu et al.33 Lack of adequate knowledge on MDR TB was noted among the health workers as less than half of exhibited good knowledge on MDR TB.33

In Ethiopia patients who reported inadequate counselling were 2 likely to be have MDR TB. 35 Lovelady et al 36 in Kwazulu Natal South Africa found that a positive relationship exist between
successful treatment outcomes and health systems performance. A significant variation in treatment outcomes across the study sites ranging from 72% to 52% were noted.\textsuperscript{36} Lack of training has been cited in a study by Ibrahim et. al in Nigeria as having a negative effective on provision of TB services and care.\textsuperscript{37} At least 30.3% of the health care workers reported that they had never received any form of training in TB control aspects. \textsuperscript{37} However Keifer et al in Peru found satisfactory knowledge among health workers on contagious nature of the disease, symptoms, initial diagnosis, and treatment regimens was quite high among all health care practitioners (HCPs).\textsuperscript{38}

\subsection*{2.1.8 Treatment Monitoring and MDR TB}
DOTS has been proven to be an effective strategy in improving adherence and treatment outcomes among TB patients.\textsuperscript{1,35} In a study in South Africa, TB patients not on strict DOTS during their first anti TB treatment were 11 times more likely to develop MDR TB. Treatment side effects are also a hindrance to effective treatment compliance \textsuperscript{34, 40} and these should be closely monitored throughout the TB treatment duration. Results from a study by Moonan et al.\textsuperscript{41} showed effectiveness of universal DOTS in comparison to selective DOTS.

\subsection*{2.1.9 Patient Related Factors}
Low socio-economic status’ association with TB has been well established in literature \textsuperscript{1, 2, 18.} Defaulting, travelling to different places, symptoms relief, adverse effects of medication and inability to afford treatment have been implicated in MDR TB development.\textsuperscript{3, 42} Alcoholism, illicit drug use and smoking in South Africa and Brazil were shown to be risk factors for defaulting.\textsuperscript{9, 31} In Ethiopia MDR TB patients reported that they felt ashamed of the disease.\textsuperscript{35} Stigma sometime has serious consequences for patients as reported in Mexico where MDR TB patients experienced reductions in salary and some were laid off after they were diagnosed with MDR TB.\textsuperscript{32} Psychiatric illnesses and depression are some of the documented adverse event during MDR-TB treatment, and these have been linked to poor treatment outcomes in TB
patients. Depression is most common psychiatric illnesses found in both HIV-infected patients and those under MDR-TB treatment. An MDR TB diagnosis can have an impact on the psychological and environmental aspects of an individual. MDR TB patients can experience a wide range of psychological reactions: negative feelings of survival, poor health, self-esteem and constrained relations with their family and friends during treatment.

2.1.10 HIV and Multi Drug Resistant Tuberculosis
HIV has been driving the global burden of TB since its emergency. Whilst the association between primary TB infection and HIV has been proven several studies conducted in Tanzania, Botswana, South Africa, Malawi, Mozambique, India, Vietnam, and Russia did not reveal an association between HIV infection and anti TB medicines resistance. However contrary to the aforementioned studies. Some studies from Africa, South America, United States and Caribbean region have shown an existing association between HIV infection and anti-TB drug resistance. In a study by James et al. in Kwa Zulu Natal, HIV was shown to be a risk factor for mortality among MDR TB patients. An association between HIV and MDR TB has also been shown to exist in institutional outbreaks in industrialised countries.
2.1.11 Conceptual framework

The conceptual framework was developed from a review of literature to guide the study.

![Conceptual Framework Diagram]

Figure 3. Conceptual Framework
2.2 Justification of the Study

Literature from elsewhere have found risk factors associated with MDR TB. The major risk factors associated with MDR TB in Harare have not yet been established. Other factors that were found elsewhere to be associated with MDR TB have also not been confirmed to be the same driving the disease locally. An association between diabetes and MDR TB has been establishes in certain studies. The association between DM and MDR TB is unknown locally and nationally. The population has been a highly migrating one. The effect of migration and developing MDR TB among the population is also unknown. It is vital to know the effects of these factors on MDR TB, so that evidence based interventions can be put in place. Ascertaining risk factors associated with an undesirable health outcome is the hallmark of epidemiology. MDR TB is a global public health emergency. Studying the factors associated with MDR TB in Harare is of prime importance to the City and national TB control program.

2.3 Research questions

What are the major risk factors for MDR-TB in Harare City?

Is Harare City identifying MDR-TB patients late due to delayed diagnosis?

2.3.1 Hypothesis

H₀: There’s is no association between migration and pre-morbid chronic diseases with MDR-TB in Harare City.

H₁: Migration and pre-morbid chronic diseases like diabetes mellitus and HIV-1 infection are associated with MDR TB in Harare City.
2.3.2 Objectives of the Study

2.3.3 Broad Objective
To assess the factors associated with MDR TB in Harare City in 2015.

2.3.4 Specific objectives

1. To assess the MDR-TB case finding strategies among high risk MDR-TB patients in Harare City.
2. To assess the risk factors associated with MDR-TB in Harare City
3. To assess the contribution of chronic diseases and migration on the prevalence of MDR-TB cases in Harare City.
4. To use the results to improve the programmatic management of MDR-TB in Harare City
CHAPTER 3

METHODOLOGY

3.0 METHODOLOGY

This chapter will describe the research methods that were utilized in this study. It will focus on these key areas: study design, study setting, study population, sample size and sampling plan. Instruments, study variables, data capturing and analysis and ethical considerations will also be covered.

3.1 Study Design

A 1:2 unmatched case control study was conducted for primary participants. Since exposure and outcome have already occurred a case control study was used. A case control study would allow calculation of strength of association between exposure variables and a health outcome of interest. The time frame for conducting the study was short and this study design was the most appropriate compared to a cohort study.

Definitions:

Case: was a TB patient in Harare with a Drug Sensitivity Test showing resistance to Isoniazid and Rifampicin or Gene Xpert MTB/RIF result showing resistance to Rifampicin who was notified between June 2014 and July 2015.

Control: was a TB patient with a known cured result confirmed by negative sputum culture test result and has completed treatment within the last two months before the study.
3.2 Study setting
The study was conducted in Harare City health facilities. Harare City has 52 health facilities: 9 poly clinic, 2 admitting hospitals and 43 clinics spread throughout the City’s 9 administrative districts. TB and MDR TB case management is decentralized to all districts health facilities.

3.3 Study population
The study population were drug susceptible TB and drug resistant TB patients notified in Harare City from 2014 to 2015. MDR TB and TB patients who had successfully completed treatment and had a sputum negative result after treatment. Those who had completed treatment should have been declared cured at end of treatment. Key informants to be interviewed were Medical Officers, District TB coordinators, TB focal nurses.

3.4 Inclusion criteria and exclusion criteria
3.4.1 Inclusion Criteria
MDR TB patient with a DST or Gene Xpert result showing resistance to Rifampicin and TB patient who had a cured result within the last two months of study commencement and was resident in Harare. This was done to ensure that only cases and controls who had laboratory confirmation were recruited into the study. Controls who were cured and had completed treatment were recruited. This was done to rule out inclusion of TB patient with treatment failure. This was also done to reduce ascertainment bias in the study.

3.4.2 Exclusion criteria
Individual who meet this criteria were excluded from the study

- TB patients with no cured treatment outcome.
- MDR TB patient who has completed their 2 year treatment.
- TB patient notified and treated elsewhere outside of Harare
- MDR TB patients notified elsewhere other than Harare.
- Patients on MDR TB who have been transferred to other districts outside Harare
• MDR TB Patients and TB patients with cured result who have declined to participate.

3.5 Sample size

3.5.1 Primary participants
Notified MDR TB patients notified from June 2014 to July 2015 and drug susceptible TB patients who have completed treatment and had cured result in the past two months before study commencement were the primary participants.

Secondary Participants
Key informants were District TB coordinators, TB focal nurse and Medical Officers. These formed the secondary participants.

Sample size was calculated using Stat Cal in Epi Info 3.5.4 based on a study by Merza et al\(^\text{17}\) (2011) titled Anti tuberculosis drug resistant and associated risk factors in a tertiary level TB center in Iran: Assumption are that the proportion of cases who history of TB treatment were 72% whilst the proportion of control who had history of TB treatment were 37%, 80% power and OR = 6.87. The minimum sample size of 38 Cases and 74 controls was calculated. After factoring 10% non-response rate, 42 cases and 84 controls were considered.

3.5.2 Sample size for records
All the study participant’s clinical records were reviewed to reduce case ascertainment bias.

3.5.3 Sample size for key informants
Eight key informants were purposively recruited into the study.

3.6 Sampling
The cases were randomly selected from the City of Harare MDR TB registers kept at Poly Clinics by creating a random list in Excel spreadsheet. The MDR TB register captures physical address and mobile phone numbers for the cases. These were then followed up at their stated addressees. The cases were also interviewed when they come for medicines collection.
Controls were randomly selected from the Health Facility TB DOTS Register. Key informants were purposively selected into the study. Health facility from which cases and control are being managed were recruited into the study. Random selection of cases and control was selected to reduce selection bias in our study. This was done to ensure validity of our results both internal and external.

3.6.1 Cases

The random sampling method using MS Excel 2013 was used. Firstly all current active MDR TB patients on treatment notified from June 2014 to July 2015 in the City MDR TB program were entered into an Excel spreadsheet numbered from 1- to the last case. A random number column was created next to the list in the spreadsheet. A “=RAND ()” command in Excel was run to create a random number list. The created random number list was sorted by random number from small to the largest. After the sorting process, number 1-42 in the list were selected into the study. The selected number’s name, residential address and phone number were documented for follow up.

3.6.2 Controls

The number of controls to be recruited from a certain district followed the study’s case to control ratio of 1:2. Control to be selected for the study were chosen using random selection method. The controls were selected from Health Facility TB DOTS register. TB Patients with a cured result within the last two months before study commencement were listed and entered into Excel spreadsheet. Microsoft Excel was used to create a random list. The random list was be sorted by random number from smallest number to largest. Numbers from 1- to last value corresponding to the case to control ratio in the district were recruited into the study. The selected control’s names, cell numbers and residential address were documented for follow up.
3.6.3 Key informants
The key informants for this study were the Medical Officers, TB focal nurses, Sister in charge and TB coordinator. These were purposively recruited due to their knowledge on the TB program and their interaction with patients at the facilities. The key informants offered perspectives on the health related factors that impact on the MDR TB program. They were used to triangulate and verify information elicited from patients.

3.6.4 Health Facilities
Five poly clinics from the City district with highest TB notifications in the City were conveniently sampled for assessing cases detection strategies in Harare City.

3.7 Data Collection
3.7.1 Primary participants
A pre-tested interviewer administered, structured questionnaire was used to collect data from cases and controls on demographics, chronic core morbidities, history of migration, knowledge, and patient and health service factors.

3.7.2 Key Informants
An interview guide for key informants was used to elicit information on MDR TB management challenges and health system aspects.

3.7.3 Records Review
MDR TB presumptive case records were reviewed especially for those considered MDR TB risk individuals. These were; retreatment cases, MDR TB contacts, TB patients who have failed to convert, former prisoners and those with a history of travel to South Africa. Records for Gene Xpert, Sputum exam and DST were reviewed in the registers. The records for patients screened and notified from May 2015 –August 2015 were reviewed. The MDR TB patients’
DST results were also reviewed. Patient’s medical files at health facilities were reviewed for every participant in the study to ascertain:

- Date of Notification
- Type of TB patient
- History of TB drug use
- DOTS method
- Gene Xpert and Drug Sensitivity Test Results

3.7.4 Pretesting data collection Instruments

3.7.5 Interviewer administered semi structured questionnaire
The questionnaire was pretested at Mbare Poly Clinic to check for questionnaire consistency and duration of administering the questionnaire.

3.8 Data Processing and Analysis
Data were entered and analysed using Epi Info 3.5.4 (CDC 2012). Check codes, and legal values were used to reduce errors of data collection and entry. Data were cleaned to reduce errors during data entry. The same statistical software was used to calculate frequency tables, the means of continuous data were calculated and also contingency tables were used to analyze categorical.

3.9 Ethical Considerations
Questionnaire were administered at the home of the respondents or at health facility when the patients were coming for their medicines or sputum examinations. The interview for the control were conducted at their residence or places where they were comfortable. Privacy was ensured during the interviews. Before a questionnaire was administered to respondents, the objectives of the study were explained. A brief overview of some of the information to be sought and intended use of information was outlined explained to the study participants. Confidentiality was assured as well as anonymity. Participants were assured that that no personal identifiers
will be used for both data collection and results dissemination. Written consent was sought from all respondent before they were administered the questionnaire.

The following ethical areas were considered and addressed to the respondent before interview:

Voluntary participation: Study participants were informed that participating in the study was voluntary. Study participants were informed that they could withdraw from the study process at any point without any consequence. No coercion was employed in getting respondents to participate in the study.

Benefits: Respondents were informed that no momentary benefits would accrue to them by virtue of their participation in the study. However they were informed of the benefits that may accrue to the community and nation at large from the results of the study.

Harm: The study did not involve any clinical procedure or extraction of clinical samples from the respondents. The respondent were informed that no physical harm may occur to them if they chose to participate in the study. The risk of emotional stress was minimum especially on question such as HIV status. However respondent were asked if they were comfortable at onset of interview to be asked such questions.

Confidentiality: Names phones and addresses of cases and control were kept in a form under secure lock and key in a safe fire proof vault at City Health Department Head office but will be destroyed immediately after the completion of the study.

Ethical review and approval for the study was sought from the following bodies

- Joint Ethics and Research Committee of Parirenyatwa Hospital
- Medical Research Council of Zimbabwe
CHAPTER 4

RESULTS

4.0 Introduction
This chapter focuses on data presentation and analysis on socio-demographics, factors associated with multi drug resistant (MDR TB) Tuberculosis in Harare City.
4.1 MDR TB Case Detection Strategies in Harare City
Figure 3 shows the schematic diagram on the screening and diagnosis of presumptive risk and non-risk MDR TB in the City. Five (5) poly clinics with highest TB notifications in the City were conveniently selected for assessing for MDR TB cases detection activities, capabilities and adherence to TB case detection guidelines.

Figure 4. Schematic overview of MDR TB screening activities in Harare City TB program
The key informants reported that all the presumptive TB cases undergo sputum microscopy examination in the City if they meet criteria for presumptive MDR TB or drug susceptible TB. The specimen that has evidence for Acid Fast Bacilli on staining (sputum positive) from results
won’t go undergo Gene Xpert and will be notified as Category 1 TB patient. The sputum specimen that come negative for Acid Fast Bacilli (AFBs) are subjected to the Gene Xpert examination. All high risk presumptive MDR TB cases undergo both culture and microscopy examination and Gene Xpert to detect Rif Resistance. A DST is also ordered for all MDR TB presumptive cases. Per the local guidelines high risk MDR TB presumptive cases include the following: retreatment TB, treatment failure, defaulters MDR TB contact, and prisoners and those with a history to South Africa. The DST is ordered by medical officer for case that have been isolated by Gene Xpert as R resistant. A DST is also ordered where there is a failed sputum conversion after intensive phase. In the program; TB case detected by Gene Xpert as non-Rifampicin resistant MTB will have their follow up sputum examination conducted by microscopy instead of the Gene Xpert.

Table 4 shows the risk population screening at 5 poly clinics.

<table>
<thead>
<tr>
<th>MDR TB Risk Person</th>
<th>Number</th>
<th>Type of Test Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retreatment</td>
<td>20</td>
<td>DST 20/20</td>
</tr>
<tr>
<td>Prisoner</td>
<td>2</td>
<td>Microscopy 2/2</td>
</tr>
<tr>
<td>Recent travel to South Africa</td>
<td>9</td>
<td>DST 9/9</td>
</tr>
<tr>
<td>MDR TB Contact</td>
<td>3</td>
<td>DST 3/3</td>
</tr>
<tr>
<td>No Sputum Conversion</td>
<td>4</td>
<td>DST 4/4</td>
</tr>
</tbody>
</table>

Five (5) Health facility in the City with highest TB notifications were conveniently selected into the study. The Health Facility TB and Presumptive TB Registers were reviewed. A total of 20 retreatment patients were identified from the registers. Two former prisoners also were identified from the registers. There was evidence that all the risk presumptive MDR TB cases
had undergone Gene Xpert and microscopy and the results were recorded. DST had been ordered but the results were absent from the registers. DST results were not recorded at the facilities. The Health workers reported that they were yet to update the new Health facility TB register and were also to some of the DST results from National Microbiology Reference Laboratory.

4.3 Availability of Gene Xpert, Guidelines and TB Medicines in Harare City, 2015

The 5 polyclinics were assessed for availability of MDR TB management guidelines. None of the five facilities had current guidelines for MDR TB. All the facilities had 2010 TB guidelines. Four of the 5 polyclinics had a gene Xpert in place. All the five health facilities assessed in this study had no current copy of the MDR TB programmatic management guidelines from the Ministry of Health. All the facilities had the 2010 National TB guidelines that guide the management of drug susceptible TB. Five of the assessed polyclinics have an operational Gene Xpert machine. Six out of the nine polyclinics in Harare City have a Gene Xpert in place. The staff at the assessed health facilities were using the Programmatic management of MDR TB training guidelines.

All the key informants reported that no drug stock outs occurred during the past two years. The study respondents conformed this as none of the two groups ever reported to have faced any challenges in acquiring ant TB medicines at the health facilities. The drug status reports for the health facilities were also reviewed to confirm availability of the commodities for the period under review.
4.4 General Characteristics of Study Respondents

A total of 42 cases and 84 control were recruited into the study. Table 2 shows the demographic characteristics of study participants.
Table 2: Demographic Characteristic of Study participants in Harare City, 2015

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cases n= (%)</th>
<th>Controls n= (%)</th>
<th>p- Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>16(38)</td>
<td>35(42)</td>
<td>0.84</td>
</tr>
<tr>
<td>Male</td>
<td>26(62)</td>
<td>49(58)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td>8(20)</td>
<td>36(45)</td>
<td>0.15</td>
</tr>
<tr>
<td>30-39</td>
<td>10(25)</td>
<td>24(30)</td>
<td></td>
</tr>
<tr>
<td>40-49</td>
<td>14(35)</td>
<td>12(15)</td>
<td></td>
</tr>
<tr>
<td>50-59</td>
<td>4(10)</td>
<td>6(8)</td>
<td></td>
</tr>
<tr>
<td>60+yrs</td>
<td>4(10)</td>
<td>2(3)</td>
<td></td>
</tr>
<tr>
<td>Median Age</td>
<td></td>
<td>33(Q1=27 Q3=44)</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>22(55)</td>
<td>33(42)</td>
<td>0.33</td>
</tr>
<tr>
<td>Secondary</td>
<td>17(43)</td>
<td>45(58)</td>
<td></td>
</tr>
<tr>
<td>Tertiary</td>
<td>1(3)</td>
<td>0(0)</td>
<td></td>
</tr>
<tr>
<td>Employment Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formally employed</td>
<td>0(0)</td>
<td>5(31)</td>
<td></td>
</tr>
<tr>
<td>Self employed</td>
<td>11(28)</td>
<td>58(71)</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>31(72)</td>
<td>24(29)</td>
<td></td>
</tr>
<tr>
<td>Religion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African apostolic churches</td>
<td>13(32)</td>
<td>32(42)</td>
<td>0.47</td>
</tr>
<tr>
<td>Islam</td>
<td>3(7)</td>
<td>2(3)</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>6(15)</td>
<td>17(22)</td>
<td></td>
</tr>
<tr>
<td>Pentecostal</td>
<td>6(15)</td>
<td>10(13)</td>
<td></td>
</tr>
<tr>
<td>Protestant</td>
<td>8(20)</td>
<td>9(12)</td>
<td></td>
</tr>
<tr>
<td>Roman Catholic</td>
<td>5(12)</td>
<td>6(8)</td>
<td></td>
</tr>
</tbody>
</table>

There was no significant difference between cases and control in terms religion, age and sex.

Fourty percent 51(40%) of the respondents were female and 75(60%) were male. The majority
of the cases and control were <50 years and no respondent was <20 years. The median age among cases and controls was 33 years (Q₁=27; Q₃=44). The majority of controls 55(76%) were self-employed compared to cases 10(28%). A majority of the cases 22(52%) had attained primary education as the highest form of education ever attained. A total of 20(48%) cases had attained secondary level of education whilst 48(58%) controls had attained secondary level education among controls. The majority of cases 13(26%) and controls 32(35%) belonged to the African apostolic churches compared to other religious affiliations. A minority among the cases and control had no religious affiliations. Fourteen 14(35%) cases and 35(44%) controls reported to be married. A majority of cases 11 (28%) cases were divorced and single 11(28%). There were 2(5%) widows among cases and 3(4%) among controls.

### 4.5 Income among study participants in Harare City.

#### Table 3: Income among study participants in Harare City

<table>
<thead>
<tr>
<th>Factor</th>
<th>Cases n= (%)</th>
<th>Control n= (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average monthly earning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$100</td>
<td>2(50)</td>
<td>1(6)</td>
</tr>
<tr>
<td>&lt;$200</td>
<td>1(25)</td>
<td>15(83)</td>
</tr>
<tr>
<td>$200-500</td>
<td>0(0)</td>
<td>2(11)</td>
</tr>
<tr>
<td>$500+</td>
<td>1(25)</td>
<td>0(0)</td>
</tr>
<tr>
<td>Average daily earnings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$1/day</td>
<td>1(13)</td>
<td>19(38)</td>
</tr>
<tr>
<td>$2-$5/day</td>
<td>7(88)</td>
<td>31(62)</td>
</tr>
</tbody>
</table>

Majority of cases had no earning greater than $100 per months compared to controls who had a least 15(83%) earning greater amount than $100 per month. Among those who had some source of daily income at least 7(88%) among case earned $2-$5 per day. The majority 31(62%) of those with a daily source of income among controls were earning $2-$5.
4.6 Habitation status

Table 4 shows the habitation status among study participants in Harare City.

**Table 4: Habitation status among study participants in Harare City**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Case n= (%)</th>
<th>Control n= (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Residing rooms</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>7(18)</td>
<td>53(64)</td>
</tr>
<tr>
<td>2-3</td>
<td>29(73)</td>
<td>23(28)</td>
</tr>
<tr>
<td>4+rooms</td>
<td>4(10)</td>
<td>7(8)</td>
</tr>
<tr>
<td><strong>Ownership status of residence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living House belongs to parents</td>
<td>6(12)</td>
<td>12(14)</td>
</tr>
<tr>
<td>House owned</td>
<td>12(27)</td>
<td>16(19)</td>
</tr>
<tr>
<td>Renting</td>
<td>11(26)</td>
<td>51(61)</td>
</tr>
<tr>
<td>Living with relatives</td>
<td>13(31)</td>
<td>4(5)</td>
</tr>
</tbody>
</table>

The majority of controls lived in a single (1) room 53(64%), whilst the majority of cases resided in 2-3 rooms 29(73%). The majority of cases were living with relatives 13(31%), renting 11(26%) and lived at their parents houses 6(12%). The majority of controls lived in rented houses 51(61%) and smaller proportion in were living with relatives 4(5%). A small proportion among cases and control owned houses.
### 4.7 Patient related factors

Table 5 shows the patient related factors associated with MDR TB.

**Table 5: Patient related factors associated with MDR TB in Harare City**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Case n= (%)</th>
<th>Control n= (%)</th>
<th>OR(95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of Imprisonment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2(5)</td>
<td>2(3)</td>
<td>1.75 (0.23-12.7)</td>
<td>0.98</td>
</tr>
<tr>
<td>No</td>
<td>40(95)</td>
<td>82(97)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being Employed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>11(28)</td>
<td>58(77)</td>
<td>0.14[0.06-0.33]</td>
<td>0.000</td>
</tr>
<tr>
<td>No</td>
<td>31(73)</td>
<td>24(23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of being a TB contact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>18(44)</td>
<td>18(24)</td>
<td>2.56[1.23-6.13]</td>
<td>0.02</td>
</tr>
<tr>
<td>No</td>
<td>24(56)</td>
<td>66(76)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of smoking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>8(19)</td>
<td>8(10)</td>
<td>2.2[0.78-6.45]</td>
<td>0.36</td>
</tr>
<tr>
<td>No</td>
<td>34(81)</td>
<td>76(91)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0(0)</td>
<td>1(1)</td>
<td>Undefined</td>
<td>Undefined</td>
</tr>
<tr>
<td>No</td>
<td>42(100)</td>
<td>83(99)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past Alcohol use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>16(40)</td>
<td>25(30)</td>
<td>1.56[0.70-3.39]</td>
<td>0.38</td>
</tr>
<tr>
<td>No</td>
<td>26(60)</td>
<td>58(70)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The majority of study respondents were never imprisoned. There were more control who were self-employed 58(77%) as compared to cases 2(11%). A bigger proportion of cases 18(44%) reported to have been a contact of a TB patient than controls 18(24%). Those who reported to have ever been a contact of TB patient in the household were 2.75 times likely to be have MDR
TB than those who did not report a history of contact with TB patient in household. This association was statistically significant (p=0.02). The majority of cases and controls were not smokers. Those with a history of tobacco use (OR=2.2 95% CI: 0.78-6.45) and alcohol use (OR=1.56 95% CI: 0.70-3.39) were likely to have MDR TB than non-smokers. However the association between tobacco use, alcohol use and MDR TB was not statistically significant (p= 0.36, 0.38). In this study females were less likely to have MDR TB compared to males (OR=0.86 95% CI: 0.40-1.84). However the association was not statistically significant.

4.8 Health and treatment related Factors.

Table 6 shows the health related factors associated with MDR TB in Harare City.

Table 6: Health and Treatment Related factors associated with MDR TB in Harare City

<table>
<thead>
<tr>
<th>Factor</th>
<th>Case n= (%)</th>
<th>Control n= (%)</th>
<th>OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>30(75)</td>
<td>57(72)</td>
<td>1.13[0.4-2.76]</td>
<td>0.94</td>
</tr>
<tr>
<td>Negative</td>
<td>10(25)</td>
<td>22(28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2(5)</td>
<td>3(4)</td>
<td>1.15[0.21-.10]</td>
<td>0.8</td>
</tr>
<tr>
<td>No</td>
<td>40(95)</td>
<td>81(97)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kidney failure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0(0)</td>
<td>0(0)</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>42(100)</td>
<td>84(100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of TB treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>38(91)</td>
<td>10(13)</td>
<td>65.6[19-223]</td>
<td>0.000</td>
</tr>
<tr>
<td>No</td>
<td>4(9)</td>
<td>74(87)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever Stopped taking medication in previous treatment.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>28(71)</td>
<td>5(28)</td>
<td>6.62[1.91-23]</td>
<td>0.04</td>
</tr>
<tr>
<td>No</td>
<td>11(28)</td>
<td>13(72)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experienced Side effects during previous treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>16(94)</td>
<td>3(75)</td>
<td>4.6[0.78-27.24]</td>
<td>0.35</td>
</tr>
<tr>
<td>No</td>
<td>1(6)</td>
<td>1(25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reason for stopping treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side effects</td>
<td>13(57)</td>
<td>3(43)</td>
<td>1.73[0.31-9.57]</td>
<td>0.42</td>
</tr>
<tr>
<td>Feeling better</td>
<td>10(43)</td>
<td>4(57)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous DOTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health worker</td>
<td>16(67)</td>
<td>4(44)</td>
<td>2.5[0.52-11.95]</td>
<td>0.22</td>
</tr>
<tr>
<td>Non Health worker</td>
<td>8(33)</td>
<td>5(56)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The proportion of HIV positive respondents among the two groups was almost similar (72%; 75%). Those who were HIV positive were 1.13 times likely (OR: 1.13, 95% CI 0.42-2.76) to have MDR TB than HIV negative respondents. In this study the prevalence of diabetes among cases and controls was low. Only 2 cases (5%) and 3(4%) controls reported to be diabetic. Diabetics were 1.15 time likely to have MDR TB than non-diabetics, however this association was not statistically significant (p=0.8). In this study no case or control reported to be suffering from renal failure.

There was a significant difference between the number of cases and controls who had prior exposure to anti TB medicines. There were 7 times more cases 31(91%) than controls10 (13%) who had been diagnosed and treated for TB before. Those who had reported to have undergone TB treatment before were 65.6 times likely (p<0.0001) to have MDR TB compared to those who had no history of exposure to TB medicines. The majority of cases 28 (71%) reported to have stopped taking medication in the previous treatment category. A majority 16(94%) reported to have experienced medication side effects The major reasons for given by cases for stopping medication were side effects 13(57%) and feeling better before completing treatment 10(43). Those who interrupted treatment were 6.62 times (95% CI: 1.91-23) likely to have MDR TB than those who had never stopped taking their ant TB medication. This association was statistically significant (p=004).The were more cases 13(57%) than controls 3(43%) whose reason for stopping treatment was adverse effects of medication. Those who reported to have had experienced side effects in previous TB treatment were 4.63 times likely have MDR TB. A bigger proportion of the cases 16(66%) reported to have been monitored by a health worker in previous treatment category. Those who reported to have been monitored by a health worker (HW DOTS) in their previous treatment were 2.5 time likely to have MDR TB though this association was not statistically significant (p=0.22).
4.9 Health system factors
All the MDR TB 42(100%) patients reported to have had received some form of counselling on the disease compared to only 23(38%) who reported to have had received the same. Table 7 shows the health system factors related with having MDR TB.

Table 7: Health system factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>Case n= (%)</th>
<th>Control n= (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever received Counselling on TB issues</td>
<td>30(90)</td>
<td>23(38)</td>
</tr>
<tr>
<td>Attitude of Health care workers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>42(100)</td>
<td>84(100)</td>
</tr>
<tr>
<td>Bad</td>
<td>0(0)</td>
<td>0(0)</td>
</tr>
<tr>
<td>Ever faced challenges in getting drugs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0(0)</td>
<td>0(0)</td>
</tr>
<tr>
<td>No</td>
<td>42(100)</td>
<td>84(100)</td>
</tr>
</tbody>
</table>

Among the 5(five) health facilities assessed, key informants reported that no TB drug stock out have been recorded in the past two years. None of the MDR TB and drug susceptible patients interviewed reported that they had ever faced challenges in getting drugs at facilities. All the cases 42 (100) and controls 84(100%) rated the attitude of the health workers as good.
4.10 Knowledge of MDR TB among study respondents

Table 8 shows knowledge of MDR TB among study respondents.

Table 8: Knowledge of MDR TB among cases and controls in Harare City 2015

<table>
<thead>
<tr>
<th>Variable</th>
<th>Case n= (%)</th>
<th>Control n= (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correctly identified cause of MDR TB</td>
<td>2(5)</td>
<td>0(0)</td>
<td>0.02</td>
</tr>
<tr>
<td>Aware of risk of defaulting treatment</td>
<td>39(99)</td>
<td>62(75)</td>
<td>0.02</td>
</tr>
<tr>
<td>Know importance of finishing Treatment course</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>42(100)</td>
<td>64 (85)</td>
<td>0.007</td>
</tr>
<tr>
<td>Don’t know</td>
<td>0(0)</td>
<td>11(15)</td>
<td></td>
</tr>
</tbody>
</table>

Only a minority of the cases could correctly identify the cause of MDR TB in TB patients. The majority of cases 39(99%) were aware of the risks of defaulting TB treatment whilst also a bigger proportion of controls (76%) were also aware of the dangers of defaulting. All the cases 42(100%) were aware of the importance of completing TB treatment compared to controls 64(85%). Most of the respondents could point out that if one defaults there is a likelihood of relapse TB. More cases knew the risk of defaulting treatment as compared to control. There was a significant difference in terms of this knowledge between the two groups.
4.11 Migration and MDR TB in Harare City

Table 9 shows history of migration and MDR TB and among study participants.

Table 9: History of migration and MDR TB in Harare City, 2015

<table>
<thead>
<tr>
<th>Factor</th>
<th>Case n=(% )</th>
<th>Control n= (%)</th>
<th>OR[95% CI]</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever visited any country</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>18(39)</td>
<td>42(51)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>24(60)</td>
<td>42(49)</td>
<td>0.66 [0.30-1.41]</td>
<td>0.34</td>
</tr>
<tr>
<td>Diagnosed with TB outside of country</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2(8)</td>
<td>2(6)</td>
<td>1.45 [0.19-11.11]</td>
<td>0.87</td>
</tr>
<tr>
<td>No</td>
<td>22(92)</td>
<td>32(94)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Received a visitor from another country with MDR TB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0(0)</td>
<td>0(0)</td>
<td>undefined</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>42(0)</td>
<td>0(84)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There were no immigrant MDR TB cases or controls in this study. A bigger proportion of study respondents reported to have visited another country in the past two years. Those who had a history of visiting other countries in the past two years were less likely (OR: 0.66 95% CI 0.34-1.4) to have MDR TB compared to those who had never traveled outside the borders of the country. Those who reported to have been once diagnosed with TB outside the country were 1.45 times likely to have MDR TB however this association was not significant.
4.12 Stratified Analysis
To control for confounders and effects modification stratified analysis was carried. Table 10 shows the association between self-employment and having MDR TB stratified by gender.

Table 10: Stratification of association between employment status and MDR TB status by gender in Harare City, 2015

<table>
<thead>
<tr>
<th>Variable</th>
<th>Case n= (%)</th>
<th>Control n= (%)</th>
<th>OR(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self Employed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4(25)</td>
<td>20(61)</td>
<td>0.21[0.05-0.81]</td>
</tr>
<tr>
<td>No</td>
<td>12(75)</td>
<td>13(39)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7(28)</td>
<td>36(78)</td>
<td>0.11[0.03-0.33]</td>
</tr>
<tr>
<td>No</td>
<td>18(72)</td>
<td>10(22)</td>
<td></td>
</tr>
<tr>
<td>Crude OR</td>
<td></td>
<td></td>
<td>0.15[0.06-0.35]</td>
</tr>
<tr>
<td>aOR</td>
<td></td>
<td></td>
<td>0.14[0.06-0.34]</td>
</tr>
</tbody>
</table>

The association between being employed and having MDR TB was modified by whether one was male or female. The crude OR (COR= 0.15, 95% 0.06-0.35) lies within the stratum specific Odds Ratios (0.21, 0.11). The association between having a prior exposure to TB treatment and developing MDR TB was also modified by whether one was female or male. Females who had some form of self-employment were nearly twice less likely to have MDR TB as compared to males.
Table 11 shows the association between previous history of TB treatment and having MDR TB stratified by gender.

**Table 11: Association between history of TB treatment and having MDR TB stratified by gender in Harare City, 2015**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Case n= (%)</th>
<th>Control n= (%)</th>
<th>OR(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous TB history</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>14(88)</td>
<td>7(21)</td>
<td>26[4.47-142]</td>
</tr>
<tr>
<td>No</td>
<td>2(13)</td>
<td>26(79)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>24(92)</td>
<td>6(12)</td>
<td>86[16-460]</td>
</tr>
<tr>
<td>No</td>
<td>2(8)</td>
<td>43(88)</td>
<td></td>
</tr>
<tr>
<td>Crude OR</td>
<td></td>
<td></td>
<td>50.42[15-156]</td>
</tr>
<tr>
<td>aOR</td>
<td></td>
<td></td>
<td>47.53[14.53-155.43]</td>
</tr>
</tbody>
</table>

The Crude OR (COR=50.42, 95% 15-156) lies within the stratum specific Odds Ratios. The association between having previous exposure to TB treatment and having MDR TB among respondent was modified by gender. Males with a previous history of TB treatment were nearly 3[OR=86, OR=26] times more likely to have MDR TB compared to those who had no previous TB treatment history.
4.13 Independent risk factor associated with MDR TB in Harare City
Table 12 shows the independent risk factors associated with MDR TB in the City.

Table 12: Independent Risk factors associated with MDR TB in Harare City

<table>
<thead>
<tr>
<th>Variable</th>
<th>Crude OR</th>
<th>Aor</th>
<th>95% C.I</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous history of TB</td>
<td>65.6</td>
<td>35</td>
<td>[10-127]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Being employed</td>
<td>0.12</td>
<td>0.16</td>
<td>[0.04-0.6]</td>
<td>0.006</td>
</tr>
</tbody>
</table>

A forward logistic regression analysis was carried out. Table 12 displays the independent risk factors associated with MDR TB. The factors from bivariate analysis that had a p-value of <0.25 were put into the model. Having a history of TB treatment remained a significant risk factor (aOR= 35, 95% CI 10-127) for MDR TB after controlling for possible confounders. Being employed also remained a significant protective factor (aOR=0.16, 95% CI 0.04-0.6) after multi-variate analysis.
CHAPTER 5

DISCUSSION AND CONCLUSION

5.0 DISCUSSION

A case control study was conducted among the residents of Harare City who had MDR TB and those who had undergone TB treatment and had been declared cured. Female were less likely to have MDR TB than male respondents. There was evidence that TB program was screening all high risk MDR TB presumptive cases through sputum culture technique and Gene Xpert for Rifampicin resistance detection. Those who had a history of TB treatment were at a greater risk of having MDR TB than those who had no previous history of TB treatment. Those who reported to have stopped taking TB medication before were likely to have MDR TB than those who did not stop treatment previously. Those who had some form of self-employment were less likely to have MDR TB than those who had no form of self-employment. HIV was not significantly associated with MDR TB in this study. Diabetes and kidney failure were not associated with MDR TB in the City. There was low prevalence of diabetes and kidney failure in this study.

The screening program in Harare was effectively identifying and subjecting the presumptive MDR TB cases to the required test as per the guidelines. MDR TB screening activities are guided by the National TB guidelines of 2010 and Multi Drug Resistant Programmatic Management Guidelines. As per the guidelines sputum negative cases with no known risk factors for MDR TB are subjected to a compulsory Gene Xpert MTB/Rif test whilst sputum positives from non MDR TB risk individuals are excluded from Gene Xpert examination. The
omission of sputum positive specimen from non-risk MDR TB presumptive cases does create a potential for missing drug resistance at this level. Drug resistance may be detected late at 2 months if it exist. However in the present study there was no evidence to show how many MDR TB case could have been missed by not subjecting non MDR TB risk sputum positive to Gene Xpert. Rifampicin and Isoniazid resistance which are the two markers for MDR TB cannot be detected by microscopy therefore these can only be detected by Gene Xpert and culture and DST. There is likelihood of commencing patients who are sputum positive yet they may have undetected mono resistant TB or MDR TB. There was no evidence that lack of proper guidelines were affecting screening activities as they cover the essential activities. This could likely be attributed to competency and skill and training. However they are not handy as they are divided into several modules. In the long run it may affect the program if proper single composite guidelines are not available. This may be critical in event of staff turnover in future.

In this study females were less likely to be MDR TB cases as compared to the males though this association was not statistically significant. Our finding was similar to those by Merza et al in Iran\(^\text{17}\) were being male was a risk factor for MDR TB. However our findings are contrary to findings by Lomtadze et al.\(^\text{57}\) in Georgia and Liu et al.\(^\text{59}\) in Northern China and Sachin et al.\(^\text{16}\) in India were females were more at risk compared to their male counterparts. In the Mumbai\(^\text{16}\) case control study the sample size was large that this study. The association between history of TB treatment and MDR was also modified by gender as males were 3 times more at risk compared to females. There is no clear explanation for this association but we can postulate that this could likely be due to the difference in health seeking behaviour between the sexes. Females may have better health seeking behaviour compared to male counterparts.
In this study the majority of the cases earned less daily and monthly incomes compared to controls. Whilst the majority of the study participants may be living below the poverty datum line (Ministry of Finance: Poverty Datum lines). It is evident enough in this study that the economic status for cases is much worse than controls in terms of highest level of education attained, daily and monthly income, residential status and employment status. Low socio economic status has also been shown to be associated with MDR TB in different settings by Lomtadze et al.\textsuperscript{57}, Merza et al\textsuperscript{17}, Hirpa et al\textsuperscript{35}, Barrosso et al\textsuperscript{9} and Mendoza et al.\textsuperscript{58} Lower level of education status may also create a poverty trap. An improvement in education and literacy may likely lead to a better understanding of health issues and employment opportunities and better quality of life.\textsuperscript{17} It is likely that those who have low economic status are incapacitated to afford good housing, have poor access to nutritious food and limited access to health service. These factors converge, resulting in emerging of TB in poor settings.\textsuperscript{1} A majority of respondent who had some form of employment were self-employed. These could be involved in some economic activity out of formal employment structures. This is a true reflection of the economic situation in the country were the majority of the population is not formally employed and is now involved in informal sector for survival. Those who have no employment have been shown in other studies to be more at risk of developing MDR TB.\textsuperscript{17}

The association between having a history of TB treatment and MDR TB has been shown in literature.\textsuperscript{1,2,4,8,9,14,17,30,34,61,62} In this study the same factor was significantly associated with MDR TB. Previous history of exposure TB treatment and eventually developing MDR TB might be linked to negative outcome in previous treatment category such as treatment failure, defaulting. It cannot be ruled out that those who were previous treated were already having MDR TB but it was not identified in the previous treatment category. Those who have poor treatment adherence, interruption and defaulting will likely create conducive environment for
TB bacilli to develop resistance. Poor treatment compliance will result in adverse treatment outcomes. The association between having been treated for TB before and having MDR TB may be credible evidence that locally, MDR TB is acquired rather than primary MDR TB. This entails that TB patients are developing MDR TB during treatment. This raise programmatic issues that may need to be evaluated.

Stopping TB treatment in previous treatment category was associated with MDR TB in this study. In this study a sizeable proportion of cases reported to have experienced some side effects. Stopping medication was influenced by two critical issues in this study: side effects and feeling well before completing treatment. It is likely that if patients start to experience side effects of medicines they may stop treatment. The link between side effect and abandoning treatment has been confirmed in literature\textsuperscript{17, 35}. TB treatment is long, once patients start to feel well, they may have a false sense of wellness and opt out of seemingly treatment and the inconveniences that accompany being on treatment. In this study those who interrupted treatment had experienced side effects were likely to have MDR TB. This association is also similar to findings by Hirpa et al.\textsuperscript{35} in Ethiopia and Barrosso et al. in Brazil where those who had stopped treatment had a risk of 13.1 and 2.8 respectively of developing MDR TB. HIV prevalence among TB patient may also indicate that most of the respondents are on dual ART/TB treatment. The dual ART /TB treatment may also lead to treatment side effects. Stopping treatment may potentiate mutation of TB bacilli thereby increasing likelihood of MDR TB.\textsuperscript{9}
HIV has been shown to be associated with primary drug susceptible TB infection in the population. In this study no significant association could be found between MDR TB and HIV. This could be likely be due to the high HIV prevalence among the drug susceptible and MDR TB patients with no major difference in the rates among the two groups. The country has a generalized HIV epidemic with HIV prevalence in the 15-49 age group >13% and HIV prevalence among all TB patient is estimated at 72%. There is wide debate among researcher on whether HIV is associated with MDR TB or not. The finding in this study are similar to those found by Hirpa et al. in a case control study and Weyer et al. in a cross sectional study in South Africa where no association between HIV and MDR TB was found. Barrosso et al. in a low HIV prevalence setting of Brazil also found no association between HIV and MDR TB. This is contrary to studies that have shown that an association between HIV and MDR TB exist.

Diabetes has the effect of lowering immune system simmilar to HIV. In this study there was no significant association between being diabetic and having MDR TB. In this study there was low prevalence of diabetes among study participants. It could be likely they there were some respondents who were diabetic but haven’t had a diabetes diagnosis yet. It could also be a true reflection of low prevalence of diabetes among both TB and MDR TB. The small sample size in this study could also have the effect of reducing the strength of association. The majority of the respondents were below the age of 50 years. This age group is at a lesser risk of diabetes compare to the >50 years. Older age has been shown to be a risk factor for diabetes. However a study with a larger sample size may be needed to determine the actual prevalence of DM among TB patients in the city and country since it has been shown to be a risk factor for TB elsewhere. This study findings were similar to those by Hsu et al. in a cross sectional study in Taiwan where they found no association between Diabetes Mellitus and MDR TB.
However the present findings are contrary to those found in New York\textsuperscript{20} and Iran\textsuperscript{60} where an association between DM and MDR TB was found. Diabetics were 6.32 and 8.66 times more likely to have MDR TB in the two studies.\textsuperscript{20,60} The study designs from which an association between DM and MDR TB was found differed from this study. Barghei et al.\textsuperscript{19} conducted a case control study where TB patients DM were cases and controls where TB patients without DM. Bashar et al. conducted a records review of patients that attended a TB clinic in Newyork.\textsuperscript{20}

In this study those who reported to be on health worker (HW) monitored DOTS in previous TB treatment were 2 times more likely to have MDR TB than those who were on other forms of DOTS. Harare City TB program maintains a universal health facility DOTS for all TB patients. This may explain the big proportion of cases who reported HW monitored DOTS in this study. The problem may not lie with DOTS strategy per but it may point to a weak patient tracing system. Tracing TB patients may also be impeded by high mobility in urban population. This may be credible as majority of cases reported to have been treated before and the stopped treatment. DOTS should be backed up by other strategies to monitor and track patients. It should be backed by other strategy to keep TB patients in care.

In this study those who had history of migrating out of the country were less likely to have MDR TB compared those with no history of migration though it was not significant. This could be likely be due to the fact that those who are able to move across the borders might be engaged in some of employment activities which can be a source of income. This study has already shown that having some form of self-employment is protective. These in turn may have improved access to basic health service and better living conditions which may mitigate against developing MDR TB.
A prior history of imprisonment was associated with being an MDR TB patient though not statistically significant. The association could likely be due to poor social economic associated with MDR TB and TB. Those with a poor social economic status and lack credible sources of income could likely engage in illegal activities as source of living.

5.1 Limitation of the Study
The study had its own limitation. The small sample size could likely have reduced the strength of association of some exposure that could otherwise have been significant in this study. Chance of recall bias cannot be ruled. Cases could have more likely have reported more exposures than controls leading to an overestimation of the strengths of associations. Selection bias could not be ruled out as those who had been transferred out and MDR TB who had completed treatment were excluded from the study. This study excluded transfer outs of Harare City. This could have likely reduced the strengths of associations.

5.2 CONCLUSION
The screening activities adheres to the MDR TB programmatic management protocols. From the results of this study it can be concluded that MDR TB in Harare affects the <50 years most compared to the older age groups. Interrupting treatment in previous TB treatment category was a significant risk factor for developing MDR TB. MDR TB cases who stopped treatment before did so due to treatment side effects and feeling better before completing treatment. Being HIV positive was not associated with having MDR TB. Those who reported a previous history of being a TB contact were likely to have MDR TB. Based on the findings of this study. It is likely that MDR TB in Harare is acquired drug resistance as prior exposure to anti TB medicines was the leading risk factor. Females were less likely to have MDR TB compared to male respondents. There is no delayed case detection for high risky presumptive cases in the City. Those who reported to be employed were less likely to have MDR TB. Those who
reported to have been health worker DOTS monitored were likely have MDR TB than those who were on non-health DOTS monitored. Diabetes, HIV and renal failure were not associated sign with MDR TB in Harare City. There was a low prevalence of diabetes mellitus among the study respondents. Those with a history of migration were less likely to have MDR TB compared to those who have never left the country. There was a significant difference in knowledge on risk of defaulting between cases and controls. History of TB treatment was independently associated with having MDR TB. Being employed was independently associated with less likelihood of having MDR TB.

5.3 RECOMMENDATIONS

1. Facilities should intensify counselling and health education among drug susceptible TB patients so that they understand the risk of developing MDR TB during treatment - The District Medical Officers, Nurses in Charges and TB coordinators.

2. The TB clinic and OI/ART staff should identify TB patients who are experiencing treatment side effects for proper management and counselling so that they may not abandon treatment- City TB /OI Focal person, Medical Officer and Nurse in Charge.

3. The City Health management should intensify case follow up and tracking monitoring in a highly mobile and metropolitan setting such as the City of Harare- Community Nursing and Environmental Health Department.

4. Health care workers should provide adequate counselling to all TB patient regardless whether one is drug resistance or drug susceptible- Nursing Manager
5. All facilities should be provided with proper MDR TB guidelines so that staff don’t resort to MDR TB training guidelines—Director Health Service and Ministry of Health and child care.

6. Economic support and sustenance programs for vulnerable TB patients should be put in place to alleviate economic vulnerability as most of them have no credible source of livelihood. A form of livelihood for TB patients was associated with a lower risk of having MDR TB as shown in this study—Ministry of Health and Child Care and Ministry of Labour and Social welfare.

7. The should be continual sustained investment in Xpert MTB/RIF diagnostic machines in the City to enable sputum from all presumptive TB cases to be screened for Rifampicin resistance. The MDR TB threat is growing globally therefore there is a need to rule out drug resistance at onset of all TB notifications—Ministry of Health and Child Care.
CHAPTER 6

REFERENCES

6.0 REFERENCES


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27. Stuckler D, Basu S, McKee M, and King L. Mass incarceration can explain population increases in TB and multidrug-resistant TB in European and central Asian countries. PNAS. 2008.105


7.0 ANNEXES

ANNEX 1: CITY OF HARARE APPROVAL LETTER

TO WHOM IT MAY CONCERN

Re: AUTHORISATION TO CARRY OUT A STUDY IN HARARE CITY HEALTH FACILITIES: FACTORS ASSOCIATED WITH MULTI-DRUG RESISTANT TUBERCULOSIS IN HARARE, 2015: MR T FAMBIRAI

I refer to the above
The bearer is an MPH officer attached to City of Harare, City Health Department.
Permission is granted for Mr Tichaona Fambirai to carry out a study on Factors Associated with Multi-Drug resistant Tuberculosis in Harare. Could you kindly assist him

Yours Sincerely

DIRECTOR OF HEALTH SERVICES

[Stamp] 15 Jun 2015
ANNEX 2: JREC APPROVAL LETTER

APPROVAL LETTER

Date: 26th August 2015

JREC Ref: 181/15

Name of Researcher: Tichaona Fambirai
Address: University of Zimbabwe, Department of Community Medicine

Re: Factors associated with Multi Drug Resistant Tuberculosis in Harare City, 2015.

Thank you for your application for ethical review of the above mentioned research to the Joint Research Ethics Committee. Please be advised that the Joint Research Ethics Committee has reviewed and approved your application to conduct the above named study. You are still required to obtain MRCZ approval and if required by the nature of your study, RCZ approval as well, before you commence the study.

- APPROVAL NUMBER: JREC/181/15
- APPROVAL DATE: 26th August 2015
- EXPIRY DATE: 25th August 2016

This approval is based on the review and approval of the following documents that were submitted to the Joint Ethics Committee:

a) Completed application form
b) Full Study Protocol
c) Informed Consent in English and/or appropriate local language
d) Data collection tool version:

After this date the study may only continue upon renewal. For purposes of renewal please submit a completed renewal form (obtainable from the JREC office) and the following documents before the expiry date:

a) A Progress report
b) A Summary of adverse events.
c) A DSM-5 report
• MODIFICATIONS:

Prior approval is required before implementing any changes in the protocol including changes in the informed consent.

• TERMINATION OF STUDY

On termination of the study you are required to submit a completed request for termination form and a summary of the research findings/results.

Yours sincerely

Dr N Madziva

For JREC Chairman

27 Aug 2016
ANNEX 3: ENGLISH QUESTIONNAIRE

Questionnaire for Cases and Controls, Harare City 2015

Questionnaire no___________________

Participant’s signature________________ Date___________________________

Socio-demographic data

Status of respondent: [ ] Case [ ] Control

1. What is your age (Completed years) [ ]

2. Sex [ ] Female [ ] Male

3. What is your marital status? [ ] Single [ ] married [ ] divorced [ ] widowed [ ] widower [ ]

4. What is the highest level of education you attained? [ ] Never went to school [ ] Primary [ ] Secondary [ ] Tertiary

5. What is your Religion? [ ] Orthodox [ ] Traditional [ ] Pentecostal [ ] Muslim [ ] African Apostolic churches [ ] Roman Catholic [ ] None [ ] Other__________________________

6. Are you employed? [ ] Yes [ ] No______ Self Employed Yes[ ] No [ ]

7. What do you do for a living? _____________________________

8. What is your average monthly income? <$200 [ ] $200-$500 [ ]>$500.

9. What is your daily income <$1[ ] $1 [ ] $2-5 [ ] $10+ [ ]

10. How many rooms do you live in? [ ]

You live with how many people in those rooms? is the house rented? [ ] house owned? [ ] relative’s house? [ ] Parent’s house? [ ]

Treatment Related Factors

11. Have you ever been treated for TB previously? Yes [ ] No [ ]
12. *If you were put on treatment.* How many months did you undergo treatment  
[ ] <1month [ ] 1month [ ] 2-3 months [ ] 4-6 months [ ]

13. Did you ever stop treatment? Yes [ ] No [ ]

14. *If yes* For How long months [ ] weeks [ ]

15. What caused you to leave treatment? no transport money [ ] adverse reactions from drugs [ ] No drugs at Clinic [ ] Rude nurses [ ]

16. Did you ever live in with a person who was suffering from MDR TB Yes [ ] No [ ]

17. Who was monitoring you taking treatment in previous treatment?

   Wife [ ]
   Husband [ ]
   Friend [ ]
   No one [ ]
   Health worker [ ]
   Community Health Worker [ ]

11. Were you a member of any support group? Yes [ ] No [ ]

12. During taking treatment in previous treatment did you experience side effect  
[ ] Yes [ ] No [ ]

13. List the side effects that you experienced

   ..................................................
   ..................................................
   ..................................................
   ..................................................
   ..................................................
   ..................................................

14. Did the side effects led you to leave treatment Yes [ ] No[ ]

15. Were you ever tested for HIV? Yes [ ] No [ ]
16. If Yes are you HIV positive Yes [ ] No [ ]

17. Are you on HIV treatment Yes [ ] No [ ]

History of diabetes and kidney failure

18. Do you suffer from diabetes Yes [ ] No [ ] check with chronic disease register if yes

19. If yes Which type of diabetes Type 1 [ ] Type 2 [ ]

20. Have you ever experienced a kidney failure Yes [ ] No [ ]

21. Are you on renal dialysis currently Yes [ ] No [ ]

History imprisonment

29. Have you been imprisoned before? Yes [ ] No [ ]

30. If Yes For how long? <1 [ ] 1 month [ ] 2 months [ ] 3 months [ ] 4 months-1 year [ ] >1 year

31. Did you go to prison taking anti TB drugs? Yes [ ] No [ ]

32. Any history of TB diagnosis whilst in prison TB? Yes [ ] No [ ].

History of Migration

33. Have you ever visited any country? Yes [ ] No [ ]

34. If Yes when was the last time………/…./……….

35. If you are regular visitor to other countries. How long do you usually stay there………..

36. Did you fall ill with TB whilst still outside Zimbabwe Yes [ ] No [ ]

37. Do you have a relative/visitor who came to visit you from another Yes [ ] No [ ]

38. Did the visitor suffer from TB? Yes [ ] No [ ]

39. If Yes What type of TB ………………………don’t know [ ]
Knowledge on MDR TB

40. Have you ever heard of MDR TB?  Yes [ ] No [ ]

41. What do you think causes MDR TB …………………? Not sure [ ] don’t know [ ]

42. Is MDR TB preventable?  Yes [ ] No [ ]

43. Do you know the importance finishing TB treatment course? Yes [ ] No [ ]

44. Have you ever been told the importance of finishing TB treatment course  Yes [ ] No [ ]

45. Did you get this information from a health worker? Yes [ ] No [ ]?

46. If you have the information but not from health workers where did you get it?............................

47. What are the dangers of leaving treatment?

1………….,……2……………3……………………4……………….5…………..

48. If you start feeling better after taking TB drugs for a month what should you do?

Leave the drugs [ ]

Stay on medication [ ]

Behavioural Practices.

49. Do you smoke? Yes [ ] No [ ]

50. Do you smoke when taking TB drugs?

Yes [ ] No [ ]

51. Did you drink beer during TB treatment? [ ]  No [ ]?

Health system and provider factors

52. Have you faced challenges in accessing MDR TB drugs at the clinic? Yes [ ] No [ ]

53. Specify the challenges? Transport money [ ] User fee [ ] staff attitude [ ]

54. What do you think of the health workers attitude?  good [ ] bad [ ] rude [ ]

55. Did you receive any counselling concerning TB?  Yes [ ] No [ ]

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56. Did you face challenges with accessing drugs at your facility? [ ] Yes [ ] No

57. Are there community support groups in your area? [ ] Yes [ ] No [ ]

58. If yes, do they offer social support to you or your family? [ ] Yes [ ]
ANNEX 4: MIBVUNZO MURURIMI RWECHISHONA.

Mibvunzo mururimi rweShona yakanangana ne ma *Cases nema Controls*,

Questionnaire no.______________________

Siginecha yemubvunzwi __________________ Zuva_______________________

Maberekerwo, Magariro ne Mararamiro

Chimiro chemubvunzwi: [ ] Case [ ] Control

1. Mune makore mangani akazara ekuberekwa? [ ]
2. Mudzimai [ ] Murume [ ]
3. Ndakaroorwa [ ] ndakaroora [ ] takasiyana nemudiwa wangu [ ] ndinogara ndega [ ]
   ndiri shirikadzi [ ] ndiri tsvimborume [ ]
4. Makadzidza kusvika pachidango chipi? handina kana kumboenda kuchikoro [ ] kusvika
   puraimari [ ] kusvika kusecondari [ ] kukoregi /ku yunivhesiti [ ]
5. Munopinda chitendero chipi? chechi Orthodox [ ] chechinyakare [ ]
   chichi purotesitendi [ ] chiMuslim [ ] chechi Chipositori [ ] Roma [ ]
   chechi chipendekostari [ ] Hapana chandinopinda [ ] (Dzimwewo mhando)_______
6. Mune kubasa kwamunoshanda?  hongu [ ] kwete [ ] mune basa remaoko enyu
   ramunozviititra ? Hongu [ ] Kwete [ ]
7. Munoita basa ripi kuti muzviraramise? _____________________________
8. Munowanawo mari yakawanda sei pa mwedzi woga woga? [ ] iri pasi pe $200 [ ] kubva
   pa $200-$500 [ ] inopfuura $500.
9. Munowana mari yakawanda sei pazuva rega rega kubva kumabasa emaoko kana
   kumishando? pasi pe $1[ ] $1 chete [ ] iripakati pe $2-$5 [ ] inopfuura $10

Nhoroondo ye TB mumubvunzwi

11. Makamborapwa TB here mumakore apfuura? hongu [ ] kwete [ ]
12. *Kana iri hongu pamusoro* mwedzi mingani yamakanga muri pamushonga ye kurapa TB? handina kupfuura mwedzi umwe [ ] mwedzi umwe [ ] mwedzi iripakati pe miviri nemitatu [ ] mweidzi mina kusvika mitanhatu [ ]
13. Makambomira kunwa mishona here panguvaidzodzo? hongu [ ] kwete [ ]
14. *Kana iri hongu* kwemwedzi mangani? [ ] kwe mavhiki mangani? [ ]
15. Chakaita kuti mumbomira kunwa mishonga yekurapa TB chii? Kushaiwa mari yeKufambisa [ ] marwadzo aibva pakunwa mishonga [ ] kushaikwa kwemishonga pazvipatara [ ] kusabatwa zvakakanaka nevashandi vepa chipatara [ ] Ndainge ndava kunzwa zviri nane [ ]
16. Makambogara here nemunhu airwarane ne TB yemhando ye MDR TB mumakore maviri apfuura? hongu [ ] kwete [ ]
17. Aikuongororai kuti manwa mishonga yenyu ye TB ndiani?

    Mudzimai wangu [ ]
    Murume wangu [ ]
    Shamwari yangu [ ]
    Ndega [ ]
    Hama yangu [ ]
    Mushandi wezveutano [ ]
    Vana mbuya utano [ ]
    Vamwewo (*domai*) __________

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18. Maiva nhengo ye maboka anonzi ma support group munharaunda yamunogara here? hongu [ ] kwete [ ]

19. Pamainwa mapiritsi e TB kumashure makambonzwa marwadzo here? hongu [ ] kwete [ ]

20. Domai marwadzo amakanzwa

........................................
........................................
........................................ ...
........................................
........................................

21. Marwadzo aya akakuitai kuti musiye kunwa mishonga here? hongu [ ] kwete [ ]

22. Makambo ongororwa chimiro chenyu che HIV here? hongu [ ] kwete [ ]

23. Kana iri hongu. Makawanikwa mune utachiwana hwe HIV here? hongu [ ] kwete [ ]

24. Muri kunwa mishonga ye ma ARV here? hongu [ ] kwete [ ]

Zvinoendera ne chirwere che shuga ne Itsvo

25. Munorwara nechirwere cheshuga here? hongu [ ] kwete [ ] (tarisa mubhuku re Chronic Disease Register kana iri hongu)

26. Chirwere cheshuga chemhando ipi? Type 1 [ ] Type 2 [ ]

27. Makamboita chirwere chetsvo here? hongu [ ] kwete [ ]

28. Munogeza itsvo here nemushini hongu [ ] kwete [ ]

Nhoroondo yekugara muhusungwa

29. Makambogara mujere here? hongu [ ] kwete [ ]
30. *Kana iri hongu. pamusoro* kwenguva yakareba sei? pasi pemwedzi umwechete [ ] mwedzi umwechete [ ] mwedzi miviri [ ] mwedzi mitau [ ] mwedzi mina kusvika kugore [ ] kupfuura gore rimwe [ ]

31. Kana makamboenda kujere makaenda muchinwa mishonga here yekurapa TB hongu [ ] kwete [ ]

32. Panguva yamaiva mujere makamborwara here ne TB? hongu [ ] kwete [ ]

Nhorooondo yekufamba

33. Makamboshanyira imwe nyika here? hongu [ ] kwete [ ]

34. *Kana iri hongu makapedzisira riinhi./…………/…………

35. Munosiwanza ku gara nguva yakareba sei kunze kwenyika ………………

36. Makamborwara ne TB muri kunze kwe nyika here? [ ] kwete [ ]

37. Mune hama here yakabva kunze kwenyika akakambokushanyirai munguva dzabvuura?
hongu [ ] kwete [ ]

38. Muenzi uyu akanga achirwara ne TB? hongu [ ] kwete [ ]

39. *Kana iri hongu* yaiva TB yemhando ipi? ……………….. Handizi mhando yacho [ ]

Ruzivo pamusoro pe chirwere che Rurindi/TB

40. Makambonzwawo here nezve MDR TB? hongu [ ] kwete [ ]

41. Chii chamunofunga chinokonzera MDR TB ………………… handina mashuwa [ ]

Handizivi [ ]

42. MDR TB inokwanisa kudzivirika here? Hongu [ ] kwete [ ]

43. Munoziva zvakakoshera kunwa mapiritsi e-TB kusvika *course* yacho yapera? Hongu [ ] kwete [ ]

44. Makapuwa ruzivo here rwekunaka kwekunwa mishonga yenyu kusvika yapera? Hongu [ ] kwete [ ]
45. Makapuwa ruzivo urwu nevashandi vezve utano here? Hongu [ ] kwete [ ]

46. *Kana muine ruzivo rusina kubva kuvashandi veutano* ruzivo urwu makarupuwa kupi ?……………..

47. Chi chakaipira kuregera kunwa mushonga ye kurapa TB?

1...........................2............................3..............................4..........................5..........................

48. Kana ukatanga kunzwa zviri nane usati wapedza mwedzi inotarisirwa kunwa mapiritsi anorapa TB unodii?

Ndinosiya mishonga yacho [ ]

Ndinoramba ndichinwa mishonga [ ]

Magariro nema Itiro.

49. Munoputa fodya here? hongu [ ] kwete [ ]

50. Munoputa fodya muchinwa mapairits e TB here? hongu [ ] kwete [ ]

51. Munonwa here doro kana muchinwa mapiritsi e TB? hongu [ ] kwete [ ]

Zvinoenderena ne bazi rezveutano nevashandi vacho.

52. Makambosangana ne zvinetso here pakuwana pakuwana mishonga ye TB?

Hongu [ ] kwete [ ]

53. *Kana iri hongu* domai zvinetso zvacho. mari yekufambisa [ ] miripo yekudhindisa makadhi [ ] kusagamuchirwa zvakakanaka nevashandi vepachipatara [ ]

54. Mabatirwo enyu nevashandi veutano munomamona sei? akanaka [ ] akaipa [ ] vanotsvinya [ ]

55. Makapangwa mazano here zvinoenderana ne TB kana MDR TB?

Hongu [ ] kwete [ ]

56. Pane dambudziko here pakuwana mapitsiri kuchipatara? [ ] hongu [ ] kwete [ ]

57. Mune mapoka ema *support group* here munharaunda yamunogara? Hongu [ ] kwete [ ]
58. *Kana iri hongu.* Vanokupai rubatsiro here kwamuri kana kumhuri yenyu?

hongu [ ] kwete [ ]

(*ndinokutendai nenguva yenyu*)
ANNEX 5: ENGLISH QUESTIONNAIRE FOR KEY INFORMANTS

Interview Guide for Key Informants

Part A: Demographic characteristics

1. Sex   Male [ ]  Female [ ]

2. What is your job title/ position? ______________________________

3. How long have you been in your current position?   __________________________

4. What is the highest level of education you attained? [ ] Never went to school [ ] Primary [ ] Secondary [ ] Tertiary [ ]

Part B: TB program management

5. Have ever seen the MDR TB programmatic management guidelines and National TB guidelines?  Yes [ ] No [ ]

6. Are you aware of the MDR TB guidelines and the 2010 National TB guidelines? Yes [ ] No[ ]

7. Are you implementing the National Programmatic management of MDR TB guidelines and National TB treatment Guidelines of 2010? [ ]Yes [ ] No[ ] (Check availability of guidelines if Yes)

8. Do you offer collaborative HIV/TB service? Yes [ ] No[ ]

9. Do you screen Diabetes in TB patients? Yes [ ] No [ ]

10. Do you offer counselling to MDR TB and TB patients? Yes [ ] No [ ]

11. At which stage do you offer DST to following? Retreatment TB patients......... former prisoners ............... Health Care Workers TB patients.............

12. Who observes TB and MDR TB patients taking at this facility? HCW[ ] Community Worker [ ] Relatives [ ] Self [ ] None [ ]

13. When do you consider a TB patient a defaulter? .................

14. Is there a mechanism for following up defaulters? Yes [ ] No [ ]

15. Are the health workers (nurses, doctors, counselors) in your facility trained in MDR TB/ TB program management? Yes [ ] No

16. If yes, what proportion of health workers (nurses, doctors, nurse aids, EHPs) were trained in your facility? ___% 

17. Have you ever experienced stock outs of TB drugs in the past 2 year? Yes [ ] No [ ]
18 If yes for how long <1 Weeks [ ] >1 weeks [ ] 1 month >1 month.

19 During TB drug stock outs where do TB patients get drugs?

20 What do you think contribute to patient developing MDR TB?
……………………………………………………………………

21 In your opinion what can be done to prevent TB patients to develop MDR TB in Harare? [ ]
[ ] Provide HIV health education to the community
[ ] having regular surveillance meetings
Other ____________________________
ANNEX 6: SHONA QUESTIONNAIRE FOR KEY INFORMANTS

Interview Guide for Key Informants

Part A: Zvemaberekerwo ne Basa

1. Murume [ ] Mukadzi [ ]
2. Mune chigaro chipi pabasa? ______________________________
3. Mava nemakore mangani muri pabasa ramuri kuita ikozvino? ______
4. Makadzidza kusvika papi? [ ] handina kumboenda kuchikoro [ ] kusvika puraimari [ ] kusekondari [ ] kukoregi/kuunivesiti

Part B: Mafambisirwo ebasa rekudzivirira TB

5. Makambonzwawo nezve MDR TB programmatic management guidelines ne National TB guidelines hongu [ ] kwete [ ]
6. Munozivawo here nezve magwaro anoti MDR TB guidelines ne 2010 National TB guidelines hongu [ ] kwete [ ]
8. Munoongorora here HIV/TB pamwechete muvarwere hongu [ ] kwete [ ]
10. Munopanga here mazano varwerwe ve MDR TB ne TB? hongu [ ] kwete [ ] No
11. Pachidanho chipi pamunoiita kuti varwere ava ve TB vaitwe maDST ?: Varwere vadzokorora kuita TB zvakare…………Vakambogara muhusungwa ……………vashandi vehutano vanenge vaita TB.
12. Ndiani anoonona kuti varwere ve TB ne MDR TB vanwa mishonga yavo here? Vashandi vepa chipatara [ ] vana mbuya nana sekuru utano [ ] hama neshamwari dzevarwere [ ] varwere vega pachavo [ ] hapana [ ]
13. Ndepapi pamunoti munhu ane TB ne MDR TB atiza kunwa mishonga yake? ………………………
14. Pane nzira here dzekuronda vanenge vatiza mishonga yavo ye TB? hongu [ ] kwete [ ]
15. Vashandi vemuzvipatara vakadzidziswa here nezve MDR TB/ TB program management? 
Hongu [ ] kwete [ ]

16. *Kana iri hongu* Chikamu chakadii kubva muzana? ____%

17. Makamboperewa here nemishonga ye kurapa TB mumakore maviri apera? hongu [ ] kwete [ ]

18. *Kana iri hongu.* Kwenguva yakareba sei? Hapana kupfuura vhiki [ ] kupfuuravhiki imwe [ ] mvedzi umwe [ ] kupfuura mvedzi umwe [ ]

19. Pakanga pasina mishonga varwere vaiwanepi mishonga?


20. Chii chamunofunga chinokonzera kuti vanorwara ne TB vazoita MDR TB


21. Pamafungiro enyu chii chingaitwe kudzivirira chirwere che MDR TB muguta re Harare?

[ ] kudzidzisa nharaumda nezve TB

[ ] kuvanemisangano inoongorora nezve huwandu weTB.

zvimwewo zvingaitwa_______________________________

___________tatenda nenguva yenyu___________
ANNEX 7: CHECKLIST

Presumptive MDR cases finding activity Facility Checklist

Health Facility .................................

<table>
<thead>
<tr>
<th>Patient No</th>
<th>Type of Risk</th>
<th>DST Test</th>
<th>Gene Xpert Test</th>
<th>TB treatment</th>
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<tr>
<td></td>
<td>presumptive</td>
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<tr>
<td></td>
<td>MDR TB</td>
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</table>
ANNEX 8 : ENGLISH CONSENT FORM

SUBJECT INFORMED CONSENT

PROTOCOL TITLE: Factors Associated with Multi Drug Resistant Tuberculosis in Harare City, 2015

NAME OF RESEARCHER: Tichaona Fambirai

PHONE: 0773 836 788

PROJECT DESCRIPTION:

You have decided to take part in the research study named above. The study will collect your information about your age, gender and income, place of residence, TB treatment history, your knowledge on risk of MDR TB. This consent form gives you information about the collection, storage and future use of data collected from you. Please ask if you have any questions. You will be asked to sign or make your mark on this form to indicate whether or not you agree to participate in the study. You will be offered a copy of this form to keep and will keep the other form for at least 3 years.

YOUR RIGHTS

Before you decide whether or not to volunteer for this study, you must understand its purpose, how it may help you, the risks to you, and what is expected of you. This process is called informed consent.

PURPOSE OF RESEARCH STUDY

The study seeks to determine factors Associated with Multi Drug Resistant Tuberculosis in Harare City, 2015. The factors being looked at are divided into health related, patient related treatment related and history of migration. You will also be asked knowledge of risk of defaulting treatment.
PROCEEDURES INVOLVED IN THE STUDY

Data will be collected using an interviewer administered questionnaire and checklist. The questionnaire you will respond to consists of open ended and closed ended questions.

DISCOMFORTS AND RISKS

There are minimal ethical risks related to storing your information. It is not possible for anyone to identify you from the information on the questionnaire. Codes will be used on the questionnaires to avoid identification of respondents. To minimise disclosure of your information; questionnaires and consent forms will be strictly put under lock and key in the Records and Information vault at City of Harare Health Department Head Office. Information collected from you will be used only for academic purposes.

POTENTIAL BENEFITS

There are no immediate benefits to you from participating in this research. You and the community can benefit in the future. As the research seeks to find what causes TB patients to develop MDR TB and how this condition can be reduced. The answers can be used in future to reduce TB/MDR TB infections in the community and deaths due to the condition. TB is the biggest killer of HIV positive people. So HIV positive people in the community will benefit from the study findings as biggest cause of mortality among the infected is reduced.

STUDY WITHDRAWAL

You may choose not to enter the study or withdraw from the study at any time without loss of benefits entitled to you.
CONFIDENTIALITY OF RECORDS

You name, identity particular and residential address will not be entered on the questionnaires and consent forms. These questionnaires will be kept under lock and key for at least 3 years at City of Harare Health Department Records and Information Safety vaults. There may be destroyed after this period. No other person except the researcher Tichaona Fambirai Cell No: 0773 836 788 will handle the questionnaires.

PROBLEMS/QUESTIONS

Please ask about this research or consent now. If you have any questions in future please ask.

AUTHORIZATION

I have read this paper about the study or it was read to me. I understand the possible risks and benefits of this study. I know being in this study is voluntary. I choose to be in this study. I know I can stop to be in this study and I know I will not lose any benefits entitled to me. I will get a copy of this consent form

________________________________________________________________________

Client Signature or Mark                                                                                       Date

________________________________________________________________________

Client Name (Printed)

________________________________________________________________________

Researcher Signature                                                                                            Date

________________________________________________________________________

Witness Signature                                                                                                        Date
ANNEX 9 : SHONA CONSENT FORM

MVUMO YEACHABVUNZWA
MUSORO WETSVAKURUDZO: Factors Associated with Multi Drug Resistant Tuberculosis in Harare City, 2015
ZITA REMUTSVAKURUDZI: Tichaona Fambirai
PHONE : 0773 836 788

NHANGA NYAYA

KODZERO DZENYU
Musati mabvuma kupinda muongororo iyi munofanirwa kuti munziwisise chinangwa chayo, uye kuti ichakubatsirai chii?, uye ndezvipi zvinotarisirwa kubva kwamuri. Gwara iri rinonzi kubvuma mune wirirano nazvo.

CHINANGWA CHETSVAKURUDZO.
Tsvakiridzo iyi iri kutsvaka zvinhu zvingaita kuti munhu awane chirwere che TB chemhando ye MDR TB muguta re Harare. Zvinogona kukonzero chirwere zvakaiswa muzvikwata zvinotii: zvemurwere, zvemushonga, marapirwo nehoroodo yekufamba kwenyu muchishanyira dzimwe nyika. Muchabvunzwa wo nezveruzivo rwenyu pamaererano nehuipi hwekutiza kunwa mishonga inorapa TB.

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MATORERO ATICHAITA UMBOWO.
Tichashandisa bepa rine mubvunzo yamuchakumbirwa kupindura nemachekilisiti.

NJODZI KANA KUSHUNGRUZIKA MUTSVAKIRIDZO IYI

ZVINGAKUYAMURIWO PAKUPINDA MUTSVAKIRIDZO IYI.
Hapana kuyamurika kwamunoita pakupinda mutsvakiridzo iyi munguva yamunenge muri mutsvakiridzo asi imi nevamwewo vanogara nemunharuenda yamunogara vanogona kuyamurika mune remangwana. Humbowo hwesarudzo hunogona kutipa mhinduro dzekuti sei varwere veb vari kubata TB yemhando ye MDR TB. Huwandu hwevanorwara ne TB uye MDR TB hunogona kuderedzwa kuburikidza netsvakurudzo iyi mune ramangwa. TB ndiyo inouraya vanhu vazhinji vane utachiona hwe HIV. Tsvakiridzo iyi inogonga kuderedza huwandu hwevane utachiona hwe HIV vanofa nechirwere cheTB kana MDR TB muguta re Harare uye nemunyika yese.

ISARUDZO YENYU KUPINDA KANA KUREGA KUPINDA MUTSVAKIRIDZO IYI
Kupinda mutsvakiridzo iyi hakumanikidzwi. Makasununguka kubuda mutsvakiridzo iyi nguva ipi zvayo tiri mutsvakiridzo yacho kunyange manga mambobvuma pekutanga. Kubuda mutsvakiridzo iyi hakukanganisi kurapwa kwenyu kwamanga muchiwana nguva dzose.

KUCHENGETEDZeka KWEZVAWANIKWA MUTSVAKURUDZO

**MIBVUNZO**

Munokwanisa kubvunza pamusoro petsvakiridzo kana kubvuma mutsvakurudzo panguva ino. Kana muinayo mibvunzo zvakare nguva ichatevera makasungunuka kubvunza.

**MVUMO.**


________________________________________________

____________________________________________

Siginecha yemubvunzwi                                                                 Zuva

___________________________________________________

Zita remubvunzwi (rakanyorwa nemavara makuru)

____________________________________________________

Siginicha yemautsvakurudzi                                                                 Zuva

____________________________________________________

Siginecha ye Chapupu                                                                 Zuva