Factors associated with the increase in new TB infections among clients in Thulamela municipality, Limpopo province, South Africa

By

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A mini-dissertation submitted in partial fulfillment of the requirements for the degree of Masters in Public Health at the School of Health Sciences, University of Venda

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DECLARATION

I, **NWENDAMUTSWU MBULAISENI OLIVE**, hereby declare that the mini-dissertation titled **"Factors associated with an increased new TB infections in Thulamela Municipality, Limpopo Province, South Africa"** submitted in partial fulfillment of the requirements for the degree of Master in Public Health at the School of Health Sciences, University of Venda submitted by me, has not previously been submitted for a degree at this or any university, and that this is my own work in design and execution and that all reference materials contained therein have been duly acknowledged.

Signature Nwendamutswu MO. **Date……**

DEDICATION

I dedicate this mini-dissertation to God Almighty who gave me the privilege, strength and wisdom to pursue this degree. I also dedicate this work to my husband Nwendamutswu Livhuwani Phanuel, thank you for your support, caring and love. This is the dream that you have waited for so long to see it happening and I am saying, I made it because of your support. I love you and God bless you.

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ABSTRACT

Background: TB and HIV/AIDS were identified as priority healthcare problems of current years worldwide. Notable concerns (2878) were raised in Vhembe District Municipality because of an increase in patients with TB, including re-treatment patients (Department of Health, 2017).

Purpose: The main aim of the study was to investigate the factors associated with the increase of new TB infection among clients in Thulamela Municipality, South Africa.

Methodology: A quantitative descriptive survey design was used to conduct this study. Census sampling or total population sampling technique was used to select the respondents who were patients seeking treatment for TB from the designated clinics within Thulamela. Self-administered questionnaire was used to collect data from respondents. Data were analyzed using statistical package for social sciences version 25.0.

Results: out of a high proportion of the respondents 45 % (n=98) respondents were taking ARV treatment while 27% (n=58) were taking respiratory disease treatment at the time of TB diagnosis. Moreover, 59% (n=169) respondents reported being next to a coughing person before diagnosed with Tuberculosis.

Conclusion and recommendations: The results discovered that most respondents stayed in the dusty area for more than three years. Educating the community about how staying and working in dusty areas contribute to TB infection may decrease the rate of infection.

Key words

Causes, Contributing factors, Development and Tuberculosis.

List of abbreviations

AIDS : Acquired Immune-deficiency Syndrome

HIV : Human Immunodeficiency Virus

MDR : TB- Multi Drug Resistant Tuberculosis

NHLS : National Health Laboratory Service

SANTA : South African National TB Association

TB : Tuberculosis

WHO : World Health Organization

List of figures

Figure **Page no**

List of tables

Table **Page no.**

Table of Contents

Content **Pages**

CHAPTER 1
INTRODUCTION AND BACKGROUND

1.1. Introduction

TB is an infectious disease caused by the bacillus mycobacterium Tuberculosis. it typically affects the lungs (pulmonary Tuberculosis) but can also affect other sites (extrapulmonary Tuberculosis). The disease is spread when people who are sick with pulmonary TB expel bacteria into the air, for example by coughing. Overall, a relatively small proportion (5–15%) of the estimated 1.7 billion people infected with M. TB will develop TB disease during their lifetime. However, the probability of developing TB disease is much higher among people infected with HIV, and also higher among people affected by risk factors such as under-nutrition, diabetes, smoking and alcohol consumption (World Health Organization, 2017). This section covers background to the study, problem statement, rationale of the study, significance, aim and objectives as well as the definitions of terms.

1.2 Background to the study

TB has existed for millennia and remains a major global health problem. It causes ill-health for approximately 10 million people each year. TB is one of the top ten causes of death worldwide. For the past five years, it has been the leading cause of death from a single infectious agent, ranking above HIV/AIDS (World Health Organization [WHO], 2017). According to the global TB report (WHO, 2017), TB is the ninth leading cause of death worldwide and the leading cause from a single infectious agent, ranking above HIV/AIDS. In 2016, there were an estimated 1.3 million TB deaths among HIV negative people (down from 1.7 million in 2000) and an additional 374 000 deaths among HIV-positive people. A study conducted by Kibret , Yalew, Belaineh and Asres (2013) found that people who were respondents in the study and diagnosed with TBwere smokers, alcohol drinkers, and had a history of Asthma .Moreover, Akolo, Adetifa , Shepperd and Volmink (2010) found that there was no association between TB and diabetes. The environment where an individual spends most of their time, is either by working or sleeping contributes to TB infection. Boccia, James , Bianca , Katherine and Chaap. (2011) found that respondents who were infected with TB and lived in households having a size of 6–10 members were more likely to develop TB compared with the number of persons in the household between 1 and 5.

According to the WHO (2017), an estimated 10.4 million people (90% adults; 65% male; 10% people living with HIV) fell ill with TB in 2016 (i.e. were incident cases). Most of the estimated number of incident cases in 2016 occurred in the WHO South-East Asia Region (45%), the WHO African Region (25%) and the WHO Western Pacific Region (17%); smaller proportions of cases occurred in the WHO

Eastern Mediterranean Region (7%), the WHO European Region (3%) and the WHO Region of the Americas (3%). The top five countries, with 56% of estimated cases, were (in descending order) India, Indonesia, China, the Philippines and Pakistan. Globally, the TB mortality rate is falling at about 3% per year. TB incidence is falling at about 2% per year; this needs to improve to 4–5% per year by 2020 to reach the first milestones of the End TB Strategy. Regionally, the fastest decline in TB incidence is in the WHO European Region (4.6% from 2015 to 2016). The decline since 2010 has exceeded 4% per year in several high TB burden countries, including Ethiopia, Kenya, Lesotho, Namibia, the Russian Federation, the United Republic of Tanzania, Zambia and Zimbabwe. Regionally, the fastest declines in the TB mortality rate are in the WHO European Region and the WHO Western Pacific Region (6.0% and 4.6% per year, respectively, since 2010). High TB burden countries with rates of decline exceeding 6% per year since 2010 include Ethiopia, the Russian Federation, the United Republic of Tanzania, Viet Nam and Zimbabwe. Globally, the proportion of people who develop TB and die from the disease (the case fatality ratio, or CFR) was 16% in 2016 (WHO, 2017).

Without treatment, the mortality rate from tuberculosis is high. Studies of the natural history of TB disease in the absence of treatment with anti-TB drugs (conducted before drug treatments became available) found that about 70% of individuals with sputum smear-positive pulmonary TB died within 10 years of being diagnosed, as did about 20% of people with culture-positive (but smear-negative) pulmonary TUBERCULOSIS. Effective drug treatments were first developed in the 1940s. The currently recommended treatment for cases of drug-susceptible TB is a 6-month regimen of four first-line drugs: isoniazid, rifampicin, ethambutol and pyrazinamide. The Global TB Drug Facility supplies a complete 6-month course for about US$ 40 per person (WHO, 2017).

Treatment for rifampicin-resistant tuberculosis (RR-TUBERCULOSIS) and multidrug-resistant tuberculosis (MDR-TUBERCULOSIS) is longer, and requires more expensive and more toxic drugs. Until early 2016, the treatment regimens recommended by WHO typically lasted for 20 months, and cost about US$ 2000–5000 per person. As a result of new evidence from several countries, WHO issued updated guidance in May 2016. Shortened regimens of 9–12 months are now recommended for patients (other than pregnant women) with pulmonary RR-TB or MDR-TB that is not resistant to second-line drugs. The cost of a shortened drug regimen is about US$ 1000 per person (WHO, 2017).

The latest data reported to WHO show a treatment success rate for MDR-TB of 54%, globally, reflecting high rates of loss to follow-up, unevaluated treatment outcomes and treatment failure. Between 2000 and 2016, TB treatment averted an estimated 44 million deaths among HIV-negative people. Among HIV-positive people, TB treatment supported by ART averted an additional 9 million deaths. Drug-resistant TB is a persistent threat, with 490 000 million cases of multidrug-resistant

TB(MDR-TUBERCULOSIS) emerging in 2016 and an additional 110 000 cases that were susceptible to isoniazid but resistant to rifampicin (RR-TUBERCULOSIS), the most effective first-line anti-TB drug. The countries with the largest numbers of MDR/RR-TB cases (47% of the global total) were China, India and the Russian Federation (WHO, 2017).

In 2016, TB new cases in South Africa declined to 231,936 cases recorded (Dlamini, 2017). Most people in South Africa have been affected by latent TB than active Tuberculosis. South Africa still has increased number of mortality rate because, notification gives an estimate figure of 62 827 deaths which is 11.6 % including those who have HIV and AIDS (South African National Tuberculosis Association, 2015. SANTA further reported that there were both strength and weakness in SA TB control programs.

Among provinces in South Africa, Limpopo (the Limpopo Province in South Africa, compared to the other eight provinces, was ranked number seven in 2012 with respect to TB prevalence) is experiencing poor TB treatment outcomes despite the adoption of Direct Observation Treatment Strategies (DOTS) to improve treatment outcomes. Limpopo has an estimated 1035 (86,2%) new cases, 962 (80,1%) received initial phase treatment and 803 (74,4%) cases had successful treatment (National institute for communicable diseases, 2017).

In the Limpopo Province, TB and HIV/AIDS were identified as priority healthcare problems and notable concerns were raised in Vhembe District Municipality (DoH, 2014e) because an increase in patients with Tuberculosis, including retreatment patients, was reported in Vhembe District municipality clinics (DoH, 2011b). Some contributing factors to the increased number of TB cases in the Municipality were identified, namely (SANTA, 2011): the high rate of population growth, unemployment, poverty, migration, inability to complete treatment (drug interruption) and HIV/AIDS, being HIV positive which increases the individual's risk of contracting TB in areas where both TB and HIV are common, inadequate TB treatment that results in drug-resistant TB forms, and the emergence of HIV and AIDS. In South Africa the URC is in place and focuses on providing assistance in strengthening TB care initiatives at the provincial, district, and community level, as well as strengthening the health system to manage the pressures exerted by the HIV and AIDS epidemic. It has trained over 20000 health care workers to fight against TB. TB free campaign was launched in Limpopo by Foundation and their Aurum Institute and Department of Health to fight against TB infection (Sanofi, 2013).

The WHO (2012) has introduced the direct observation treatment (DOTs) as one of the effective strategies to fight against TB. The direct observation treatment focuses on variety of strategies to fight against TB and these include case detection by sputum smear microscopy among symptomatic

patients self-reporting to health services and standardized treatment regimen of six to eight months for at least all confirmed sputum smear positive cases, with directly observed treatment (DOTs) for at least the initial two months.

1.3 Problem statement

Despite the availability of TB control programmes nationally, Thulamela Municipality recorded 373 new TB cases in 9 clinics in 2016 (DOH, 2016). The researcher is professional who is based in the PHC setting. Her duties include screening clients for TB symptoms. The researcher observed that there is an increase in the number of people who were diagnosed with TB lately. In 2017 alone, there were about 844 recorded cases of TB in Thulamela municipality (DOH, 2017). WHO (2016) reported tha South Africa recorded 454,000 cases of active TB in 2015. So about 0.8% of the population of about 54 million develop active TB disease each year. Moreover, 24th of March 2017, the MECs for Health in Limpopo (Dr Phophi Ramathuba) visited Makonde village on World TB day as a way to support people on TB treatment. There were high number of TB cases that drew the MEC attention This prompted the researcher to investigate factors associated with increase in new TB infection among clients in Thulamela Municipality. Until 2008, TB death rate was 9.2%, and MDR-TB cases increased from 60 cases in 2004 to 826 in 2010 (National Institution for Communicable Diseases, National Health Laboratory Services,2010).

1.4 Rationale for the study

Many studies have been conducted worldwide including South Africa and attempted to describe factors associated with increase in new T infection among clients. However, there are no known studies that described factors associated with increase in new Tuberculosis infection among clients that focused on Thulamela Municipality. So, the value of this study was to determine the factors associated with increase in new TB infection among clients in the designated area. By doing so, the study may provide some useful information and basis for the management of TB in this area.

1.5 Significance of the study

Study results may lead to the development of new programs and policies to deal with and address TB in Thulamela municipality. Study results may also add to the existing knowledge about factors that lead to increase in new TB cases. The results of the study may be used to make recommendations for the development of a new policy and programs or improve and amend the existing ones regarding the management (in dealing with, addressing and eradicating) of TB in Thulamela Municipality. The results of the study may also be used to help the public health practitioners manage TB cases with

professionalism and help them to review and develop TB programs for effectiveness and efficiency. Finally, this study may open new doors to further studies in this very same field.

1.6 Aim of the study

The main aim of the study was to investigate the factors associated with the increase of new TB infection among clients in Thulamela Municipality.

1.7 Objectives of the study

The objectives of the study were to;

- Assess personal factors that lead to new TB infection among clients
- Describe environmental factors that lead to increase in new TB infection among clients
- Assess socio-economic factors that lead to increase in new TB infection among clients

1.8 Research questions

- What are the personal factors that lead to increase in new TB infection among clients?
- What are the environmental factors that lead to increase in new TB infection among clients?
- What are the socio-economic factors that lead to increase in new TB infection among clients?

1.9 Definitions of key concepts

The key concepts upon which the study will be based are the following:

- **Contributing factors**-refer to something that is partly responsible for a development of a disease (Mobsey medical dictionary, 2009). In this study contributing factors are things responsible for the development or progression of Tuberculosis.

- **Development-** the act, process, or result of developing •the development of new ideas •an interesting development in the case (Mobsey medical dictionary, 2009). In this study development refers to occurrence of new infection of Tuberculosis.

- **TB (TUBERCULOSIS)-** is a potentially fatal contagious disease that can affect almost any part of the body but is mainly an infection of the lungs. It is caused by a bacterial microorganism, the tubercle bacillus or Mycobacterium Tuberculosis. (DoH, 2006). In the study, TB refers to a highly infectious disease that mostly affects the lungs and other parts of the body.

- **Environmental factors** refer to household and working situations which enhance the possibility of TB infections. These include ventilation, overcrowding and work place.

- **Socioeconomic factors** refer to factors that promote transmission of TB which include, poverty, income, level of education and occupation

- **Personal factors** are the factors that enhance the chances of being infected by TUBERCULOSIS. For this study, personal factors include smoking, drug abuse, alcohol abuse, malnutrition and body mass index

- **New TB clients:** refers to a person diagnosed with TB for the first time and is receiving treatment for TUBERCULOSIS.

CHAPTER 2
LITERATURE REVIEW

2.1. Introduction

Gray (2009) defines a literature review as a report about an assortment of documents (published or unpublished) on a topic that has certain facts, ideas and evidence in relation to a particular research topic and the evaluation of these documents. This literature review covers the TB definition, the state of TB in South Africa, TB risk factors, TB control in South Africa, TB control through the DOTS strategy and Legislation in TB control and management.

2.2 Defining TUBERCULOSIS

TB is a communicable, systemic disease caused by the Tubercle Bacillus (Mycobacterium Tuberculosis) (Boehme et al, 2010). Almost every organ in the body can be affected, but involvement of the lungs (Pulmonary TUBERCULOSIS) accounts for more than 80% of TB cases. Infection by mycobacterium through ingestion of unpasteurized cow's milk is less common. Most infections are caused by inhalation of droplet nuclei containing virulent human strains of the tubercle bacillus (Federal Ministry of health, 2000). There is also other type of atypical Mycobacterium; such as Mycobacterium marinum (M. marinum) which is found in salt and fresh water. M. marinum infection occurs following skin trauma in fresh or salt water and usually presents as a localized granuloma or sporotrichotic lymphangitis (Gupta & Chaphalkar 2015). There is also Mycobacterium avium-intracellulare, a pulmonary pathogen that affects individuals with immune compromise secondary to AIDS, hairy cell leukemia, and immunosuppressive chemotherapy (Gupta & Chaphalkar 2015).

TB is not transmitted by fomites, such as dishes and other articles used by the patient. Those who become infected with TB will not necessarily develop the disease. The immune system "walls off" the TB bacilli, which can lie dormant for years. When someone's immune system is weakened, chances of developing TB increase. On average, 10% of the infected individuals develop the disease during their lifetime (Fogel, 2015).

The major factors that determine the risk of becoming exposed to tubercle bacilli include the number of incident infectious cases in the community, the duration of their infectiousness, and the number and nature of interactions between a case and a susceptible contact per unit of

time of infectiousness. The disease is usually chronic with varying clinical manifestations (World Health Organization, 2014).

Extra-pulmonary TB can involve sites such as bones, glands, the genito-urinary system, the nervous system (TB meningitis), intestine or almost any other part of the body. The time from the receipt of infection to development of positive tuberculin test, defined as a sterile liquid preparation made from the growth products or extracts of a tubercle bacillus culture and injected into the skin as a test for TB ranges from three to 6 weeks (Fogel, 2015). Development of the disease depends upon the following: the closeness of contact, sputum positivity of source case (dose of infection) and host-parasite relationship. Thus, the incubation period may be weeks, months or years (World Health Organization, 2014).

The most important symptoms of TB in adults (over 15years of age) are as follows: productive cough persisting for three weeks, hemoptysis, and significant weight loss. Patients with TB may also have other symptoms (which are more common, but less suggestive) such as chest pain, breathlessness, fever\night sweats, fatigue and loss of appetite (Centers for Disease Control and Prevention,2013).

2.3 TB in South Africa

South Africa had the third highest burden of disease in the world, after India and China, with an estimated incidence of 450 000 cases of active TB in 2013, an increase of 400% over the last 15 years. (World Health Organization, 2014). An estimated 60–73% of the 450 000 incident cases have both HIV and TB infection (Ramaliba, Tshitangano, Akinsola &Thendele, 2017). The incidence of multi-drug resistant (MDR) and extensively drug-resistant TBare increasing (Mbengo, Ngirande, Ndou, et al, 2014). South Africa has the second highest number of reported multidrug resistant TB(MDR-TUBERCULOSIS) cases globally (Pietersen, Ignatius, Streicher , et al,2014). TB remains the leading cause of death in South Africa (Statistics South Africa, 2014). Limpopo province had 17 301 national TB cases and ranked number seven among all nine provinces. TB is one of the major problems in Limpopo province and it is regarded as the first priority of the Department of Health strategy plan (National Department of Health, 2012). According to Tshitangano(2013), Limpopo province has gradually recorded an increase in TB load, up from 11 897 in 2005 to 22 158 in 2011. As transmission is driving the TB epidemic in South Africa, early detection of the disease and

getting those diagnosed with TB onto treatment as quickly as possible is of utmost importance. It is for this reason that all clients entering PHC facilities are supposed to be screened for TB

2.4 TB risk factors

2.4.1 Personal factors that lead to new TB infection among clients

Age

Age is an important factor on TB infection. TB incidences are associated with young adult age which creates a main obstacle towards a sound economic and social development of countries where TB is endemic (Giovanni, 2012).

HIV

Being infected with HIV is another risk factor for TB infection. When a person is infected with HIV, it increases the chances of TB infection. Because the immune become suppressed due to HIV infection, persons with latent TB as well as newly infected persons may progress rapidly to clinical disease (Seeley, Charlotte, Watts Kippax & Russell (2011).The estimated risks of clinical disease in HIV-infected persons are between 6 and 26 times the risk in non-HIV-infected persons (Diedrich & Flynn,2011).

Smoking

Smoking as a lifestyle that one chose is another important factor in TB infection. An association has been found between smoking and TB infection and it shows that smoking is a risk factor for TBinfection and for the development of pulmonary TB (Kant , Maurya, Kushwaha & Nag,2010). Smoking increases the chances of TB infection, the risk of progression from infection to disease, and the risk of death among TB patients (Kant, Maurya, Kushwaha & Nag, 2010). Nearly 61% of TB deaths are attributable to smoking (Mishra, Srivastava, Krishnan & Sreenivaas, 2012). There is a clear association between smoking and reduced local immunity within the lungs. In smokers, the mucous membranes of the lungs would be damaged and inflamed with paralyzed hair cells. The impact of smoking would make the lungs susceptible to infections including TB(Bhattarai, Thapa, Shrestha , Dangol , Niroula , Verma ,2014).

Diabetes

Diabetes has been shown to increase the risk of active TB disease (Alisjahbana, Van Crevel, Sahiratmadja, den Heijer, Maya & Istriana, 2006).It is estimated that currently 70% of people with diabetes live in low- and middle-income countries (World Health Organization,(2010), and the rates are steadily increasing in areas where TB is endemic, including India and sub-Saharan Africa(Rathmann, Giani &,Wild, 2004). Biological evidence supports the theory that diabetes accelerates the proliferation of TB(Narasimhan, Wood, MacIntyre, & Mathai, 2013).

Alcohol

Alcohol has been recognized as a strong risk factor for TB disease and a recent meta-analysis of molecular epidemiological studies has established alcohol as a risk factor for recent transmission of TB in both high and low-incidence countries (Fok, Numata, Schulzer, and FitzGerald,2008). Studies concluded that the risk of active TB is substantially elevated among people who drink more than 40 g alcohol per day and/or have an alcohol use disorder (Narasimhan et al, 2013). Reasons for increased risk include alteration in the immune system, specifically in altering the signaling molecules responsible for cytokine production (Szabo, 1997). As per the findings of Kolappan and Gopi (2002), alcohol consumption could increase health problems and occurrence of infectious diseases (Kolappan & Gopi, 2002). Chronic alcoholism had been associated with TB and chronic alcoholics had increased incidence of bacterial pneumonia due to immune system suppression (Kolappan & Gopi, 2002).

Genetic factors

Various lines of evidence indicate that genetic factors determine in part the differences in host susceptibility to infection with mycobacteria and those that might contribute to the pattern of clinical disease. The most convincing evidence comes from twin studies: because twins theoretically share the same environment, higher concordance rates for monozygous than for dizygous twins suggest that genetic factors are important in susceptibility to TB (Srivastava, Kant & Verma, 2015).

Dangerous use of drugs

Dangerous drug use has been seen as a risk factor for TB infection. Addictive substances reduce the immune mechanisms of the body leading to challenges in screening, diagnosis, and treatment of TB(David, Nadim, Mary Patricia, Yancovitz, Denise,1995). Drug use also

causes poor adherence to treatment, increasing drug interactions, and the emergence of drug-resistant TB- a major obstacle in TB control (Kiboi, Nebere , & Karanja , 2016).

2.4.2 Environmental factors that lead to increase in new TB infection among clients

The extent and persistence of contact with an infected person are the main environmental factors for the transmission of TB. An association has been confirmed between overnight cough frequency and increased transmission among household contacts, where droplet nuclei (due to coughing) can stay in the air for a long time (Srivastava, Kant & Verma, 2015).

A number of studies have shown that crowding is a risk factor for infection and for increased risk of disease after infection (Srivastava, Kant & Verma, 2015). The study of Clark, Riben and Nowgesic (2002) suggested that TBincidence was higher in communities with a higher average housing density (Clark, Riben & Nowgesic,2002). In the study by Dhingra, Rajpal , Aggarwal & Taneja (2004), it was found that an increase of 0.1 persons per room (PPR) increased the risk of two or more cases of TB in a community by 40% (Dhingra, Rajpal , Aggarwal & Taneja,2004).In another study that was conducted by Mohamed, Kanagasabapathy, & Kalifulla (2015), established that crowding associated with incidences of TB infection with 64.3% of families living in single rooms some with as many as 10 people being infected. When a TB patient sneezes or coughs, aerosol droplets with the tubercle bacilli are released into the open atmosphere. Fine droplet nuclei remain suspended in the air stream that reaches the alveolar space, thereby starting the infection (Mohamed, Kanagasabapathy, & Kalifulla, 2015).

TB transmission has long been known to be associated with poor ventilation and poorly ventilated living conditions are important factors for TB transmission (Srivastava, Kant & Verma, 2015). Factors that may inhibit increased ventilation in a house are the outdoor temperature, noise, comfort, and energy costs, the condition of windows or doors, or cultural and personal habits. TB bacteria hang around in the room if there is no fresh air. Therefore, TB transmission occurs with greater prevalence in poorly ventilated and crowded spaces (Beggs, Noakes & Sleigh, 2003).

Employed people often spend most of their time in the work environment where they work. Occupational exposure to TB infect ion is another factor that has been found to have played a role in TB infection among some individuals. Inadequate air change rates, negative air flow

and recirculation of air have been identified as an occupational hazards in hospitals with respect to TB transmission (Patil, Vithal, Thakare and Patil, 2014). Studies in hospitals and health care facilities have shown that poor ventilation design or construction have contributed to the transmission of infection (Srivastava, Kant & Verma, 2015). Certain occupations, such as mining, are also at an increased risk of TUBERCULOSIS.

Air pollution in the environment where people live should be taken into consideration when looking at TB infection risk factors. Health impacts depend on the pollutant type, its concentration, and length of exposure, other coexisting pollutants and individual vulnerability(Kampa and Castanas, 2008). According to Srivastava, Kant and Verma (2015), in rural areas of lesser developed countries, biomass are burned indoors as a source of fuel. Because homes are poorly ventilated and this fuel source is inefficient, requiring fires to be kept going for many hours a day, women and their infant children are exposed to years of daily smoke. Heart disease and chronic Lung Disease have been found to be prevalent and to develop earlier than average in non-smoking women, who cook with biomass (Mishra, Srivastava, Krishnan & Sreenivaas, 2012).

2.4.3 Socio-economic factors that lead to increase in new TB infection among clients

Malnutrition

Malnutrition is another factor that plays a vital role on TB infection. Malnutrition profoundly affects cell-mediated immunity (CMI), and CMI is the principal host defence against TB. This secondary immunodeficiency increases the host's vulnerability to infection and hence increases the risk of developing TB(Srivastava, Kant & Verma,2015). Before the arrival of anti-TB chemotherapy, a diet rich in calories, proteins, fats, minerals, and vitamins was generally considered to be an important factor in the treatment of TB (Sinclair, Abba, Grobler & Sudarsanam, (2011). Vitamins and minerals can play an important role in the treatment of TB. The supplementation with vitamin A and zinc improved the effectiveness of the anti-TB drugs in the first two months (Kant, Gupta & Ahluwalia, 2015).

Unemployment

Unemployment has been profoundly identified as another risk factor for TB infection. According to the World Health Organization (2005), unemployment in underdeveloped countries is a contributory factor for transmission of TB and the percentage rises between

7.5% and 13.9%. The following response attests thus: Unemployed people have been found to be at risk of being infected with TB(Ivanovs, Salmane-Kulikovska & Viksna,2016).TB patients are often unemployed for a long time. If TB patients are employed, they commonly have lower-skilled jobs and lower salary level. The unemployed have 6.6 times higher risk of developing TB than the employed (Lönnroth, Jaramillo, Williams, Dye & Raviglione, 2009). Unemployed people rarely afford to buy nutritious food.

Homelessness

Homelessness is the second strongest TB risk condition. If a person is homeless, the risk of getting TB is 28.7 times higher than for an individual who dwells in a house, an apartment or in a jointly-inhabited area (Ivanovs, Salmane-Kulikovska & Viksna, 2016).

2.5 TB control in South Africa

In order to respond to the dual epidemics of HIV and TB rationally, SA developed an integrated National Strategic Plan (NSP) for HIV, STIs and TB(2012 - 2016). The targets set in the NSP for TB are to reduced incidence and mortality by 2016 and to have no new TB infections, deaths or stigma by 2032. The central pillars of TB control include finding, treating and preventing TB in order to avoid TB deaths and reduce transmission (Churchyard, Mametja, Mvusi, Ndjeka, Hesseling , Reid, Babatunde & Pillay, 2014). The National Tuber culosis Programme has substantially strengthened the TB control programme since 1994. Encouragingly, the efforts of the NTP have contributed to a slow decline in TB case notification rates since 2009 (Churchyard, 2014).

2.5.1 Success and challenges in TB control in South Africa

Beginning with success in fighting against TUBERCULOSIS, treatment success rate among new smear-positive and smear-negative/extrapulmonary TB patients has improved to 79% and 76%, respectively, achieved largely as a result of an increase in cure rates and a decline in the treatment default rate following the introduction of community-based tracing teams (Churchyard, 2014). SA adopted the ‘3Is’ policy of isoniazid preventive therapy (IPT), intensified case finding and infection control in 2002. In 2012, 949 800 HIV-positive South Africans were screened for TB, which although impressive is still substantially below the total number of people living with HIV in care. During 2011 >150 000 household contacts were

screened for TB and >3 000 new cases, which would not have been detected through routine means, were identified (Churchyard, 2014).

Despite the success that has been made in the fight against TB infection, up to 25% of sputum smear-positive TB cases are lost to follow-up before treatment initiation, which may contribute to on-going transmission and an increased risk of death (Claassens , du Toit &, Dunbar, 2013). Moreover, the mortality rate remains high even after completion of TB treatment, probably due to HIV disease). Among persons on long-term ART the prevalence of undiagnosed TB remains high, and underscores the need for ongoing TB screening. SA introduced a TB infection control programme in 2007, the implementation of infection control guidelines remains sub-optimal (Churchyard, 2014).

2.6 TB control through the DOTS strategy

DOTS is the internationally recommended strategy to ensure cure of Tuberculosis. It is based on five key 27 principles that are common to disease control strategies, relying on early diagnosis and cure of infectious cases to stop spread of TB(World Health organisation,1994).
The recommended strategy for TB control comprises (Ahmed Suleiman, Sahal, Sodemann, Elsony, Aro & 2013):

1. Government commitment to ensuring sustained, comprehensive TB control activities;
2. Case detection by sputum smear microscopy among symptomatic patients self-reporting to health services;
3. Standardized short-course chemotherapy using regimens of six to eight months, for at least all confirmed smear positive cases. Good case management includes directly observed therapy (DOT) during the intensive phase for all new sputum positive cases, the continuation phase of rifampicin-containing regimens and the whole re-treatment regimen.
4. A regular, uninterrupted supply of all essential anti-TB drugs;
5. A standardized recording and reporting system that allows assessment of case-finding and treatment results for each patient and of the TB control programme.

2.7 South African Legislation in TB control and management

- The draft national infection prevention and control policy for Tuberculosis, mdr TB and xdr TB.

This policy was developed with the goal to help management and staff minimize the risk of TB transmission in health care facilities and other facilities where the risk of transmission of TB may be high due to high prevalence of both diagnosed and undiagnosed TB such as prisons (Department of Health, 2007). This applies to health care managers, health care workers, administrators, and stakeholders in the public, private, and nongovernmental health sector involved in providing care and treatment to persons with TB and or HIV and AIDS (Department of Health,2007). The policy also applies to persons or institutions responsible for the health and wellbeing of large numbers of persons living with HIV and AIDS (PLWHA) (Department of Health, 2007). Settings include VCT centres, community-based outreach centres, ARV and other HIV care clinics, hospices, general health care facilities, drug rehabilitation centres, and correctional institutions such as prisons.

2.8 Conclusion

In this this chapter literature related to the study topic was reviewed. This includes the state of TB in South Africa, TB risk factors, TB control in South Africa, Success and challenges in TB control in South Africa. The chapter also covered TB control through the DOTS strategy and therefore South African Legislation in TB control and management.

CHAPTER 3
METHODOLGY

3.1 Introduction

This section covers research approach, study design, study setting, population and sampling. It also covers data collection method, research instrument, validity and reliability and ethical considerations.

3.2 Research design

Babbie & Mouton (2016) define research design as a plan or blueprint of how the researcher intends to conduct the study to bring solutions to the research problem. Creswell (2013) states that research design is the entire process of research from the conceptualization to the writing of research report.

The study employed quantitative cross-sectional descriptive design. Data were collected in the form of numbers, analysed and subjected to some statistical tests, in line with Rubin and Babbie (2010). The researcher chose cross-sectional descriptive design as a method which emphasizes precise objectives and generalizable findings. This design allowed the researcher to describe factors that lead to the development of new TB cases in Thulamela Municipality while the cross-sectional design will allow her to collect such data at one point in time.

3.3 Research setting

A research or study setting is the physical, social, and cultural site in which the researcher conducts the study (Given, 2008). This study took place at William Eddie local area within Thulamela municipality in Limpopo Province. Thulamela municipality has 6 local areas: Sibasa, Madala, William Eddie, Shayandima, Tshaulu and Mutale. William Eddie local area was purposively selected due to high number of TB cases than other local areas. It has about 9 clinics and 1 mobile clinic. There are about 373 people diagnosed with TB for the first time from 2015-2017. The area comprises of Venda speaking people who are about 700 000 and some few Tsongas speak both Tshivenda and Xitsonga. There are also people who speak Shona and Sepedi. William Eddie local area covers Tshiombo village, Makonde village, Damani village ,Malavuwe village, Mukula village, Tshidimbini village, Vhufuli-Tshitereke village, Tshilapfene village and Gondeni village. Moreover, the area is dominated mostly by youth and people in middle adulthood. Many people within William Eddie local areas live in modern houses, but there are still few people using huts and mud houses as their shelter.

3.4 Study population

According to De Vos (2010), population is the group upon which the researcher is interested in making inferences. It is as a set of entities in which all the measurements of interests to the practitioner or researcher are presented. It is also a group (usually of people) about whom the conclusions will be drawn (Babbie & Mouton, 2016). For this study, the population was all TB patients who were receiving treatment in the nine selected clinics in Thulamela under William Eddie clinics in Vhembe District Municipality, Limpopo Province. The table below indicates the 9 clinics under William Eddie local area clinics.

3.5 Population frame

Table 3.1: Names of clinics and TB patients in each clinic (2015-2017)

Names of clinics	**TB patient (2015-2017)**
Vhufuli Tshitereke	62
William Eddie Health Centre	74
Thondo Tshivhase	30
Gondeni	15
Mukula	37
Makonde	45
Damani	29
Tshiombo	35
Sterkstroom	46
Total	**373**

The clients who were identified through participating clinics as indicated in table 2.1 were Tshivenda and Xitsonga speaking people.

3.6 Sample and sampling technique

According to Alvi (2016) sampling is the process of selecting units from a population of interest so that by studying the sample, one can generalize the findings to the population from which the sample was drawn. According to Creswell (2016) sampling designs are classified as either probability or nonprobability. This therefore means that units to be selected are either given equal or no chance of being selected. In this study, Census sampling techniques was used to select a site and study respondents.

3.6.1 Sampling of a site

Thulamela Municipality has demarcations of 6 local areas: Sibasa, Madala, William Eddie, Shayandima, Tshaulu and Mutale local area. William Eddie was purposively selected to take part in the study, because it has recorded high number of new TB cases than other local areas in 2015 to 2017, and all clinics that fall under William Eddie local area will form part of the study.

3.6.2 Sampling of respondents

Census sampling technique was employed to select all TB patients diagnosed with TB at all the clinics that formed part of the study. The sample consisted of TB patients who have been diagnosed with TB between the years 2015 to 2017 at the above mentioned 9 clinics. These patients were selected by means of census or population sampling technique. However, only those who met the inclusion criteria in 3.6.3 took part in the study.

3.6.3 Inclusion criteria

- TB patient must have been diagnosed with TB for the first time at the clinic(s) that fall within William Eddie local area
- They must be living within Thulamela Municipality
- They must be aged 14 years and above

3.6.4 Sample size

The sample size for this study consisted of 373 TB patients (as shown in table 3.1)

The researcher added more 27 respondents in order to cover for those who were not be able to participate due to sickness or other unknown reasons.

3.7 Data collection instrument

A Self-administered Questionnaire was used to collect data. The questionnaire comprised only of closed questions. The instrument was developed in English language and translated to languages of respondents. The instrument was developed taking into consideration the aim and objective of the study. The instrument consisted of 4 sections as follows;

Section A: Demographic information

Section B: Personal factors that contribute to the development of new TB infection.

Section C: Environmental factors that lead to the development of new TB infection

Section D: Socio-economic factors that lead to the development of new TB cases

The questionnaire consisted of open-ended and closed-ended questions.

3.8 Pre-test of the instrument

Pre-testing refers to a collection of techniques and activities which allow researchers to assess survey questions, the questionnaire and/or other survey procedures before the actual data collection process (Casper, Peytcheva & Cibelli, 2011).The main aim is to evaluate if the questionnaire will be understood by respondents and be able to answer questions contained in the instrument. It is also done to identify errors that respondents may encounter when filling the questionnaire. As a result of pre-testing, it was discovered that some items did not have the response options from which respondents could choose their answers. It was also found that some questions contained words which were difficult for respondents to understand. The instrument was amended to complete incomplete questions.

3.9 Methods of data collection

Data was collected by means of a self-administered questionnaire that the researcher developed based on the research questions, research objectives, aim of the study and the literature review. The researcher relied on the TB registers that were available in each clinic to select and recruit the respondents. The researcher personally got in contact with respondents through help of TB coordinators. This was done telephonically. Only those respondents who meet the inclusion criteria took part in the study. The researcher was present during data collection in order to collect completed questionnaires and also to clarify the respondents in case misconception exists. Those who were fluent in English,Tshivenda, Xitsonga, Shona and Sepedi completed the questionnaire themselves, but those who could not were assisted by the researcher (herself). Those who were not able to read and write were assisted by research assistants who the researcher employed. Research assistants were trained about administering of the instrument.

3.10 Methods of data analysis

Leedy and Ormrod (2011) point out that the term analysis basically means the resolution of a complex whole into parts. It involves reducing to manageable proportions the wealth of data that one has collected or has available.

Data were analysed by means of the Statistical Package for Social Sciences (SPSS) 25.0 (the latest version). Descriptive statistics such as frequencies and percentages as well as the chi square test (to establish relationships or cross tabulation between two categorical variables) were performed/calculated and conclusions were drawn thereof. Data are presented in tables and graphs.

3.11 Validity and Reliability of the measurement instrument

Creswell (2013) declares that an important attribute of a research tool is the existence of validity and reliability which are both essential in any study.

3.11.1 Validity

Validity is the degree to which a research tool measures what it is supposed to measure or the extent to which findings correctly represent what is happening in the situation (Mohamad, Sulaimanb, Sern & Sallehd, 2015). For this study, content and face validity were established. Content validity was established by ensuring that the instrument is constructed in such a way that it addresses the aims and objectives of the study. Face validity was also used to ensure validity by taking the research instrument to research supervisors for examination to see if it really measures what it is supposed to measure.

3.11.2 Reliability

According Burn and Grove (2013), reliability involves the accuracy of the researcher's research methods and techniques and to what degree they may be maximised. Additionally, reliability is associated with accuracy, stability, consistency and the repeatability of the study. Test-retest method was used to measure the reliability of the measurement instrument. Reliability coefficient test was performed as a way of measuring consistency of the instrument and the degree of consistency was quantified based on the test results. The researcher administered the questionnaire (measurement instrument) twice, one week apart to some 20 people (these 20 people will not take part in the study) from the same designated area (setting).

3.12 Limitations of the study

Twenty respondents did not return the questionnaires that they were given to complete while five respondents withdrew from participating in the study. The study was conducted in Thulamela municipality, therefore the results cannot be generalised to all municipalities

3.13 Ethical considerations

Ethics deals with matters of right and wrong. Ethics is the social, religious or civil code of behavior that is considered correct. The ethical considerations pertaining to the study are the following:

3.13.1 Permission to conduct the study

The proposal was presented to the School of Health Sciences higher Degree committee for quality assurance; thereafter it was submitted to the University Higher Degree Committee (UHDC) for approval, as well as University ethical committee for ethical clearance. The request letter was submitted to the provincial department and district departments of Health for permission to conduct the study. Clinic managers were also consulted and informed about the study.

3.13.2 Informed consent

According to Cohen, Manion and Morrison (2008), the principle of informed consent arises from the subject's right to freedom and self-determination and competence to make correct decisions voluntarily after full information, including the right to discontinue participation in the project at any time without prejudice, had been given to the participant. The researcher explained to the participants what was expected from them and the nature of the study, so that they can give voluntary informed consent. The participants should understand the purpose of the research and that participation in the study is voluntary and that they are not going to be paid. The researcher informed participants that they could terminate or opt out of the study at any stage without intimidation and giving any reasons. For respondents who were minors during the time of conducting the study, their parents or legal guardians were asked to give consent on behalf them. Moreover, such respondents were required to complete an assent form in approval of their parents or legal guardian consent for participation in the study.

3.13.3 Right to confidentiality and anonymity

Complete anonymity exists if the participant's identity cannot be linked, even by the researcher. Confidentiality is the researcher's management of private information shared by the participant as stated by Burns and Groove (2013). The researcher assured the respondents that all the information provided during the course of the study would be treated with the strictest confidentiality. That information was not divulged to anyone or published. All data gathered was kept in a safe place by the researcher.

3.13.4 Privacy and the right to protection from harm

The researcher assured the participants that under no circumstances the research report, either written or oral would be presented in such a way that others become aware of how a particular participant had responded or behaved during data collection process unless the participants have specifically granted the researcher a written permission for such disclosure.

Also, professional secrecy was observed for all the patients who disclosed their HIV status as one of the factors that contributed to the increase in the number of TB patients in their municipality areas. No risks or discomfort was experienced by the participants and their personal information was kept in secret and was not disclosed to unauthorized people (Connolly, Davies &, Wilkinson, 2015:105).

3.14 Conclusion

This section presented the research design and methodology used for the study. This included the study setting, the population, sample and sampling techniques, measurement instruments, validity and reliability of the measurement instrument, data collection and analysis.

CHAPTER 4

ANALYSIS AND PRESENTATION OF DATA

4.1 Introduction

In this chapter the results of the study are presented. Responses from study respondents were compiled into frequency tables, converted into percentages and presented in charts, bar graphs and tables. This was done to facilitate easy analysis and understanding of the data of the study that sought to investigate the factors associated with the increase of new TB infection among clients in Thulamela Municipality. The data were analysed based on the study specific objectives and results related to specific study objectives are presented in the subsequent sections. Three hundred and seventy five (375) questionnaires were distributed to respondents and 348 questionnaires were satisfactorily filled in and returned, thus the response rate was 92.8%.

4.2 Demographic information

In order to gather demographic information about the study respondents, questions on issues such as age, gender, level of education, and place of residency were asked in the first section of the questionnaire. Table 4.1 presents demographic variables of respondents as explained above.

Table 4.1 indicates that 114(32.8%) respondents were aged 21-30, followed by 29.3% (n=102) respondents aged 31-40. Moreover, 19% (n=66) respondents were aged 41-50 while 13.2% (n=46) were above 51 years old. However, 5.7% (n=20) respondents were below the age of 20.Furthermore, Table 4.1 shows that 59.8% (n=202) respondents were females while 40.2% (n=136) were males. This shows that the study was distributed to both genders. The results also show that 42.9% (n=145) respondents were single, 33.4% (n=113) married, 12.7% (n=43) windowed and 10.9% (n=37) had already divorced. Moreover, results show that 43.7% (n=148) of the respondents had attended school up to tertiary level, 31.3% (n=106) had attended up to secondary, 18.9% (n=64) attended primary level and 6.2% (n=21) have never been to school at all.

Table 4.1 Respondents demographic information

VARIABLES	CATEGORY	FREQUENCY (F)	PERCENT (%)
AGE			
	20	5.7	
	21-30	114	32.8
	31-40	102	29.3
	41-50	66	19
	51>	46	13.2
GENDER			
	Male	136	40.2
	Female	202	59.8
MARITAL STATUS			
	Single	145	42.9
	Married	113	33.4
	Divorced	37	10.9
	Widowed	43	12.7
LEVEL OF EDUCATION			
	Never been to school	21	6.2
	Primary	64	18.9
	Secondary	106	31.3
	Tertiary	148	47.3

< 20

4.3 Personal factors that contribute to the increase of new TB infection

This section presents results regarding personal factors that contribute to the increase of new TB infection. Respondents were asked about their smoking status, working environment, Diabetes status, types of food consumed, frequency of food intake daily and if they spent time with person diagnosed with TUBERCULOSIS.

4.3.1 Smoking as a contributing factor

The results presented in figure 4.1 show that 26.4% (n=87) of the respondents reported that they smoke while 73.6% (n=24) reported that they did not smoke. Of the 87 respondents who reported being smokers, 49 smoked 1- 5 years, 19 smoked for 6-10 years, 14 smoked less than a year and only 5 smoked more than 10 years.

4.3.1 .1 Did you smoke before diagnosed with TUBERCULOSIS?

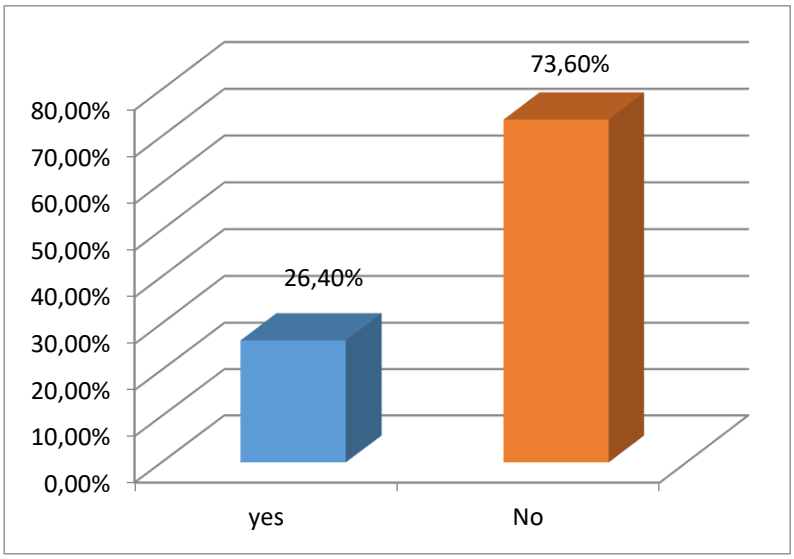

Figure 4.1: respondents' smoking status (n=348)

4.3.2 Working environment as contributory factor

Figure 4.2 indicates that 43.2% (n=82) of the respondents were hospital employees, 26.8% (n=51) were labourer, 14.7% (n=28) mine workers while 12.6% (n=24) were school learners. Only 2.6% (n=5) respondents were tertiary students.

4.3.2.1 Where were you working when you were diagnosed with TUBERCULOSIS?

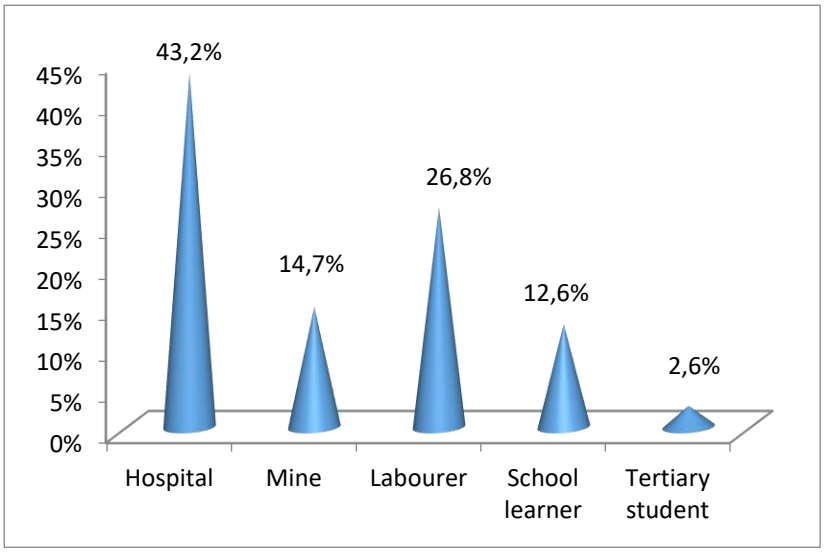

Figure 4.2: Distribution of respondents' work places during TB diagnosis (n=190)

4.3.3 Diabetes as a contributory factor

Figure 4.3 shows that 78% (n=265) of the respondents reported that they were never diagnosed with diabetes mellitus before it was found that they were infected with TUBERCULOSIS, while 22% (n=74) were diagnosed with Diabetes before TB infection.

4.3.3.1 *Have you been diagnosed of diabetes mellitus?*

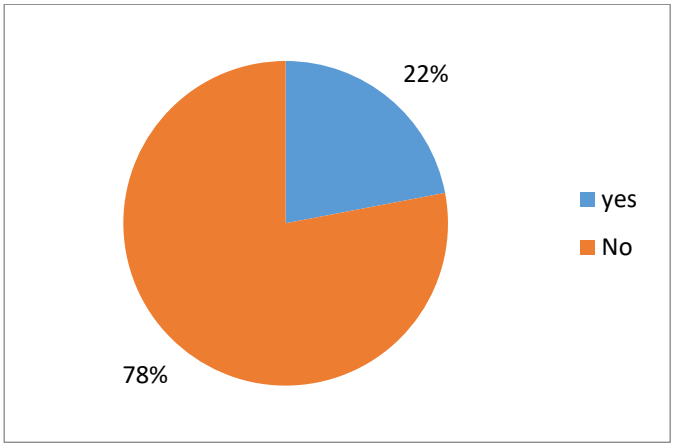

Figure 4.3: Distribution of respondents diagnosed with Diabetes mellitus before TB diagnosis (n=339)

Figure 4.4 shows that 56.7% (n=42) of the respondents were diagnosed with diabetes mellitus less than a year ago, 29.7% (n=22) had 1-5 yeas, 12.2% (n=9) had 6-10 years and 1.4% (n=1) respondent had more than 10 years.

4.3.5.2 How long have you been diagnosed with diabetes mellitus?

This question was designed for respondents who have been diagnosed with diabetes mellitus only

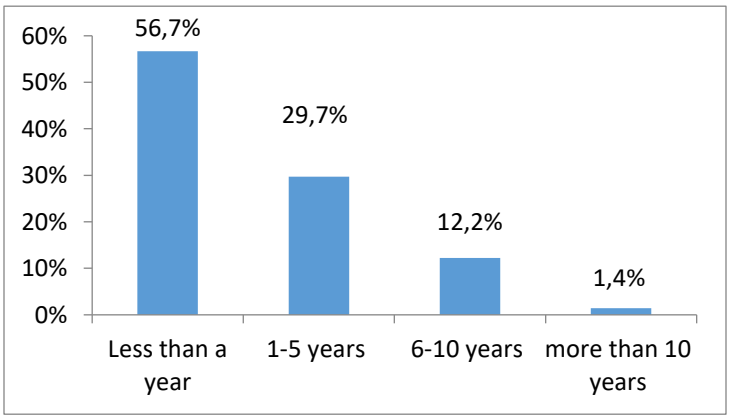

Figure 4.4: Distribution of respondents who were diagnosed with Diabetes mellitus and period spent with the diseases (n=74)

4.3.4 Type of food consumed daily as contributory factor to TB infection

Figure 4.5 indicates that 77.8% (n=259) of the respondents reported eating well balanced diet food while 13.8% (n=46) consumed alcohol more than food. However, 8.4% (n=28) respondents reported eating junk food.

4.3.4.1 What type of food you eat on daily basis?

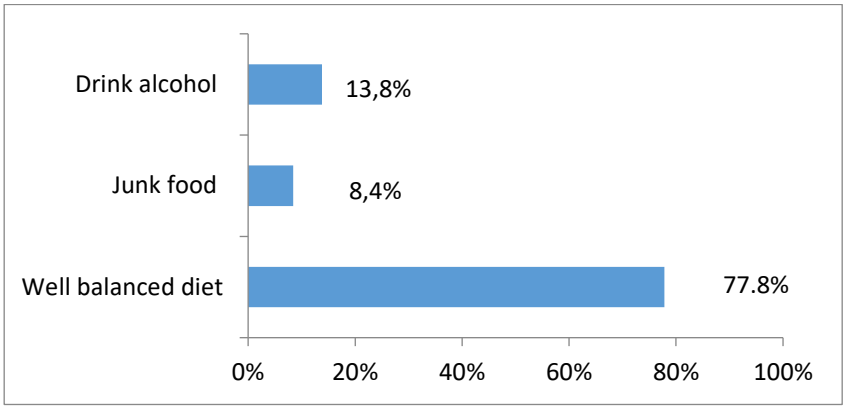

Figure 4.5: responses on food eaten on daily basis (n=333)

4.3.5 Frequency of food intake in a day

Table 4.2 shows that 46.8% (n=163) of the respondents reported eating thrice a day, followed by 45.1% (n=157) who reported eating twice a day while 4.3% (n=15) reported eating three times a day. Moreover, only 3.7% (n=13) of the respondents reported eating once a day.

4.3.5.1 How frequently do you eat food in a day?

Table 4.2: respondents' frequency of daily food consumption

Frequency of food consumption in a day	*Frequency(f)*	*Percent (%)*
Once a day	*13*	*3.7*
Twice a day	*157*	*45.1*
Thrice a day	*163*	*46.8*
More than three times a day	*15*	*4.3*
Total	*348*	*100*

4.3.6 Have you been hospitalized before you were diagnosed with Tuberculosis?

Figure 4.6 indicates that 53% (n=182) of the respondents were never hospitalized while 47% (n=159) reported having been hospitalized before TB infection.

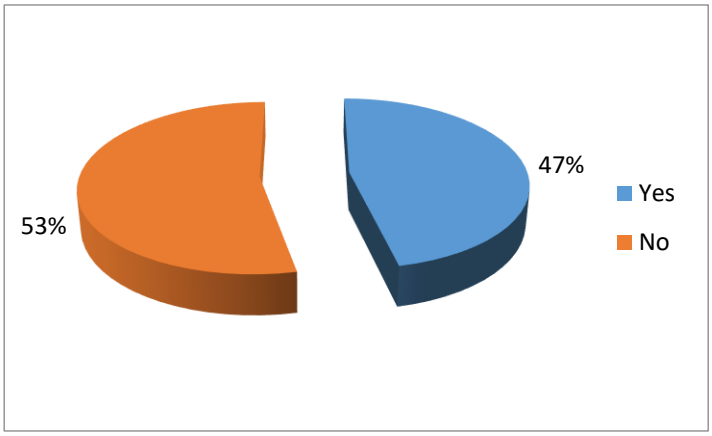

Figure 4.6: Distribution of respondents who were hospitalised and those who were never hospitalized before TB infection (n=341).

4.3.7 How long were you hospitalized?

This question was designed for respondents who were once hospitalized before TB diagnosis. Figure 4.7 shows that 43.1% (n=97) of the respondents reported being hospitalized for less than a week while 26.2% (n=59) of the respondents spent about 1-3 weeks at the hospital. Moreover, 20.4% (n=46) of the respondents reported being hospitalized for a month. However, only 10.2% (n=23) of the respondents spent more than 1 month at a hospital

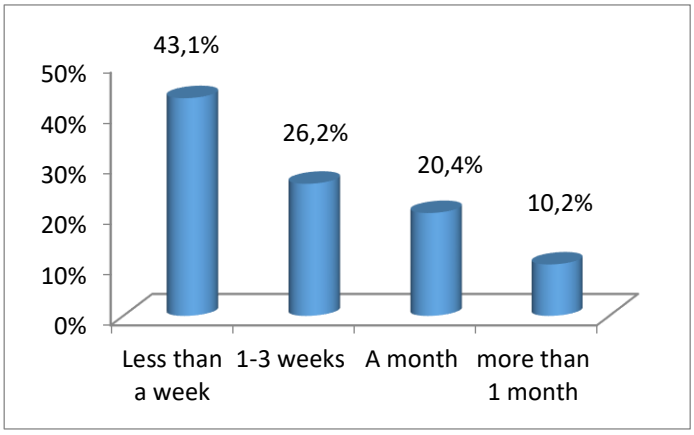

Figure 4.7: period respondents spent at the hospital during admission (n=225)

4.3.8 Have you been next to a coughing person?

Figure 4.8 shows that 59% (n=169) of the respondents reported being next to a coughing person while 41% (n=118) reported not being next to a coughing person.

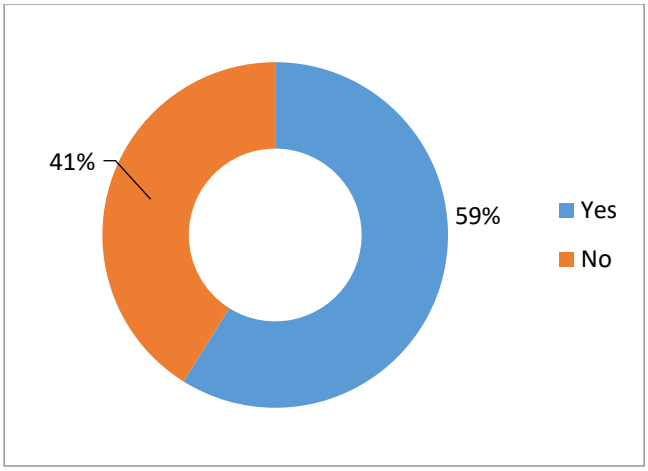

Figure 4.8: responses on being next to a coughing person (n=287)

4.3.9 What type of treatment were you taking?

Table 4.3 shows that 45% (n=98) of the respondents were taking ARV treatment while 27% (n=58) were taking respiratory disease treatment at the time of TB diagnosis. Moreover, (n=46) of the respondents were taking diabetes treatment while 9 took malaria treatment at the time of TB diagnosis. However, 5 respondents were taking treatment for pneumonia.

Table: 4.3 Type of treatment taken by respondents

Type of Treatment	*(f)*	*(%)*
ARV	*98*	*45*
Diabetic treatment	*46*	*21.3*
Respiratory diseases	*58*	*27*
Malaria	*9*	*4.2*
Pneumonia	*5*	*2.3*
Total	*216*	*100*

4.3.10 Have you ever spend more time with a person(s) diagnosed with Tuberculosis?

The results indicate that 185(53%) respondents reported that they spent more time with a coughing person while 163(46.8%) never spent more time with a coughing person around them.

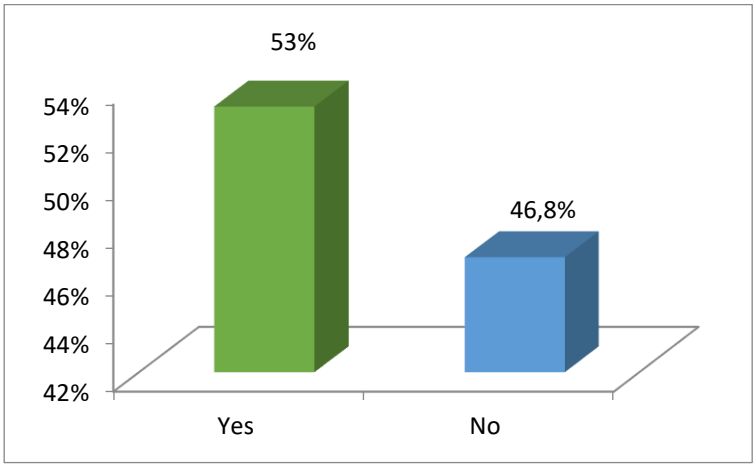

Figure 4.9: distribution of respondents who spent and did not spend more time with a person diagnosed with TB (n=348)

4.3.11 Association between Gender and smoking

Table 4.4 shows that a high number (58%) of females were non-smokers while most of the male (22%) of the respondents were smokers. However, there is a statistically significant relationship between gender and smoking (*p<0.001).*Moreover, the test results also suggest that although smoking is a factor to TB infection, however, the are other factors that predispose non-smokers to TB infection such as staying in dusty area as shown in figure 13 and 14 since the high number of respondents were non-smokers but infected with TUBERCULOSIS.

Table 4.4 Association between Gender and smoking

Variable		Non smokers f(%)	Smokers f(%)	*n*	χ2-statistic (df)	*P*- value
Gender	**Male**	52(16)	70(22)	122	104.303(1)	0.000
	Female	186 (58)	12 (4)	198		

4.4 Environmental factors that lead to the development of New TB infection

This section presents results about environmental factors that predisposed respondents to TB infection. Respondents were asked about the size of the house and the number of people living in the house. Respondents were also asked if the house had windows, whether they opened windows, number of people who shared the room, staying dusty area and how long they stayed in the dusty area.

4.4.1 Size of the house and number of people living in the house

The results show that 133(41%) respondents reported having three roomed houses while 100(31.1%) reported having more than three roomed houses. Moreover, 60(18.5%) indicated having two roomed houses while the remaining 30(9.2%) respondents had one roomed houses. Furthermore, of the 133 (41%)respondents who reported having three roomed houses, 96(29%) indicated that less than five 5 people share the room, 33(10%) indicated that 6-10 people shared the room and 4(1.2%) reported having 11-15 people sharing the rooms. Moreover, of the 100(31.1%) respondents who reported having a house of more than three rooms, 60 (18.4%)indicated that less than 5 people shared the house, 31 (10%)reported having 6-10 people sharing the house while 9(2.7%) reported having 11-15 people sharing the house. Furthermore, of the 60(18.5%) people who reported having two roomed house, 46 (14.1%)indicated that less than five people shared the rooms while 14 (4%) had 6-10 people sharing the two roomed house. Moreover, of the 30 (9.2%) respondents who reported having one roomed house, 20 (6.1%) had less than 5 people living in the house while 10 (3%) had 6-10 people sharing the room.

Table 4.5: cross tabulation of house size and number of people living in the house (n=323)

Number of people living in the room	Size of the house				Total
	One room (f) (%)	Two rooms (f) (%)	Three rooms (f) (%)	More than three rooms (f) (%)	
Less than 5 people	20 (6.1%)	46 (14.1%)	96 (29%)	60 (18.4%)	222 (68%)
6-10 people	10 (3%)	14 (4 %)	33 (10%)	31 (10%)	88 (27%)

11-15 people	0	0	4 (1.2%)	9 (2.7%)	13 (4%)
Total	30 (9.2%)	60(18.5)	133 (41%)	100 (31.1%)	323 (100%)

4.4.2 Did your house have windows when you were diagnosed with TUBERCULOSIS?

The results indicate that 316(92.10%) respondents reported that their houses have windows while 27 (7.9%) indicated that their houses did not have windows.

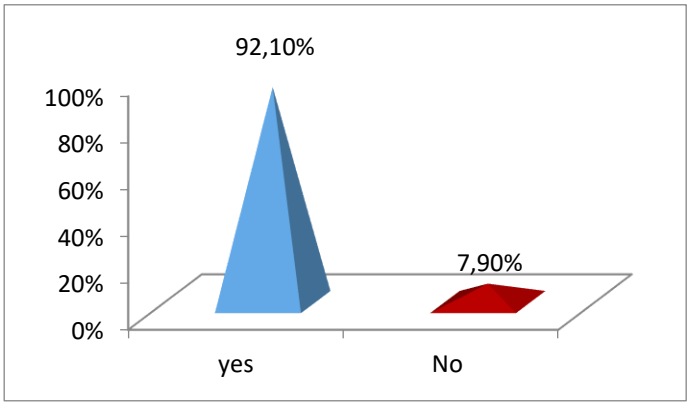

Figure 4.10: distribution of respondents whom their houses had windows (n=348)

4.4.3 Were you opening windows?

Figure 4.11 indicates that 225 (67%) respondents opened windows while 109 (33%) could not.

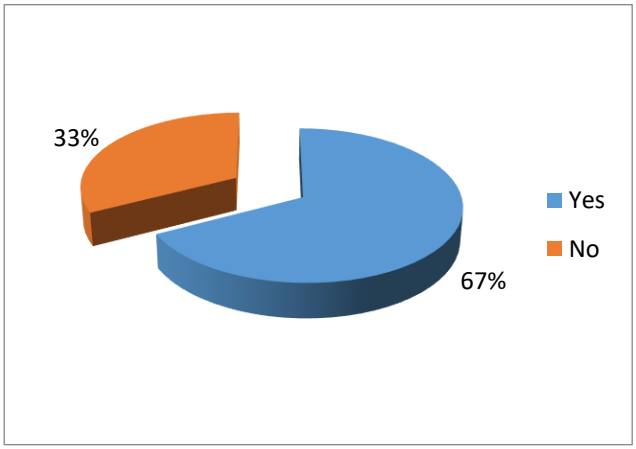

Figure 4.11: distribution of respondents who opened windows before they were diagnosed with TB(n=334)

4.4.4 How many people shared a room?

Figure 4.12 shows that 164 (48.4%) respondents reported that two people shared a room while 91(26.8%) reported that a room was shared by three people in their respective houses. Moreover, 65 (65%) respondents also indicated that a room was shared by four people in their households. However, only 19 (19%) respondents reported having more than four people sharing in their household.

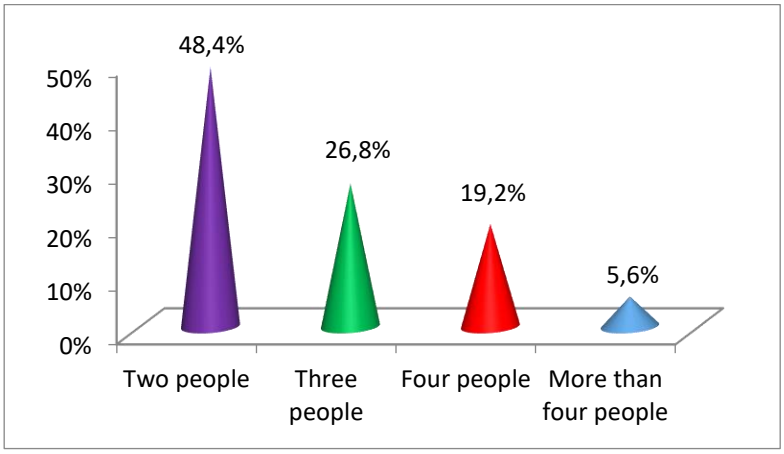

Figure 4.12: Distribution of number of people who shared a room in the households of respondents (n=339)

4.4.5 Have you ever stayed in the dusty area?

Figure 4.13 shows that 185(54%) respondents reported that they stayed in a dusty area before they were diagnosed with TUBERCULOSIS, while 158(46%) reported that they did not

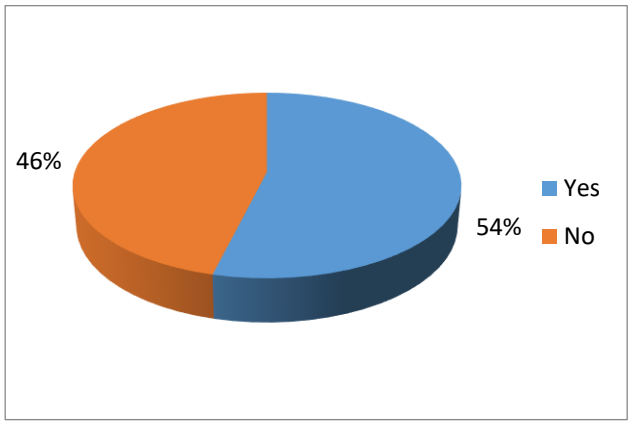

Figure 4.13: respondents who stayed in dusty area before they were diagnosed with TB(n=343)

4.4.6 How long have you stayed in the dusty area?

The results indicate that 128(65.3%) respondents spent three years, while 45 (23%) respondents only spent one year. Moreover, 14(7.1%) respondents reported that they lived in dusty are for three years and those that spent two years were 9(4.6%).

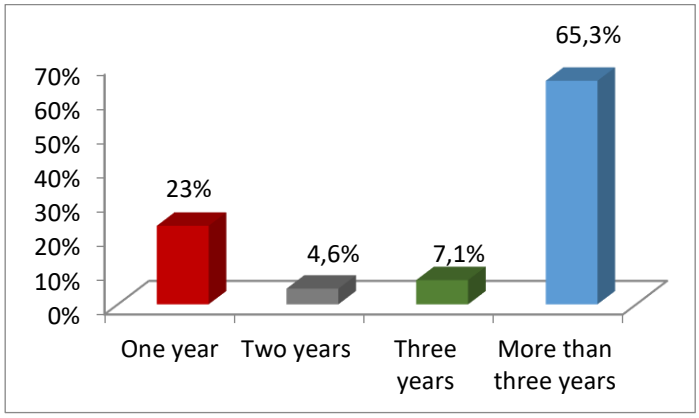

Figure 4.14: distribution of periods that respondents spent living in the dusty area (n=196).

4.5 Socio economic factors that lead to the increase of new TB infections cases

This section presents results about socio economic factors that lead to TB infection. Respondents were asked employment status, occupation, source of income, and gross monthly income.

Table 4.5 indicates that 124 (37.7%) respondents reported being unemployed while 113 (34.3%) were formally employed by the time they were diagnosed with TUBERCULOSIS. Moreover, 61(18.5%) respondents reported being students when they were diagnosed with TUBERCULOSIS. However, only 31 (9.4%) respondents were self-employed at the time of TB diagnosis. Table 4.5 also indicates that respondents were also asked about occupation at their respective work places and 174 respondents indicated their occupation. Of the 59(33.9%) reported being health workers at the time of TB diagnosis followed by 53(30.5%) respondents who reported being laborers. Moreover, 25(14.4%) respondents reported that they were student nurses while 22(12.6%) respondents were miners. Furthermore, 5 (2.9%) respondents were cook, another 5 (2.9%) were domestic workers and the remaining 5 (2.9%) respondents were interns.

Table 4.5 also indicates that 124(39.4%) respondents reported having salary as a source of their income while 118 (37.5%) were pensioners. Moreover 45 (14.3%) respondents received their income from business profit while 28(8.9%) had stipend as their source of income. Table 4.5 further indicates that 128(40.6%) had monthly income of less than R1000, followed by 77(24.4%) who had monthly income of R2000-R4000. Furthermore, 47(14.9%) respondents had monthly income of above R10000 and 36(11.4%) had monthly income of R8000-R10000. Moreover, 27(8.6%) respondents reported that they had monthly income of R5000-R7000. The respondents were also asked if they were able to buy well balanced diet food, 239 (69.7%) indicated that they were able while 104(30.3%) reported being not able to buy well balanced diet food.

Table 4.6: respondents' responses on socio economic factors of TBinfection

Variables	Responses	(f)	(%)	Total (n)
Employment status	Unemployed	124	37.7	329
	Self employed	31	9.4	
	Employed	113	34.3	
	Student	61	18.5	
Occupation	Mine worker	22	12.6	174
	Health worker	59	33.9	
	Labourer	53	30.5	
	Student nurse	25	14.4	
	Cooker	5	2.9	
	Domestic worker	5	2.9	
	intern	5	2.9	
Source of income	Salary	124	39.4	315
	Grant /pension fund	118	37.5	
	Profit(business)	45	14.3	
	Stipend	28	8.9	
Household gross monthly income	<R1000	128	40.6	315
	R2000-R4000	77	24.4	
	R5000-R7000	27	8.6	
	R8000-R10000	36	11.4	

	>R10000	47	14.9	
Ability to afford to buy well balanced diet food	Yes No	239 104	69.7 30.3	343

4.7 Conclusion

In this chapter the data which were collected from TBpatients from Thulamela Municipality, Limpopo province, South Africa were presented and analysed. Personal, environmental and Socio economic factors towards infection were presented. An association was drawn between gender and smoking. Association was also made between gender and being diabetic. In the next chapter the findings presented and analysed in this chapter are discussed.

CHAPTER FIVE
DISCUSSION OF FINDINGS

5.1 Introduction

This section discusses the results of the study based on literature review. The similarity, contradictions as well as inferences are deliberated. The discussions are arranged as sub-headings based on the objectives of the study, namely personal factors, environmental factors, and socio-economic factors that lead to increase of New TB infection.

5.2 Discussion

5.2.1 Demographic information

This section discusses the results of the distribution of the respondents by age, gender, marital status, and level of education. The socio-demographic characteristics of respondents who participated in the study indicated that 32.8% of the respondents were aged between 21 and 30 years. These results suggest that the economically active population are vulnerable to TB infection. Some studies indicated that there is an increase in mortality and morbidity in young adult population mostly between 15-44 years of age (WHO,2013) which is in line with the study results. Moreover, there were more female respondents in the study with 59.8%, thus it shows that females are more vulnerable to TB infection than males. However, this results differ with WHO (2015) findings which indicate that in most countries, greater numbers of men are diagnosed with TB than women, and men have higher death rate from TUBERCULOSIS. Furthermore, most (42.9%) respondents were single. These results suggest that marital status of the respondents might have predisposed them to other factors that led to TB infection. Looking at the situation of unemployed mother with no source of income, proper housing and lack of access to nutritious food. It was also discovered by the study that most (47.3%) respondents attended school up to tertiary level. Based on the study findings, it can be concluded that TB infects everybody regardless of their educational status.

5.2.2 Personal factors that contribute to the increase of new TB infection

The study found that most (73.6%) respondents were non-smokers during the period of TB diagnosis. Results of the current study differ with findings from the study of Kant et al, (2010) who discovered that smoking increases the chances of TB infection, the risk of progression from infection to disease, and the risk of death among TB patients. However, these results

suggest that although smoking is a risk factor for TB infection among smokers, there are other factors that predispose non-smokers to TB infection. Moreover, the results discovered that most (43.2%) respondents worked at hospital when they were diagnosed to be infected by TB disease. These results concur with results of Patil et al (2014) who discovered that inadequate air change rates, negative air flow and recirculation of air have been identified as an occupational hazard in hospitals with respect to TB transmission. The study also discovered that majority (78%) of the respondents were not diabetic during time of TB diagnosis. For those that were diabetic during TB diagnosis, most (56.7%) of them were diagnosed with diabetes less than a year during TB diagnosis. These results differ with a statement made by Narasimhan et al (2013) who stated that biological evidence supports the theory that diabetes accelerates the proliferation of TB infection. These results may suggest that people who are also not infected with diabetes can be infected with TB while diabetes increases the risk of TB infection among people who are diabetic.

Moreover, the study found that majority (77.8%) of the respondents consumed well balanced diet when they were diagnosed with TB and most (46.8%) of them would eat three times a day. These results suggest that although a person may be eating well balanced diet, other factors predispose him/her to TB infection. Furthermore, the results revealed that most (45%) respondents were taking ARV treatment during TB diagnosis. Based on the results, it can be concluded that being infected with HIV increases the probability of being infected with TUBERCULOSIS. The results are supported by Seeley, Charlotte, Watts Kippax & Russell (2011) who stated that, because the immune becomes suppressed due to HIV infection, persons with latent TB as well as newly infected persons may progress rapidly to clinical disease. The study found statistically significant relationship between gender and smoking ($p<0.001$).Moreover, the study revealed no statistically significant relationship between gender and being diabetic ($p=0.415$).

5.2.3 Environmental factors that lead to the development of New TB infection

The study found that most (41%) respondents had three roomed house with less than 5 people sharing the house. Moreover, the study found that most (48.4%) respondents indicated that two people shared a room in their households. Based on these results, it can be inferred that most respondents shared a room with somebody from their household knowing or not knowing TB infection status of the person. In the case where the respondents new infection status of

the person they shared a room with, transmission of TB to another person including themselves(respondents) might have been overlooked due to inadequate knowledge about TB. These results are supported by Srivastava et al (2015) who attested that an association has been confirmed between overnight cough frequency and increased transmission among household contacts, where droplet nuclei (due to coughing) can stay in the air for a long time.

The study found that majority (92.10%) of the respondents had houses with windows during the time of diagnosis. Moreover, most (67%) of the respondents whom their houses had windows would always open such windows to allow air flow into houses. These results suggest that there might be factors that inhibited ventilation such as outdoor temperature and condition of windows. Furthermore, the study discovered that most (54%) respondents stayed in the dusty area and most (65.3%) of the respondents spent more than three years in such areas. The results suggest that staying in dusty area increases the risk of being infected with TB.

Furthermore, most (53%) respondents were never hospitalised before they were diagnosed with Tuberculosis. For respondents who were once hospitalised, most (43.1%) spent a period of less than a week at the hospital before they could be diagnosed with TUBERCULOSIS. Based on these results, it can be concluded that apart from being hospitalised as a risk factor for TB infection, there are other factors outside of the hospital that predispose people to TB infection. Again, for those who were hospitalised, their stay at the hospital might had predispose them towards TB infection as supported by Srivastava, Kant & Verma, (2015) who pointed out that studies in hospitals and health care facilities have shown that poor ventilation design or construction have contributed to the transmission of infection.

The study revealed that most (59%) respondents have been next to a coughing person and most (53%) spent more time with the person. These results suggest that being around TB infected person and spending more time with them predispose uninfected persons towards TB infection. The results are supported by Srivastava et al, (2015) who attested that extent and persistence of contact with an infected person are the main environmental factors for the transmission of TB.

5.2.4 Socio economic factors that lead to the increase of new TB infections cases

The results revealed that most (37.7%) respondents were unemployed during TB diagnosis. These results suggest that unemployed people often do not have stable source of income and are unable to buy well balanced diet, thus they become malnourished. Srivastava et al (2015) state that malnutrition profoundly affects cell-mediated immunity (CMI), and CMI is the principal host defence against TB This secondary immunodeficiency increases the host's vulnerability to infection and hence increases the risk for developing TUBERCULOSIS. The unemployed have 6.6 times higher risk of developing TB than the employed (Lönnroth, Jaramillo, Williams, Dye & Raviglione, 2009).

The results also revealed that most (33.9%) respondents were working as health care workers when they were diagnosed with Tuberculosis. These results suggest that certain occupations such as health care facilities are risk factor for TB infection. Studies in hospitals and health care facilities have shown that poor ventilation design or construction have contributed to the transmission of infection (Srivastava, et al, 2015).The study also revealed that most (39.4%) earned salary as their source of income and about 40.6% earned monthly salary less than R1000. Although most of them reported receiving salary as a source of income, the salary was less than R1000, thus the salary could not cover all household needs including well balanced diet.

CHAPTER 6
CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the conclusions and recommendations based on the results. The main aim of the study was to investigate the factors associated with the increase in new TB infection among clients in Thulamela Municipality, South Africa. Self-administered questionnaire was used to collect data in order to:

- Assess personal factors that lead to new TB infection among clients
- Describe environmental factors that lead to increase in new TB infection among clients
- Assess socio-economic factors that lead to increase in new TB infection among clients

6.2 Conclusion

Based on the study results, the following conclusions were drawn and are arranged based on the study focus areas, namely, demographic, personal, environmental and socio-economic factors that lead to increase in new TB infection.

6.2.1 Demographic information

Most of the respondents were aged between 21 and 30 years who constitute 32.8%. Moreover, there were more female respondents in the study constitute 59.8%. Furthermore, most (42.9%) respondents were single and most (47.3%) respondents attended school up to tertiary level.

6.2.2 Personal factors that contribute to the increase in new TB infection

The study found that most (73.6%) respondents were non-smokers during the period of TB diagnosis. Moreover, most (43.2%} respondents worked at hospital when they were diagnosed to be infected with TB. The study also revealed that majority (78%) of the respondents were not diabetic during time of TB diagnosis. For those who were diabetic during TB diagnosis, most (56.7%) of them were diagnosed with diabetes less than a year during TB diagnosis. Moreover, the study found that majority (77.8%) of the respondents consumed well balanced diet when they were diagnosed with TB and most (46.8%) of them would eat three times a day. The results revealed that most (45%) respondents were taking ARV treatment during TB diagnosis. Patients and people infected with HIV are at greater risk of TB infection

6.2.3 Environmental factors that lead to the development of new TB infection

The study found that most (41%) respondents had three roomed house with less than 5 people sharing the house. Moreover, the study found that most (48.4%) respondents indicated that two people shared a room in their households. Sharing of rooms with another person infected with TB promotes TB infection among individuals. The study found that majority (92.10%) of the respondents had houses with windows during the time of diagnosis. Moreover, most (67%) of the respondents whom their houses had windows would always open such windows to allow air flow into houses. The findings also revealed that most (54%) respondents stayed in the dusty area and most (65.3%) of the respondents spent more than three years in such areas. Furthermore, most (53%) respondents were never hospitalised before they were diagnosed with Tuberculosis. The study discovered that most (59%) respondents have been next to a coughing person and most (53%) spent more time with the person.

6.2. 4 Socio economic factors that lead to the increase in new TB infections cases

The findings revealed that most (37.7%) respondents were unemployed during TB diagnosis. The findings also revealed that most (33.9%) respondents were working as health care workers when they were diagnosed with Tuberculosis. Working environment such as health care facilities predispose health workers towards high risk of TB infection Furthermore, the study discovered that most (39.4%) respondents earned salary as their source of income and about 40.6% earned monthly salary less than R1000. Earning less salary deters people from buying nutritious food and put them at risk of being malnourished and become vulnerable to TB infection

6.3 Recommendations

For Primary Health Care services

- The department should ensure that prevention measures are taken to protect its employees from being infected with TB because facilities are among factors that predispose people towards TB infection.
- Proper ventilation that will allow enough air flow into working conditions of health care workers in their working rooms including patients' wards should be ensured.

- More preventative campaigns against HIV infection should be introduced further in order to combat HIV infection since HIV is one of the driving factors behind many newly TB infections.
- Further educational campaigns should be conducted to educate the public about TB including its mode of transmission and management

For research

- Further research should examine and measure how investigated factors play a role in TB infection among newly diagnosed cases.

For communities

- Communities should be educated about coughing etiquette and other preventive practices towards TB infection. This could help with combating on-going infection from person to another in communities.
- Communities should also be taught about the dangers of living in dusty areas and how such areas can be identified and be avoided.
- Communities should also be taught about the ventilation when building a house. This could help communities to use windows that can allow enough ventilation within their houses.

Department of Social Development

- The Department of Social Development should intervene by identifying households with less salary as less than R1000 and subsidize them on nutritious food that they do not afford as a way of fighting against malnutrition and TB infection.

REFERENCES

Ahmed Suleiman MM, Sahal N, Sodemann M, Elsony A, Aro AR(2013). TBstigma in Gezira, Sudan, a case–control study. International Journal of TBand Lung Disease;17(3):388-393.

Akolo C, Adetifa I, Shepperd S, Volmink J (2010) Treatment of latent TBinfection in HIV infected persons. Cochrane Database Syst Rev(1):CD000171.

Alisjahbana,A., R. Van Crevel, E. Sahiratmadja, M. den Heijer,A. Maya, E. Istriana .(2006).“Diabetes mellitus is strongly associated with TBin Indonesia,” *The International Journal of TBand Lung Disease*, vol. 10, no. 6, pp. 696–700, 2006.

Beggs C.,B, Noakes C.,J, & Sleigh PA . (2003).The transmission of TBin confined spaces: An analytical review of alternative epidemiological models. Int J Tuberc Lung Dis 7, 1015-26.

Bhattarai S, Thapa P, Shrestha C, Dangol S, Niroula T, Verma SC,(2014). A Study on Sociodemographic Pattern and Side Effects of Anti-Tubercular Drugs among TBPatients in Pokhara Valley. SAARC J Tuber Lung Dis HIV/AIDS.;10(2):41-4.

Boccia D, James H, Bianca LDS, Katherine F, Chaap AbS. (2011). The Association between Household Socioeconomic Position and Prevalent TBin Zambia: A Case-Control Study. PLoS ONE 6(6): e20824.doi:10.1371/ journal.pone.0020824.

Boehme, C.C., et al.,(2010). Rapid Molecular Detection of TBand Rifampin Resistance. New England Journal of Medicine, :363(11)

Burns, N & Grove, S.K. (2013). *Understanding Nursing Research*. (3rd ed.), Philadelphia: WB Saunders.

Centers for Disease Control and Prevention. (2013). Introduction to the core curriculum onTuberculosis: What the clinician should know (6th ed.). Atlanta, Georgia: National Centerfor HIV/AIDS, Viral H epatitis, STD, and TBPrevention. Division of TBElimination.

Churchyard,G.,J.,Mametja,L.,D, Mvusi, L., Ndjeka, N., Hesseling A.,C., Reid, A., Babatunde, S., Pillay, Y., (2014). TBcontrol in South Africa: Successes, challenges and recommendations. *S Afr Med J*;104(3 Suppl 1):244-248

Claassens M.,M, du Toit E, Dunbar R, et al,(2013). TBpatients in primary care do not start treatment: What role do health system delays play? Int J Tuberc Lung Dis ;17(5):603-607. [http://dx.doi.org/10.5588/ijtld.12.0505]

Clark M, Riben P, Nowgesic E. (2002).The association of housing density, isolation and TBin Canadian First Nations communities. Int J Epidemiology. 31, 940-43

Cohen, L., Manion, L. and Morrison, K. (2008). *Research Methods in Education***.** Great Britain: Routledge.

Connolly, Davies and Wilkinson. (2015). *Impact of the HIV Epidemic on Mortality Among Adults With TUBERCULOSIS***.** SA. Epidemiological Research in SA.

Creswell, J.W. (2013)**.** *Research Design.* 2nd ed., USA: Sage Publications.

David CP, Nadim S, Mary Patricia P, Yancovitz S, & Denise P, (1995). TBin drug users. Clin Infect Dis. 1995;21(5):1253-64.

De Vos, A.S., Strydom, H., Delport, C.S.L. and Fouche, C.B. (2010). *Research at Grass Roots*. (4th ed). Pretoria: Van Schaick Publishers.

Department of Health. (2006). *TBSuspects.* Nelspruit: Government Printers.

Department of Health. (2011). *TBManual.* Republic of South Africa: Government Printers.

Department of Health. (2014). *National TBInfection Control Guidelines***.** Geneva: Switzerland.

Department of Health. (2016). *RSA TBStrategic Plan***.** Republic of South Africa: Government Printers.

Department of Health. (2017). *National TBControl Programme***.** Republic of South Africa: Government Printers.

Dhingra VK, Rajpal S, Aggarwal N, Taneja DK. (2004). TBtrend among household contacts of TBpatients. Ind. J Community Medicine.29, 1–3.

Diedrich CR and Flynn J.L. (2011). HIV-1/Mycobacterium TBCo infection Immunology:How Does HIV-1 Exacerbate Tuberculosis? Infec & Immu, 79, 1407–1417

Floyd K, Dias HM, & Falzon D.(2012). Global TBreport. Geneva: WorldHealth Organization.

Fogel, N., (2015).Tuberculosis: A disease without boundaries. *Tuberculosis*,. 95(5):

Fok,A., Y. Numata, M. Schulzer, and M. J. FitzGerald,(2008). "Risk factors for clustering of TBcases: a systematic review of population-based molecular epidemiology studies," *International Journal of TBand Lung Disease*, vol. 12,no. 5, pp. 480–492.

Giovanni,F.(2012). "Tuberculosis: Novel Approaches to an Old Disease," Journal of Infection in Developing Countries, Vol. 6, No. 1, pp. 4-5.

Gupta, A. and Chaphalkar S.R., (2015). HIV and Tuberculosis: Overview. *Bioengineering and Bioscience*: 3(6)

Ivanovs,A., Salmane-Kulikovska, L., & Viksna,L.(2016). The Impact of Socioeconomic Factors on TBPrevalence in Latvia. *Universal Journal of Public Health* 4(5): 230-238,

K. Lönnroth, E. Jaramillo, B. G. Williams, C. Dye and M. Raviglione,(2009). "Drivers of TBepidemics: The role of risk factors and social determinants," *Social Science and Medicine,* vol. 68, no. 12, pp. 2240-2246

Kampa, M. and Castanas E. (2008). Human health effects of air pollution. *Environ. Health*. 151, 362367.

Kant S, Gupta H, Ahluwalia S. (2015) Significance of nutrition in pulmonary Tuberculosis.Crit Rev Food Sci Nutr. 55, 955-63. doi: 10.1080/10408398.2012.679500

Kant S, Maurya AK, Kushwaha RAS, Nag VL. (2010).Multi Drug resistant Tuberculosis; an iatrogenic problem. Biosciences Trends, 4, 48-53.

Kiboi NG, Nebere SN, & Karanja JK,(2016). Immunological interactions of TBwith drugs and substance use: a systematic review and update. J Pulm Respir Med. 2016;6(326).

Kibret KT, Yalew AW, Belaineh BG, Asres MM (2013) Determinant Factors Associated with Occurrence of TBamong Adult People Living with HIV after Antiretroviral Treatment Initiation in Addis Ababa, Ethiopia: A Case Control Study. PLoS ONE 8(5): e64488. doi:10.1371/journal.pone.0064488

Kolappan C, Gopi P,G.(2002). Tobacco smoking and pulmonary Tuberculosis. Thorax;57(11):964-6.

Leedy, P.D.& Ormrod, G.(2011). *Practical Research***.** 8th ed. Jeffery W. Johnston.

Manual of the National TBControl Programme in Sudan. 2nd Edition. Federal Ministry of health, Sudan 2000.

Mbengo F, Ngirande H, Ndou ND, et al.(2014). Strategies to boost the uptake of voluntary counselling and testing (VCT) by university students.Mediterr *J Social Sci*. 4;5(15):458.

Mishra, P, Srivastava, R. Krishnan, A. Sreenivaas, V. *et al,* (2012).Indoor Air Pollution-related Acute Lower Respiratory Infections and Low Birth weight: A Systematic Review. *J Trop Pediatric*.58, 457466.

Mohamad, M, M., Sulaimanb, N, L., Sern,L,C & Sallehd,K,M (2015). Measuring the Validity and Reliability of Research Instruments. Elsevier: Procedia - Social and Behavioral Sciences 204, 164 – 171

Mohamed1, S., Kanagasabapathy,S., & Kalifulla,S. (2015). Socio-economic profile and risk factors among pulmonary TBpatients in Madurai, India: a cross sectional study. *International Journal of Research in Medical Sciences, 3(12):3490-3498*

Mouton, J. and Babbie, E. (2016). *The Practice of Social Research***.** Cape Town: Wadsworth Publishing Company.

Narasimhan, P., Wood, .J. Chandini R. M & Mathai,D. (22013).“Risk Factors for Tuberculosis,” Pulmonary Medicine, vol. 2013, pp. 1-11, ACCESSED 6 January 2019

Narasimhan,P., Wood,J.,MacIntyre,C.,R., & Mathai,D.(2013). Risk Factors for Tuberculosis. Pulmonary Medicine

National Department of Health,(2012). Annual performance plan 2012/13-2014/15. National Department of Health. South Africa. Diseases.;34:153–7.

National Department of Health. National Strategic Plan on HIV, STIs and TUBERCULOSIS: 2012-2016. http://www doh.gov.za/docs/stratdocs/2012/NSPfull.pdf (accessed 14 March 2019).

Ndungu,P.,W., Revathi ,G., Kariuki,S., & Ng’ang’a,Z.(2013). Risk Factors in the Transmission of TBin Nairobi: A Descriptive Epidemiological Study. Available from http://dx.doi.org/10.4236/aim.2013.32025

Patil PJ, Vithal G, Thakare S, Patil P. (2014). Comparative study of lung function test of policemen in traffic control with those in general duty. Natl J Physiol Pharma Pharmacol. 3, 162-166

Pietersen E, Ignatius E, Streicher EM, et al,(2014). Long-term outcomes of patients with extensively drug-resistant TBin South Africa: a cohort study. Lancet.;383(9924):1230. https://doi.org/10.1016/S0140-6736(13)62675-6

Ramaliba,T.,M T.G. Tshitangano, H.A. Akinsola & M. Thendele (2017)TBrisk factors in Lephalale local municipality of Limpopo province, South Africa, South African Family Practice, 59:5, 182-187,DOI:10.1080/20786190.2017.1304734

Rathmann,W.,Giani G, & Wild S, (2004). "Global prevalence of diabetes: estimates for the year 2000 and projections for 2030," *Diabetes Care*, vol. 27, no. 10, pp. 2568–2569

SANTA. (2011). *TBand Health News.* 40(3): 1-23.

SANTA. (2015). TBin South Africa. Geneva: Switzerland.

Seeley J, Charlotte H, Watts Kippax S. Russell R. et al. (2011). Addressing the structural drivers ofHIV: a luxury or necessity for programmes? J of the Int AIDS Society.15, 17397

Sinclair D, Abba K, Grobler L, Sudarsanam TD. (2011) Nutritional supplements for people being treated for active Tuberculosis.Cochrane Database Syst Rev. 9, CD006086.

Statistics South Africa,(2014). Mortality and causes of death in South Africa,2011: findings from death notification. Pretoria: Stats SA

Szabo,G.(1997). "Alcohol's contribution to compromised immunity," *Alcohol Research and Health*, vol. 21, no. 1, pp. 30–38.

The draft national infection prevention and control policy for Tuberculosis, mdrTBand xdrTuberculosis, (2007).Department of Health: Government printers.

Tshitangano T.,G,(2013). The management of latent TBinfection in health care workers at hospitals in Vhembe district. *Occup Health South Afr*;19(5):14–9.Volume 2013, available from http://dx.doi.org/10.1155/2013/828939

WHO(2016). Global TBcontrol 2016, Geneva www.whoint/Tuberculosis/en (accessed 25 June 2018)

WHO. (1994). Framework for effective TBcontrol.

World Health Organization,(2010).“Equity, Social Determinants and Public Health Programmes,”Geneva:WorldHealthOrganization,http://books.google.co.in/books?id=7JxutqCmctUC,

World Health Organization,(2014).Global TBReport 2014. Geneva,Switzerland: WHO Library, 2014.

World Health Organization. (2005). Surveys of TBInfection. Geneva: Switzerland.

World Health Organization. (2012) Global TBReport 2013. Geneva: WHO, 2012. http://www.who. Int/Tuberculosis/publications/global report/en/index.html (accessed 21 January 2018)

World Health Organization. (2017). Global TBReport 2017. Geneva: WHO

World Health Organization.(2014). Global TBreport. Available from: http://www/who.into/mediacenter/factsheets/fs104/en/ (accessed 14 March 2019).

Appendix A: Research instrument

FACTORS ASSOCIATED WITH THE INCREASE OF NEW TB INFECTION AMONG CLIENTS IN THULAMELA MUNICIPALITY.

Instructions

1. Do not write you name
2. Read thoroughly and understand before you answer.
3. Answer all questions
4. The questionnaire should be completed and returned to the researcher immediately
5. Only tick one appropriate answer from each item
6. For any clarity do not hesitate to contact the researcher immediately

SECTION A: DEMOGRAPHIC INFORMATION

	Questions	Answers
1	How old are you?	1 < 20 ( ) 2 21-30 ( ) 3 31-40 ( ) 4 41-50 ( ) 5 51> ( )
2	What is your gender?	1 Male ( ) 2 Female ( )
3	What is your marital status?	1 single ( ) 2 Married ( ) 3 Divorced ( ) 4 Widowed ( )
4	What is your level of education?	1 None ( ) 2 Primary ( ) 3 Secondary ( ) 4 Tertiary ( )
5	Where do you stay?	1 Gondeni ( ) 2 Tshilapfene ( ) 3 Makonde ( ) 4 Damani ( ) 5 Tshiombo ( ) 6 Tshidimbini ( ) 7 Vhufuli-Tshitereke ( ) 8 Malavuwe ( ) 9 Mukula ( )

SECTION B: Personal factors that contribute to the increase of new TB infection.

6 Do you smoke?

1. Yes ( )
2. No ( )

7 If yes, how long have you been smoking?

1 < year ( )
2 1-5 ( )
3 6-10 ( )
4 other: specify……..

8 Where do you work?

1 Hospital ( )
2 Mining ( )
3 Labourer ( )
4 Other: Specify……..

8 For how long have been working there?

1 One Year ( )
2 Two years ( )
3 Three years ( )
4 More than three years ( )

9 Have you been diagnosed of diabetes mellitus?

1. Yes ( )
2. No ( )

10 if yes, for how long have you been diagnosed?

1 < year ( )
2 1-5 ( )
3 5-10 ( )
4 Other: specify ( )

11 What types of food do you eat on a daily basis?

1. Well balanced diet ( )

2. Junk food ( )

3 Drink alcohol ( )

4 Other: specify…….

12 How often do you eat food?

1 Once a day ( )

2 Twice a day ( )

3 Thrice a day ( )

4 Other: specify……..

13. Have you ever been hospitalised before?

1 Yes ( )

2 No ( )

14 If yes, for how long have you been hospitalised?

1 < week ( )

2 1-2 weeks ( )

3 Month ( )

4 Other: specify……..

15 Was there a coughing person next to you?

1 Yes ( )

2 No ( )

16 What type of treatment were you taking?

1 HIV treatment ( )

2 Diabetic treatments ( )

3Tuberculosis ( )

4 Respiratory diseases ( )

5 Other: specify……

17 Did you ever default in taking treatment?

1 Yes ( )

2 No ( )

18 Have you ever spent more time with a person (s) who has been diagnosed with Tuberculosis?

1 Yes ( )

2 No ( )

Section C: Environmental factors that lead to the development of new TB infection

19 Size of house?

1. One ( )
2. Two ( )
3. Three ( )

4 Other: specify……..

20 How many people live in the house?

1< 5 ( )

2 5-10 ( )

3 10-15 ( )

4 Other: specify…….

21 Is your house having open able windows?

1. Yes ( )
2. No ( )

22 If your answer is yes to the question above, were you opening the windows everyday?

1. Yes ( )
2. No ( )

23 How many people shared a room?

1. Two people ( )
2. Three people ( )
3. Four people ( )
4. More than four people ( )

24 Have you ever stayed nearby a dusty area?

1 Yes ( )

2 No ( )

25 if yes to question 20, for how long have you stayed in a dusty area?

1 One Year ( )

2 Two years ( )

3 Three years ( )

4 More than three years ( )

Section D: Socioeconomic factors that lead to the increase in new TB cases

26 Employment status

1 Unemployed ( )

2 Self-employed ( )

3 Employed ( )

4 Student ( )

27 What is your occupation?

1. Mine worker ( )

2. Health worker ( )

3. Labourer ( )

4 Other: specify…….

28 What is your source of income?

1. Salary ( )

2. Grant/pension fund ( )

3. Profit (business) ( )

3. Other: specify…….

29 What is your household gross monthly income?

1. <R1000 ( )

2. R2000-R4000 ( )

3. R5000-R6000 ( )

4. R7000-R8000 ( )

5. >R8000 ( )

30 Are you able to buy well balanced diet ?

1 Yes ( )

2 No ( )

Appendix B: Ethical clearance

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Ms MO Nwendamutswu

Student No:
11600019

PROJECT TITLE: **Factors associated with the increase of new TB infection among clients in Thulamela Municipality, South Africa.**

PROJECT NO: **SHS/19/PH/05/1104**

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Dr TG Tshitangano	University of Venda	Supervisor
Dr CN Nesamvuni	University of Venda	Co -Supervisor
Ms MO Nwendamutswu	University of Venda	Investigator – Student

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE

Date Considered: April 2019
Decision by Ethical Clearance Committee Granted
Signature of Chairperson of the Committee: .....
Name of the Chairperson of the Committee: Senior Prof. G.E. Ekosse

UNIVERSITY OF VENDA
DIRECTOR
RESEARCH AND INNOVATION
2019 -04- 17
Private Bag X5050
Thohoyandou 0950

University of Venda
PRIVATE BAG X5050, THOHOYANDOU, 0950λ LIMPOPO PROVINCEλ SOUTH AFRICA
TELEPHONE (015) 962 8504/8313 FAX (015) 962 9060
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Appendix C: Permission letter

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

Department of Health

Ref : LP- 201908 - 011
Enquires : Ms PF Mahlokwane
Tel : 015-293 6028
Email : Kurhula.Hlomane@dhsd.limpopo.gov.za

Nwendamutswu Olive

PERMISSION TO CONDUCT RESEARCH IN DEPARTMENTAL FACILITIES

Your Study Topic as indicated below;

Factors associated with the increase of new TB infection among clients in Thulamela municipality, South Africa.

1. Permission to conduct research study as per your research proposal is hereby Granted.
2. Kindly note the following:
   a. Present this letter of permission to the institution supervisor/s a week before the study is conducted.
   b. In the course of your study, there should be no action that disrupts the routine services, or incur any cost on the Department.
   c. After completion of study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
   d. The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
   e. The approval is only valid for a 1-year period.
   f. If the proposal has been amended, a new approval should be sought from the Department of Health
   g. Kindly note that, the Department can withdraw the approval at any time.

Your cooperation will be highly appreciated

Head of Department

25/11/19
Date

Private Bag X9302 Polokwane
Fidel Castro Ruz House, 18 College Street. Polokwane 0700. Tel: 015 293 6000/12. Fax: 015 293 6211.
Website: http/www.limpopo.gov.za

The heartland of Southern Africa – Development is about people!

Appendix D: Consent form

Consent form for respondent

My name is Olive Mbulayiseni Nwendamutswu, a Master's student at the University of Venda, School of Health Sciences in the Department of Public Health. I am conducting a study entitled: "**Factors associated with the increase of new TB infection among clients in Thulamela municipality, Limpopo province, South Africa** ". I would like to invite you to participate in this study. Information obtained from you will be treated as confidential. Your participation in this study will be voluntary and your decision will not negatively affect your life or health.

INFORMED CONSENT DECLARATION FORM

In terms of the ethical requirements of the University of Venda, I now invite you to complete this form as an indication of your permission to voluntarily participate in this study.

I _____ hereby confirm that I have been fully informed about the purpose, procedures and activities of the study. The rights and risks of respondent have also been fully explained to me. I was given the opportunity to ask questions and I understand that participants can withdraw from the study at any stage, without giving any reasons.

I therefore hereby freely **Give/Do not give (**Delete the inapplicable**)** my consent to take part in the study, as outlined above.

Parent's signature: _____ Date: _____

Researcher's signature: _____ Date: _____

APPENDIX E: PROOF READING LETTER

SCHOOL OF HUMAN AND SOCIAL SCIENC

25 January 2020

TO WHO IT MAY CONCERN

Sir/Madam

This serves to confirm that I have proof-read Mrs. M.O. Nwendamutswu's research project titled, "Factors associated with the increase in new TB infections among clients in Thulamela Municipality, Limpopo Province, South Africa"

The proof-reading entailed editing some parts of the document; for example, to avoid wordiness, redundancy, sub-dividing sentences, and so on, to make the document more understandable.

However, I have not tampered with the content of the document, except where this constituted repetition or made the document confusing.

The research project is presently ready for examination.

Sincerely

F Mahori

.....

Mr. F. Mahori
Lecturer
Department of English

University of Vend

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