OUTCOME OF DAILY DIRECTLY OBSERVED THERAPY SHORT-COURSE AMONG PULMONARY TUBERCULOSIS AND HUMAN IMMUNODEFICIENCY VIRUS CO-INFECTED PATIENTS IN OYO STATE, NIGERIA.

BY

OLANREWAJU OLADIMEJI

MB;BS (Ibadan)

MATRIC NO: 110910

A Dissertation Submitted to

The Department Of Epidemiology, Medical Statistics, and Environmental Health,

Faculty of Public Health, University of Ibadan, Nigeria

In partial fulfilment of the requirements for the degree of

M.Sc. in Epidemiology and Medical Statistics

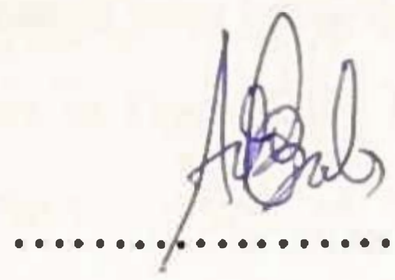
Of the

UNIVERSITY OF IBADAN

JULY 2012.

CERTIFICATION

I certify that this project was carried out under my supervision by OLADIMEJI, Olanrewaju in the Department of Epidemiology and Medical Statistics (EMS), Faculty of Public Health, College of Medicine, University of Ibadan.

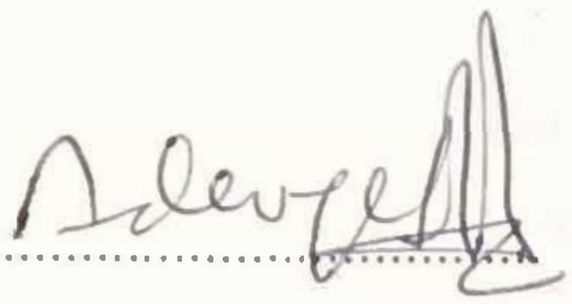


.....

Dr. Adedokun B.O

MB.BS (Ib), MSc (Epid & Med stat) (Ib),

Department of Epidemiology, Medical statistics and Environmental Health, Faculty of Public Health, College of Medicine, University of Ibadan.



.....

Dr. Adeoye I. A

MB.BS (OAU), MPH, FMPCH, MSc (Epid & Med stat) (Ib),

Department of Epidemiology, Medical statistics and Environmental Health, Faculty of Public Health, College of Medicine, University of Ibadan.

ABSTRACT

Background: Tuberculosis (TB) ranks top among other opportunistic infections in people living with Human immunodeficiency Virus (HIV) which has contributed to high motatlity across age groups in resource constraint settings. The co-existence of Tuberculosis (TB) and is known to present a management challenge. Knowledge of the determinants of outcomes of treatment can help improve care. The main objectives of this study were to determine prevalence of TB/HIV co-infection and treatment outcomes among TB/HIV co-infected patients enrolled on directly observed therapy short-course in Oyo state Nigeria.

Method: A cross sectional study design was carried out using patient records from January 2009 to 2010 in 53 functional DOTS centres in Oyo state. The study population consisted of 7905 patients enrolled on anti tuberculosis regimen except for those without HIV results. Information on the treatment cards and other reporting forms were abstracted with the use of data extraction form.Chi-square and logistic regression were used to test the relationship between TB/HIV co-infection and socio-demographic variables, clinical characteristics and treatment outcomes.

Result: The mean age of TB/HIV co-infected patients was 37.95±1.22 compared to the mean age of the TB without HIV patients which was 39.95±1.66 years. It was seen that there were more females (59%) than males (41%) who were TB/HIV co-infected while for those tuberculosis patients without HIV there were more males (56%) than females (44%) who had TB infection. It was also observed in this study that the treatment outcomes among TB/HIV patients was very poor, Cure (30.2%) and below the 85% WHO standard success rate. The mortality rate was high as (10.6%), treatment failure (4.6%), Default (3.8%), transfer out (3.6%) and treatment completed (47.2%). Majority of the co-infected client received care in the public facilities.The logistic regression showed that co-infected females were 1.227 times more likely to be successfully treated compared to males co-infected patients (CI= 1.077 – 1.398), co-infected patients that were engaged with work were 2.123 times less likely to successfully treated (CI= 0.400 – 0.555).In addition patients receiving anti-tuberculosis treatment in private owned facilities were 1.828 times less likely to be successfully treated compared to patients in government owned facilities (CI = 0.451 – 0.665).

Conclusion: This prevalence of 14.2% for TB/HIV co-infection among tuberculosis patients in this study is similar to findings from related documented studies in Nigeria. This prevalence is still high and therefore calls for collaborative activities and programs in Nigeria on effective treatment TB/HIV co-infected patients as this would really help improve treatment outcomes for TB/HIV patients enrolled on daily DOTS.

Keywords : Tuberculosis, Human immmunodeficiency virus, Directly observe therapy short-course, treatment Outcome.

DEDICATION

To the Almighty God.

To my wife for her devotion and love.

To my paternal grandmother who brought me up, but never lived to see me achieve this height and my sibling who *died* in the course of supporting me to attain medical degree.

To my parents and my only living sibling for their understanding.

To all TB and People living with HIV patients in Oyo state and beyond.

ACKNOWLEDGEMENTS

My profound and inestimable gratitude goes, first and foremost, to God almighty, my help in ages past and hope for years to come. Though it was a hard decision for me to come for this programme, He alone gave me the wisdom, inner strength and moreover, the courage of conviction needed to shoulder the challenges that attended that uncommon decision. For His covenant upon me and seeing me through this work, I give Him all the glory.

To my supervisors, Dr. B.O Adedokun and Dr.(Mrs) I.A Adeoye for their invaluable assistance and guidance. Their instructions, constructive criticism and timely correction shaped and contributed immensely to the overall success of this work.

My sincere appreciation goes to Dr. M.D Dairo for making this programme a reality for me and also for his encouragement all the time....Sir, thanks a million. God will increase you on every side.

I am also indebted to Dr. J.O Obasanya, National Co-ordinator TBL Programme, Federal Ministry of health, Dr. Soji Daniel, World Health Organisation-SWZ, Dr O.M Lawal, Oyo state TB and Leprosy control Programme , and Dr Osman El-tayeb, Country Representative and Medical Advisor Damien Foundation Belgium and DFB staff for making the work easy for me.....*even time will never erase your contribution in the fight against TB.*

To my Lecturers, especially my warmly Head of Department Dr. IKeoluwapo Ajayi, and Dr. M.A Onoja, and all other lecturers that contributed in no small measure in making me the man I have become. God almighty will favour you all in your present and future endeavours.

Big shout to my setmates, MPH/MSc, Class of 2010/2011, especially Franklin Igbodekwe, Philo, Jide, Omotunde, Belirat, Dr. dayo, Dr. Ilesanmi, Esther, Ronke, Mr Wero, Dr Adamu, Dr Tobi Bright, Dr. Oguniyan, Lara, Biola, Dr. Diran, Dr. Aniwada, Mathew, Mohammed....you know the list could be endless..... you guys were too much and thanks for the calls, texts and mails. I wish the party never ended. *William Shakespeare once said...* "we meet to part and we part to meet".....but the memory of tutorial sessions we had will never die.

To my loving parents Mr and Mrs O.T Oladimeji….my heart desire is for God to keep you old and well to be able to drink enough 'living water' from my grateful heart. To my only sibling am sorry I gave you some trouble in supporting you education. Many thanks to my Uncle Dr. M.O Fatoki and his friend Professor O.G Arinola for making this programme a reality.

My endless thanks go to my wife Mrs Kelechi Elizabeth Oladimeji for her understanding, care and full support in attaining this height.

I owe a lot….*Cicero once said* "gratitude is not just the greatness of all virtues but the parent of them all"…. this is the whole of me. I grew tall because I stood on your shoulders, all of you were the reason it happened. I wish I could express it better, I wish I could be more grateful. Please, just take me as I am. Thank you all once again.

TABLE OF CONTENTS

CHAPTER TWO: LITERATURE REVIEW

CHAPTER THREE: METHODOLOGY

LIST OF ABBREVIATIONS

AFB - Acid Fast Bacilli

AIDS - Acquired Immune Deficiency Syndrome

ART - Antiretroviral Therapy

BCG - Bacille Camille Guerine

CAT-1 - Category 1 Treatment Regimen

CAT-2 - Category 2 Treatment Regimen

CDC - Center for Disease Control and Prevention

CI - Confidence Interval

STBLCO - State Tuberculosis and Leprosy Control officer

CPT - Cotrimoxazole Preventive Therapy

DALYs - Disability Adjusted Life Years

DFB - Damien Foundation Belgium

DOTS - Directly Observed Treatment short-course

DR-TB - Drug Resistant Tuberculosis

DST - Drug Sensitivity Testing

EPTB - Extra-pulmonary Tuberculosis

FDC - Fixed Drug Combination

FLDs - First Line Drugs

FMOH - Federal Ministry of Health

GDP - Gross Domestic Product

GFATM - Global Fund for HIV/Aids, Tuberculosis and Malaria

GLRA - German Leprosy Relief Association

HAART - Highly Active Anti-retroviral Therapy

HCT - HIV Counselling Testing

HIV - Human Immunodeficiency Syndrome

IC - Infection Control

IPT - Isoniazid Preventive Therapy

MDR-TB - Multi-drug Resistant Tuberculosis

MTB - Mycobacterium Tuberculosis

NACP - National AIDS Control Program

NLR - Netherland Leprosy Relief

NTBLCP - National Tuberculosis and Leprosy Control Program

OIs - Opportunistic Infections

OR - Odd ratio

PLHIV - People Living with HIV

PPM - Private-Public Mix

PTB - Pulmonary Tuberculosis

SC - Sputum Culture

SLDs - Second Line Drugs

SS - Sputum Smear

SSR – Sub-sub Recipient

TB - Tuberculosis

TBLS - Tuberculosis and Leprosy Supervisors

TBCTA - Tuberculosis Coalition for Technical Assistance

TLMN - Tuberculosis and Leprosy Mission Nigeria

USD - United States Dollars

USAID - United States Agency for International Development

WHO - World Health Organization

XDR-TB - Extensive Drug Resistant Tuberculosis

OPERATIONAL DEFINITION OF TERMS

- ***Pulmonary TB (PTB):*** Tuberculosis affecting the lung tissues only.

- ***Extra-pulmonary TB (EPTB) :*** Tuberculosis affecting other parts/organs in the body.

- ***New Case(N):*** TB patient who has never had treatment for TB or who has taken ant-TB drugs for less than ***four weeks***

- ***Relapse(R):*** TB patient who previously received treatment and ***was declared cured or completed after a full course of treatment*** and has once again developed sputum smear-positive TB.

- ***Treatment failure (F):*** A smear-positive patients who while on treatment remains or becomes smear-positive at five months or later after commencement of treatment.

- ***Return after default (RAD):*** TB patient who completed at least four week of ***Category 1*** treatment and returned smear-positive after at least ***eight weeks*** of interruption of treatment.

- ***Transfer in (TI):*** TB patient already registered for treatment in one LGA/state who is transferred to another LGA/state to continue treatment.

- ***Other (O) :*** TB patient who has been treated for TB outside NTBLCP network for more than 4 weeks and is smear-positive. Or, has previously received treatment and was declared cured or completed a full course of treatment, then diagnose again by medical officer as sputum smear-negative TB.

- ***Cured :*** TB Patient who was smear positive at diagnosis, who completed 6 or 8 months of treatment and who is smear-negative at the end of 6^{th} or 7^{th} of treatment and at least one previous occasion.

- ***Treatment success:*** TB patient who completed the full course of treatment ***(cured + treatment completed)***

- ***Treatment Completed:*** TB patient who was smear-positive at diagnosis and who completed treatment but in whom smear examination results are not available at the end of treatment. Or, All smear-negative and extra pulmonary TB patients who completed treatment.

- ***Failure:*** TB patient who remains or becomes smear-positive at the end of fifth month or later during ant-tuberculosis chemotherapy.

- ***Died:*** TB patient who dies for any reason during the course ant-tuberculosis chemotherapy.

- ***Defaulter:*** TB patient who has interrupted for 8 consecutive weeks or more after the date of the last attendance during the course of treatment.

- ***Transfer out:*** TB patient who has been transferred to another treatment centre in another state and whose treatment result is not known.

LIST OF TABLES

APPENDICES

CHAPTER ONE

1.0 Introduction

1.1 Background to the study

Tuberculosis is a chronic infectious disease caused by the bacillus, *Mycobacterium tuberculosis* which can affect any part of the body but usually attack lung. TB has a worldwide distribution (Lucas & Gilles, 2003). Tuberculosis, being a droplet infection has high infectivity rate, and is easily transmitted from person to person through droplet/droplet nuclei (Park K., 2009).

The disease is still of significant public health importance. Today, it is estimated that one-third of the world's population is infected with TB, with about 8-10 million people developing overt tuberculosis disease annually (WHO, 2009). Left untreated, each person with active TB disease will infect an average of 10 to 15 people every year (WHO report, 2003). The rate of progression of tuberculosis infection depends on the integrity of the individual's cellular immunity (Brooks et al., 2004).

Human immunodeficiency virus (HIV) infection is caused by a retrovirus that spread through body fluids. The virus attacks the immune system, thereby weakening it and increasing the susceptibility of the individual to opportunistic infections. Tuberculosis is a major opportunistic infection and leading cause of death among people living with Human immunodeficiency virus infection/Acquired immunodeficiency syndrome in Nigeria (PLHIV) (FMOH, 2006).

Human immunodeficiency virus infection/Acquired immunodeficiency syndrome (HIV/AIDS) is life threatening and there is an ongoing pandemic ravaging mankind. About 39.5 million people are living with HIV/AIDS globally. It is estimated that over 16,000 persons are infected everyday with HIV (Olise, 2004). The increasing global burden of TB is linked to Human immunodeficiency virus infection (HIV) (Corbett et.al., 2003).

In addition to the burden of HIV and tuberculosis, malaria is another major infectious disease, which is an important cause of deaths in the developing countries (Adjuik et al,. 2006).It is estimated that over 5.6 million people are killed by HIV/AIDS, tuberculosis and malaria yearly (Tan et al. 2003)

The co-existence of HIV infection and Tuberculosis has been described as one of the most serious threats to human health, since the Black death and has been described as 'the cursed duet' (Lucas &n Gilles, 2003). The two diseases constitute a lethal combination of diseases that individually have significant impact on public health, with each making the situation of the other worse in Nigeria (FMOH, 2006). HIV is the biggest single challenge to TB control efforts, the life expectancy of the HIV infected person with TB is measured in weeks if treatment is not available (Parks, 2009). The rise in tuberculosis cases among PLWHA poses an increased risk of tuberculosis transmission to the community (Datiko et.al., 2008). The extent to which HIV fuels TB depends on the degree of overlap between the population infected with TB and the population with HIV in Nigeria (FMOH, 2006). The TB/HIV epidemic impacts negatively on existing parallel AIDS and TB programmes in several ways. These includes: increased case load of active TB attributable to HIV. Saggurti et.al (2007) in a case control study carried out in India found that the proportion of TB cases that are attributable to HIV among HIV infected individual is 68% as against 17% estimated among the general population.

HIV has led to an increase in TB cases in sub-Saharan Africa, with 30-40% of TB cases attributable to HIV (Yin S., 2006). In Malawi, the death rate was about six times higher among HIV positive individuals who are on chemotherapy as compared with HIV negative people (Glynn et al., 1997).

HIV increases the risk of TB progression in infected individuals. In the absence of HIV in a community, each infected contact has around 10% chances of progress to active diseases, those infected with HIV have a much greater chance (40%) of developing active TB diseases (Godfrey-Fausset and Ayles, 2002). HIV also poses increased burden of TB services to human and infrastructural resources .HIV led to a 4-fold rise in Number of TB cases in southern African where up to 75% of TB cases are also HIV-seropositive. With many countries in African being poor, resources available are inadequate to control the dual epidemic. (Godfrey-Fausset and Ayles, 2002).

Reduced access to health services for TB control efforts in many ways, of which are: increased case load of active TB among PLWHA. TB is now the most common co-infection that occur with HIV disease and is a major factor responsible for increased morbidity and mortality rates in HIV infected individual (Toosi et al., 2004). An HIV positive person who is co-infected with TB is 30 times more likely to become sick of TB than an HIV negative

person who has TB (CDC, 2010). TB is now the leading cause of death among HIV-positive adults living in less developed countries. It is responsible for 11% of all adult AIDS deaths world-wide (Yin, 2006).

HIV/AIDS, Tuberculosis and Malaria constitute the most serious health challenges in Sub-Saharan Africa. Malaria and tuberculosis have some features in common as both originated in the prehistoric era, but nevertheless their control and eradication is difficult (Breman 2001, Carter and Mendis 2002). The malaria parasite has developed resistance to antimalaria drugs and mosquito vector has also developed resistance to spraying agents (Carter and Mendis 2002). In tuberculosis, the appearance of MDR is a serious challenge to control (Trivedi 1988, Weltman and Rose, 1944). After the failure of measures against malaria and the new global pandemic of HIV/AIDS and combined HIV/TB infections, the international community has launched the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM) in Okinawa (Tan et al. 2003)

Principle of daily directly observed treatment short-course is based on the fact that patients swallow their drugs under the supervision of health workers or designated treatment supporters in a tuberculosis treatment centres close to the patient's home to ensure that patients receive their drugs (NTBLCP workers manual, 2010.)

1.2 Significance of the study

The global TB and HIV/AIDS epidemic represent an enormous amount of human suffering, pain and grief. The stigma attached to both diseases has serious psychological and social consequences. Every year, thousands of people die as a result of the lethal combination of TB and HIV. Families are wiped out and this creates a growing population of orphans and vulnerable children who are at heightened risk to the diseases. Life expectancies have been tragically shortened and development stifled as the most productive segments of the populace continue to die from the dual epidemic of TB and HIV. About 53% of TB deaths occur within 15-59 age groups in 2004 (WHO, 2008).

A substantial amount of global and national resources is continually being expended on the control of these diseases. About 55 million US Dollars was expended on Tuberculosis control in 2009 (Equivalent to 500 USD per patient), 13% of the expenses, was devoted to HIV-TB control activities (WHO report, 2009). TB leads to loss of about 20-30% of annual household income and 3-7% loss of GDP on national level (TBCTA, 2010).

The information provided from this study dwells on the ascertainment of the extent of overlap of the two deadly diseases as well as the impact on outcome of treatment, which will be useful in effective planning and proper implementation of TB/HIV collaborative activities in Nigeria.

1.2 Statement of problem

The burden of tuberculosis is compounded by high prevalence of HIV in the country which stands at about 4.1% in general population. The prevalence of HIV among TB patients increased from 2.2% in 1991 to 19.1% in 2001 and 25% in 2010.This indicate that TB situation in the country is HIV-driven. The proportion of TB patients tested for HIV was 79% in 2010 with a 25% TB-HIV co-infection (Nigeria tuberculosis fact sheet, 2012)

Nigeria, with TB prevalence of 830 cases per 100,000 population rank high in Africa and the 10th in the world. The National HIV prevalence in Nigeria is 4.1% (one of the highest in Africa according to ANC Sentinel Survey report, 2010) with estimated 2.98 million people living with HIV and an annual AIDS death of 192,000 (male - 105872) and 336,379 incident cases in 2009 (FMOH, 2009). TB prevalence rate in Nigeria increased from 290 cases per 100,000 population in 1990 to 400 cases per 100000 population (in 2000) to a peak of 480 per 100000 in 2004 followed by a brief decline through 2008 (with prevalence of 420/100000) until the recently high estimate in 2010. Adult HIV prevalence rate have followed similar trend. It was 8% in 1990 and rose to about 10.4% in 1994 and since then have been steadily declining to between 3.9 to 4.5% since 2002 through 2007 (USAID, 2008). In 2009, 460,000 new cases of TB occurred in Nigeria. 19% of which were HIV. There has not been a national survey to determine the burden of TB. However, WHO estimated a prevalence of 497 per 100,000 population, an incidence rate for all forms of TB of 295 per 100,000 population. (WHO Report 2010). Annually, there are about 100, 000 deaths from TB and Nigeria ranks 10th among the 22 TB High Burden Countries (HBC). In 2010, the national Programme registered a total of 90,447 of all forms of TB, 50,105 of which were new sputum smear positive. There were 2,667 relapse, 748 treatment failures, 1,650 return after default (RAD),32,616 sputum negatives and 3,928 others cases. The case detection rate was 20%.

The prevalence of TB in Africa is disproportionately high. The continent is home only to 11% of the world's population but has about 30% of the global burden of TB. In 2009, there were 2.8 million new cases of Tuberculosis in Africa. About 37% of these incident cases

were HIV positive. Similarly, 80% of all HIV positive incident TB cases occur in Africa. About 68% of people living with HIV reside in sub-Saharan Africa where 22.5 million adults and children were living with HIV in 2009. The adult prevalence of HIV in the continent is 5% and AIDS related deaths occurred among males aged 30-44 years and 36,412 deaths among females in the age group, due to TB HIV claimed 337,467 lives (among males) and 448,703 livers (among females) within the 30-44 years age group (WHO, 2009).

1.4 Justification

TB/ HIV co-infection is now a major public health threat for people living with HIV/AIDS in the community. HIV/AIDS is a great impediment to the success of anti-tuberculosis therapy for co-infected persons. Currently in Nigeria, there is a scale-up of provision of collaborative HIV /TB services across all DOTS and ART sites. The global TB and HIV/AIDS epidemic represent an enormous amount of human suffering, pain and grief. The stigma attached to both diseases has serious psychological and social consequences. Every year, thousands of people die as a result of the lethal combination of TB and HIV. Families are wiped out and this creates a growing population of orphans and vulnerable children who are at heightened risk to the diseases. Life expectancies have been tragically shortened and development stifled as the most productive segments of the populace continue to die from the dual epidemic of TB and HIV. About 53% of TB deaths occur within 15-59 age groups in 2004 (WHO, 2008).

More deaths occur among men than women across all age groups and more deaths are attributed to HIV among females than males. The peak mortality due to TB occurs in the 30-34 years age group for both sexes where 337,467 deaths of male and 448,703 deaths of females were recorded in that age group. by 2015, TB and HIV are expected to cause 989,000 and 2,282,000 deaths respectively worldwide (WHO, 2010). A substantial amount of global and national resources is continually being expended on the control of these diseases. About 55 million US Dollars was expended on Tuberculosis control in 2009 (Equivalent to 500 USD per patient), 13% of the expenses, was devoted to HIV-TB control activities (WHO report, 2009). TB leads to loss of about 20-30% of annual household income and 3-7% loss of GDP on national level (TBCTA, 2010).

'Three Is'' strategy for TB among HIV positive patients is a core means of strengthening TB/HIV collaborative activities. Three I's are *intensified case finding*, *Isoniazid preventive therapy* and *infection control.*(WHO,2008: FMOH, 2008). The success or otherwise of the implementation of the startegies will determine whether the objective of the *STOP TB*

initiatives as well as *MDG* goal 6 will be achieved. Therefore, it is of great significant to determine the factors that predict treatment outcome among TB/HIV co-infected patients on daily DOT as well as the prevalence of the co-infection among TB patients. Although few studies on prevalence and treatment outcome of TB have been carried out among HIV patients in Ibadan but, no study has been reported on treatment outcomes of anti-tuberculosis therapy among TB-HIV co-infected patient in the whole state before. This study therefore aimed at studying the prevalence, as well as the treatment success, global treatment outcomes of TB/HIV co-infected patients receiving daily directly observed treatment short-course in Oyo state, Nigeria.

1.5 Objectives

1.5.1 General objective

To determine the treatment outcome among TB/HIV co-infected patients receiving daily supervised DOTs regimen in Oyo state.

1.5.2. Specific Objectives

The specific objectives were:

1. To determine the prevalence of TB/HIV co- infected among TB patients in Oyo state.
2. To determine factors associated with global treatment outcomes among TB/HIV co-infected patients.
3. To determine factors affecting treatment success among TB/HIV co-infected patients.
4. To compare treatment outcome between TB/HIV co-infected and HIV-negative TB patients.

1.6 Research questions

1. What is the prevalence of TB/HIV co- infected among TB patients in Oyo state?
2. What are the factors affecting treatment success among TB/HIV co-infected patients?
3. What are the factors associated with the global treatment outcomes among TB/HIV co-infected patients?
4. What is the difference in treatment outcome between TB/HIV co-infected and HIV-negative TB patients?

CHAPTER TWO

2.0 Literature review

Tuberculosis (TB) is caused by bacteria of the *Mycobacterium tuberculosis* complex, most commonly *Mycobacterium tuberculosis.* People with active TB can spread TB bacilli through air when they cough, sneeze, talk or spit. Although one third of the world's population is infected with M.TB, a healthy immune system will halt the growth of the o*rganism (Mycobacterium tuberculosis),* resulting in latent TB infection (Parks, 2009). Only five to ten percent of HIV negative people with TB infection develop active TB in the course of their life (Bal *et al.* 2004). Approximately half of these people may become infectious, and if not treated on time will infect others or die. Seventy-five percent of TB cases in developing countries like Nigeria affect the most economically productive age group (15-50) (WHO, 2007) and it is a major contributing factor to the burden of TB is co- infection with HIV (Idemyor, 2007). In attacking the immune system, HIV infection makes people more vulnerable to opportunistic infections, including TB. About 12million people are co-infected with both HIV and *Mycobacterium tuberculosis* worldwide (WHO, 2010).

2.1 History of Tuberculosis

Tuberculosis (TB) is believed to have been present in humans for thousands of years. Skeletal remains show that prehistoric humans (4000BC) had tuberculosis, and tubercular decay has been found in spines of Egyptian mummies (3000-2400BC) (Brooks, 2004). In the course of history, TB has been known under a variety of names. The actual name "Tuberculosis" was introduced during the first half of the nineteenth century (Wood et al. 2007).

In the early 19th century, the work of two French doctors: Gaspard Laurent Bayle and Rene Laennec established the forms and stages of tuberculosis; both of them died of the disease. In 1874, an American doctor, Edward Trudeau, who was also afflicted with tuberculosis, established the Tradeau Laboratory in the New York and for many years became the centre of tuberculosis treatment. A German microbiologist, Robert Koch discovered the causative organism, the tubercle bacillus in 1882 and in 1890 he developed the tuberculin test for the diagnosis of the disease. In 1924, a vaccine, called the Bacille Calmette Guerin (BCG) was developed by two French bacteriologists; Albert Leon Calmette and Camille Guerin (Orlovic et al., 2001).

The first specific drug for tuberculosis became available in 1944 through an American microbiologist, Selman Abraham Wakman who discovered streptomycin. The discovery was followed by the development of Para-amino salicylic acid (PAS) in 1948 and later by Isoniazid and other Antibiotics that revolutionalized the treatment till today (Orlovic et al., 2001).

2.2 History of TB and HIV Resurgence

Before the 1980s, TB was considered on its way to being eradicated. In early 1981, cases of HIV began to surface in the United States of America among gays and was initially referred to as "gay cancer" but medically known as karposi's sarcoma. About a year later, centre for Disease Control linked the illness to blood and coined the term Acquired Immune Deficiency Syndrome (AIDS) (Orlovic et. al.,2001).

As the number of deaths soared, the search for cause and more importantly cure, was embarked on by medical experts. In 1984, Institute Pasteur of France discovered what they called 'Human Immunodeficiency Virus' but it wasn't until 1985 that Dr. Robert Gallo (a US scientist) confirmed that HIV was the cause of AIDS. Following this discovery, the first test for HIV was approved in 1985. Over the next several years, medications to combat the virus were developed as medicines to prevent infections that flourish when the Immune System is damaged by HIV (Cichocki, 2007).

Tuberculosis has been on the rise since the 1980s with its spread concentrated in South-East Asia and Sub-Saharan Africa. Much of the TB resurgence is directly connected to the HIV / AIDS pandemic especially in Africa where two-thirds of those living with HIV are also infected with TB (IUA TLD, 2009)

2.3 Modes of transmission of Tuberculosis and pathophysiology

Pulmonary Tuberculosis is transmitted mainly by inhalation of infectious droplets produced by persons with pulmonary or laryngeal tuberculosis during coughing, shouting or sneezing. Invasion may also occur through mucous membranes or damaged skin (Brooks, 2004).

Once the bacillus is inhaled by a susceptible person, they can cause infection deep inside the lung. All segments of the lungs are susceptible to infection but there are disagreements in the literature as to which areas are most commonly affected. The course of the infection initially presents as a primary infection which causes inflammation in a small area within the lung

The first specific drug for tuberculosis became available in 1944 through an American microbiologist, Selman Abraham Wakman who discovered streptomycin. The discovery was followed by the development of Para-amino salicylic acid (PAS) in 1948 and later by Isoniazid and other Antibiotics that revolutionalized the treatment till today (Orlovic et al., 2001).

2.2 History of TB and HIV Resurgence

Before the 1980s, TB was considered on its way to being eradicated. In early 1981, cases of HIV began to surface in the United States of America among gays and was initially referred to as "gay cancer" but medically known as karposi's sarcoma. About a year later, centre for Disease Control linked the illness to blood and coined the term Acquired Immune Deficiency Syndrome (AIDS) (Orlovic et. al.,2001).

As the number of deaths soared, the search for cause and more importantly cure, was embarked on by medical experts. In 1984, Institute Pasteur of France discovered what they called 'Human Immunodeficiency Virus' but it wasn't until 1985 that Dr. Robert Gallo (a US scientist) confirmed that HIV was the cause of AIDS. Following this discovery, the first test for HIV was approved in 1985. Over the next several years, medications to combat the virus were developed as medicines to prevent infections that flourish when the Immune System is damaged by HIV (Cichocki, 2007).

Tuberculosis has been on the rise since the 1980s with its spread concentrated in South-East Asia and Sub-Saharan Africa. Much of the TB resurgence is directly connected to the HIV / AIDS pandemic especially in Africa where two-thirds of those living with HIV are also infected with TB (IUA TLD, 2009)

2.3 Modes of transmission of Tuberculosis and pathophysiology

Pulmonary Tuberculosis is transmitted mainly by inhalation of infectious droplets produced by persons with pulmonary or laryngeal tuberculosis during coughing, shouting or sneezing. Invasion may also occur through mucous membranes or damaged skin (Brooks, 2004).

Once the bacillus is inhaled by a susceptible person, they can cause infection deep inside the lung. All segments of the lungs are susceptible to infection but there are disagreements in the literature as to which areas are most commonly affected. The course of the infection initially presents as a primary infection which causes inflammation in a small area within the lung

and is usually self-limiting. It takes 4-12 weeks after being infected for the primary infection to arise. The body's reaction to the infection is a cell- mediated immune response. This response is usually adequate to control the infection, but may not eliminate all the bacilli. The remaining bacteria resolve into a calcified lesion where they are housed during a latent period. (Parks, 2009). This is called primary complex and essentially, it consist of a small parenchyma lesion and involves the regional lymph node. In the lungs, this constitutes the classical Ghon focus, with a small lung lesion and invasion of the mediastinal lymph node. In most cases, the primary complex heals spontaneously, with calcification of the lesions, but the organisms may persist for many years within the focus (Prescott et al., 2005).

In a small proportion of cases, the primary complex progresses to produce more severe manifestations locally (e.g. Caseous pneumonia) or haematogonous dissemination to other parts of the body. Within a few years of the primary infection, especially during the first 6 months, there is the danger of haematogonous spread either focally (e.g. bone and joint lesion) or disseminated (in the form of military TB and tuberculosis meningitis).

Apart from the primary complex and its early complications, the adult pulmonary form of TB may occur either as a result of the reactivation of an existing lesion or by exogenous re-infection. Destruction of the lung parenchyma, with fibrotic cavitations is an important feature of this adult form. Clinically, it may present with cough, haemoptysis and chest pain, with general constitutional symptoms such as fever, loss of weight and malaise; often it remains virtually asymptomatic especially in the early stages (Brooks, 2004).

2.4 Pathogenesis of HIV

HIV belongs to a sub-group of retroviruses known as lentiviruses or "slow" viruses. The course of infection with these viruses is characterized by a long interval between initiation, infection and the onset of serious symptoms. The pathogenesis of HIV infection is a function of the life cycle, the host cellular environment and quantity of viruses in the infected individual (Salami, 2006). Factors such as age or genetic differences among individuals, the level of virulence of an individual strain of virus, and co-infection with other microbes may influence the rate and severity of the disease progression, (Prescott et al., 2003).

The probability of infection is a function of both the number of infective HIV virions in the body fluid which contracts the host as well as the number of cells available at the site of contact that have appropriate CD4 receptors for the virus. Many types of cells express CD4

receptors and are susceptible to HIV infection, including; cells of the mononuclear phagocyte lineage (principally blood monocytes and tissue macrophages), T and B - lymphocytes, natural killer (NK) cells, dendritic heamatopoietic stem cells (Langerhans cells and follicular dendritic cells in I.ymph nodes), endothelial cells, microglial cells in the brain and gastrointestinal epithelial cells (Bal et al., 2004).

Cells with CD4 receptor at the site of entry of may become infected and viral replication begins within them. The infected cells can then release Virions by surface budding or infected cells can undergo lysis to release new virions, which can then infect additional cells. Some HIY viruses are carried from the site of infection to the regional lymph nodes where other immune system cells become infected. Large number of the virus can became trapped here in networks of specialized cells with long, tentacle-like extensions. These cells are called follicular dendritic cells (FDCs) and are susceptible to infection but can survive for a long time. (Salami, 2006).

Although, CD4+ T -cells appear to be HIV's main target, other immune system cells with CD4 molecules on their surfaces are infected as well. Long-lived cells called monocytes and macrophages can harbor large quantities of the virus without being killed. Even CD4+ T cells serve as important reservoir of HIV: a small proportion of these cells maintain HIV in a stable, inactive form. Normal immune process may activate these cells, resulting in the production of new HIV Virions (Salami, 2006).

In and around the germinal centres, increasing number of virions leads to the production of a variety cytokines such as tumour necrotic factor (TNF) and IL-6 which can activate CD4+ T -lymphocytes and make them more susceptible to HIV infection. Activation of uninfected cells make them to be more susceptible and increases replication of HIV in already infected cells. While greater quantities of certain cytokines are secreted, others with key roles in the regulation of normal immune function may be secreted in decreased amount for example CD4+ T cells may lose their capacity to produce interleukin 2 (IL-2), a cytokine that enhances the growth of other T -cells and helps to stimulate other cells' response to invaders. Once infected, CD4+ T -cells may leave the germinal centre and infect other CD4+ T cells that congregate in the region of the lymph node surrounding the germinal centre. There are several theories of how HIV may destroy or disable CD4+ T cells, eventually overwhelming the immune system's regenerative capacity (Salami, 2006).

2.5 Interaction of TB and HIV Pathogenesis

Tuberculosis accelerates the course of HIV infection through various mechanisms (Goldfield and Ellner, 2007). *M tuberculosis* infection results in cytokine dysregulation and significantly increases the level of secreted cY,tokines such as Tumour Necrotic Factor-a in infected cells, thereby promoting HIV replication and genetic diversity (Bal et.al., 2004).

The T -lymphocyte turnover rate is also hastened by these cytokine perturbations (Siawaya et al., 2007). Latent HIV within T -lymphocytes may be activated through the interactions of these cells with MTB-infected phagocytes. Dually infected phagocytes have also been demonstrated to transmit HIV to T-lymphocytes (Toosi et al., 2004).

Conversely, HIV alters the course of TB. The non-cytopathic nature of HIV in phagocytic cells enables these cells to produce a prolonged milieu of cytokine factors including interferon-y and Interleukin-6, which are conducive for both mv and TB pathologies (Bal et al., 2004). Co-infection with HIV inhibits cell-mediated responses to M.TB through interruption ofinterleukin-2 signalling (Lawn et al., 2001).

Under these conditions, the risk of acquiring M. TB infection from the environment, progression of the M. TB infection to disease, or reactivation of a latent TB infection may occur rapidly (Glassroth, 2005; Swamiratha, 2004).

The deleterious effects of HIV infection on $CD4^{+}$ T-lymphocytes impair the immune .functions, resulting in its failure to contain mycobacterium infection and restrict the replication of the microbe (Lawn et.al., 2005). This has significance with regards to dissemination of MTB (Swaminatha, 2004).

2.6 Epidemiology of TB,MDR-TB and XDR-TB

The most frequent source of infection is the human who excretes, particularly from the respiratory tract, large numbers of tubercle bacilli. Close contact (e.g. in the family) and massive exposure (e.g. in medical personnel) make transmission by droplet nuclei most likely. Susceptibility to TB is a function of the risk of acquiring the infection as well as the risk of clinical disease after infection has occurred. The risk of acquiring the infection is proportionate to the rate of active infection in the population, crowding, socioeconomic disadvantage and inadequacy of medical care (Datiko et al., 2008).

The development of clinical disease after infection may have a genetic component (proved in animals and suggested in humans by a higher incidence of disease in those with HLA-BW 15 histocompactibility antigen). It is influenced by age (high risk in infancy and in elderly), under nutrition, and immunologic status and by co-existing diseases (e.g. Silicosis, Diabetes) and other individual host resistance factors (Brooks et al., 2004).

Tuberculosis has a worldwide distribution (Lucas and Gilles, 2003). Every year, about 9.4million people develop TB worldwide and 1.7million people died of disease in 2009(WHO, 2010 report).

Africa ranked second with regards to incident cases of TB in 2010. Thirty-three percent of the world TB incident cases were reported in Africa. Tuberculosis incidence with high HIV prevalence is the single most important factor determining the increased incidence of TB in the past 10years (WHO, 2010). Nigeria has the highest TB burden in Africa and the 4th in the world (FMOH, 2008). Generally, the disease is more prevalent among males than in females (Parks, 2009).

Recent changes in drug-susceptibility profiles have brought on new challenges for global TB control. The diagnosis and management of multidrug resistant-TB (MDR-TB) and extensively drug resistant-TB (XDR-TB) has recently been covered in detail elsewhere (Schaaf et al. 2009). Here, we focus on the epidemiology in Africa and on the management challenges facing clinicians in resource-poor settings. Multidrug resistant-TB is defined as resistance to rifampicin and isoniazid, whilst XDR-TB is defined as resistance to rifampicin, isoniazid, any fluoroquinolone and one of the second-line injectable agents, i.e. amikacin, kanamycin or capreomycin (Hanekom et al., 2010).

In 2007, an estimated 5.3% or approximately 500 000 of all TB cases worldwide were because of MDR-TB strains; approximately 6% or 40 000 of these were estimated to be XDR (WHO 2009). This represents a near-doubling of MDR cases since 2000. About 60% of the MDR-TB case load is from regions of the former Soviet Union, India and China. However, there is a paucity of data from Africa, particularly from longitudinal cohorts (Wright et al. 2009).Recent surveys showed an MDR-TB prevalence of 26% in Ethiopia (retreatment cases) (Meskel et al. 2008), 54% in Nigeria (tertiary hospital patients) (Kehinde et al. 2007), 9.5% in Zambia (prisoners) (Umubyeyi et al. 2007) and 9.4% in Rwanda (retreatment cases) (Umubyeyi et al. 2007). Statistical modelling suggests that MDR rates in Africa could be substantially higher than originally estimated (Nunn et al. 2007; Ben Amor

et al. 2008). Overall, there appears to have been an alarming increase in the prevalence of MDR-TB in many areas of Africa, and better surveillance data are urgently needed. For example, a relatively small survey from the Cape Town region of South Africa showed that 4.8% of new TB cases and 10.5% of retreatment cases were caused by MDR strains in 2008 (Cox et al. 2009). This contrasted with rates of 1.6% and 4%, respectively, from a larger survey in 2002.

2.7.1 Global burden of TB/HIV co-infection

HIV-associated TB (HIV-TB) remains a major challenge to global health, and the epidemic is one of the major stumbling blocks to attainment of the 2015 Millennium Development Goals for TB control (United Nations 2008). An estimated 1.37 million of new TB cases that occurred worldwide in 2007 were HIV-associated (14.8% of all TB cases), and resulted in approximately 456 000 deaths (23% of global deaths from HIV / AIDS) (WHO 2009). Comparison of the 2008 and 2009 annual WHO global TB control reports reveals an apparent twofold increase in estimated disease burden. This major upward revision in estimates has resulted from increased availability of data from greater coverage of HIV-testing among patients with TB, particularly in Africa, rather than any change in disease burden. The epicentre of the HIV-TB co-epidemic lies in sub Saharan Africa, which accounts for 79% of the worldwide disease burden. South Africa alone accounts for 25% ofcases, despite only having 0.7% of the world's population (Abdool-Karim et al. 2009, WHO 2009). Here, TB incidence rates continue to rise, although in many other countries in the region, rates have started to decrease between 2003 and 2007 (WHO 2009). These trends are likely to reflect the natural evolution of the HIV epidemic; the contribution, if any, of other potential factors such as scale-up of antiretroviral therapy (ART) is as yet unknown. HIV-associated TB is also an important public health challenge elsewhere. In Eastern Europe, overlapping HIV and TB drug-resistance epidemics have contributed to an approximate doubling of the estimated regional TB incidence rate since 1990 (Lazarus et al. 2008; WHO 2009). Even in England and Wales, HIV prevalence among patients with TB increased from 3.1% in 1999 to 8.3% in 2003 and HIV-TB cases (mostly non-UK born) contributed almost one-third to the increase in overall TB notifications (Ahmed et al. 2007). In contrast, the United States experienced a threefold decrease in the number of cases between 1993 and 2004, coinciding with improvements in TB control and advances in HIV diagnosis and treatment (Albalak et al. 2007).

2.7.2 HIV prevalence among TB patients

Although in many countries the link between HIV and TB is often well known, few TB patients currently have the opportunity to know their HIV status. The stigma attached to HIV may deter people with features suspicious of TB from seeking TB care (Ngamvithayapong et al. 2000). Despite the occasional reluctance of health workers to talk to TB patients about HIV, diagnosing HIV infection should be an opportunity for referral for ongoing provision of social and psychological support, for measures for the prevention and treatment of common HIV-related illnesses, and for ART. It is more common for patients to find out that they are HIV-positive after developing TB than to already know that they are HIV-positive and then later on develop TB. In either case, the NTP needs to coordinate closely with other services providing support and care for HIV-positive individuals. Clinicians treating HIV-infected TB patients are in a key position to refer patients to, or to provide them with, appropriate services for counselling, support, and care of patients and their families.

2.8 Diagnosis of TB in HIV Patients

Definitive diagnosis of TB in HIV infected patients requires the isolation and identification of M.TB from the culture of the infected tissue or fluid. A presumptive diagnosis is often made from microscopic observation of acid-fast bacilli (AFB) in the stained., smear of sputum (Onile et al.,1997). Acid Fast Bacilli(AFB) are rod shaped organisms with large amount of lipid in their cell walls making them difficult to stain but once stained, they resist decolourization even when washed with 95% alcohol containing 3% hydrochloric acid, thus the characteristic acid-fast property (Mcnerney, 1996). Laboratory diagnosis is by Ziehl-Neelson (ZN) or Kinyoun or Tan Thiam Hok staining procedures all of which utilizes carbol fuschin (Westley, 1978). The former is heat-fixed while the latter two are cold staining methods that require increased concentration of phenol in the staining solution. Zeihl Nelson staining with light microscope is the most commonly used methods of the three. It is however, time-consuming and has low sensitivity requiring at least 10 of tubercle bacilli per ml of specimen for reliable routine diagnosis (Mcnerney, 1996).

However, auramine-rhodamine staining technique with fluorescence microscope is a much faster and sensitive alternative. Properly collected sputum smears that fail to demonstrate AFB do not exclude the diagnosis of TB; because post-primary TB, the main source of infection, or re-infection in a given population is smear positive in about 50% of

cases(Sharma, 2005) while primary and military TB are smear positive in less than 25% of the cases (Hudson,2003). These percentages decrease further in the HIV -seropositive population because of their lower propensity to develop cavitary disease. Invasive procedures such as bronchoscopy with transbronchial biopsy may be necessary to establish the diagnosis of TB in them because of this high rate of smear negative P. TB and increasing cases of extra pulmonary TB (EPTB) as well as other opportunistic diseases that may resemble TB in presentation (Orlovic, 2001).

TB can be differentiated from other mycobacteria that could equally infect HIVIAIDS patients by culture (Herold et al.,1996), but the commonly used Lowenstein- Jensen culture agar requires 4-8 weeks for adequate growth to allow identification (Bass 1990). Recent improvement in methods of mycobacterial specification is with the use of radiometric technique (BACTEC method).

The technique uses radio-labeled palmitic acid, a substrate that is metabolized to release carbon dioxide (CO2), which is quantified to identify presence and growth of the mycobacteria (Hutton, 1990). The BACTEC system allows detection of *M TB* growth with a mean detection time of 7-13 days for smear positive and 14-22 days for smear- negative sputum specimens (Bass, 1990). Rapid diagnosis of TB is also possible with molecular amplification and identification of *MTB* specific DNA or ribosomal RNA sequences by polymerase chain reaction (Marshall and Shaw, 1996). For epidemiologic purposes, patterns of infection within a population could be studied, with identification of the points of transmission by restriction fragment length polymorphism also referred to as "DNA fingerprinting". This is a molecular biology technique that allows differentiation of unrelated strains of *M TB* by demonstration of nucleotide sequence differences at selected sites in their DNA genome (Van and Hermans, 1995).

WHO recently advocated the screening of all TB patients for HIV infection, but this has not been universally accepted by the clinicians especially in the developing counties for reasons that include; increase in the cost of patients care *(Okbro,* 2004), regional variation in the prevalence of the TB-HIV co-infection (WHO, 2005) and the fact that DOTS if properly implemented is effective in curing TB in most patients regardless of their my status (Quraishi, 2005). However, offering voluntary counseling and my testing (VCT) to TB patients is beneficial because early diagnosis of HIV co- infection in TB patients has been associated with a good prognosis in terms of TB cure and it minimizes the negative

effect of TB on the course of my (CDC, 1998). HIV co- infection should therefore be suspected in TB patients with history of risky life style, or in a TB patient that does not show prompt sputum conversion while on standard anti- TB regimen. It should also be considered in TB patients with chronic diarrhea or mucocutaneous lesions such as oral thrush, multidermatomal herpes zoster, non specific generalized dermatitis or co-existing sexually transmitted disease. Patients with extra pulmonary or disseminated TB should also be evaluated for dual infection. These categories of TB patients should be offered Voluntary Counseling and Testing (Salami, 2006).

2.9 Treatment of HIV/TB co-infection

Directly observed therapy short-course is effective in both HIV positive and negative TB patients. Sputum conversion is rapid and cure rate is good (Brindle et al. 2003). However, drug compliance is often very poor (Salami and Oluboyo, 2003) and this could encourage emergence of potentially incurable multi-drug resistant TB (MDR- TB). This is however, common in poorly organized TB control programmes, especially those that lack the basic elements of good. Control (Blumberg et al., 2003). Successful treatment of TB in HIV patients therefore, depend on early diagnosis and effective application of DOTS where anti-TB will be free and patients observed to swallow each pill. In order to increase patients' easy *access* to free ARV drugs, the existing local DOTS infrastructure could be utilized to deliver the medications in a DOT - HAART collaborative programme.

However, where DOTS is not fully feasible, self supervised patient-centred care should be encouraged to forestall non-compliance. Current guideline recommends that HIV infected patients with drug susceptible TB be started on the standard six-month regimen of four drugs and that treatment should be initiated with isoniazid (INH), rifampicin/rifabutin, pyrazinamide and ethambutol, all in mg/kg body weight for the first two months(intensive phase) followed by rifampicin and INH for the subsequent 4 months (Continuation phase). Intermittent anti-TB drug administration is not advisable in the management of HIV -TB and if it is to be adopted at all, the thrice weekly regimen should only be tried during the continuation phase of therapy (CDC, 2002). However, daily drug intake is preferred to the intermittent regimen so as to prevent development of MDR-TB (Blumberg et al., 2003). Response of HIV/TB patients to this 6-month therapy has been found to be good with similar recurrent rate to that of HIV-negative patients (Korenromp et al., 2003).

A high recurrence rate was however found in one report (El-Sadr et al.,2001). But this was ascribed to re-infection rather than treatment failure. A multi-centred study may be needed to compare the outcome of short course anti- TB management in HIV patients with early and well advanced disease (CDC, 2004). At the interim, prolongation of the continuation phase to 7 months to make a total of 9 months of treatment has been suggested if there is evidence of a 'delayed. Clinical or bacteriological response to therapy (Blumberg et al., 2003). The practice of extended post-treatment INH therapy to prevent recurrence of TB in HIV patients has not been widely accepted, though some have found it effective (Fitzgerald et al., 2000). The same principles of treatment for PTB in HIV infected adults also apply to EPTB. The drug regimens and treatment durations are the same (British HIV association, 2004). However, for certain .forms of EPTB, such as TB meningitis, bone, or joint, using rifampicin-based regimens for at least 9 months is generally recommended (BRA, 2004).

A non-rifampicin based anti- TB regimen comprising INH, pyrazinamide and ethambutol is generally not recommended for treatment of HIV-related TB. In cases of rifampicin intolerance, severe allergy or toxicity, this regimen should be administered daily for 18 months (Htay, 1999). In order to limit mortality from HIV/TB co-infection, anti- TB drugs may have to be co-administered with antiretroviral (ARV) drugs in those with advanced disease (WHO,2004). However, treatment of TB should be given priority, if possible, to avoid drug induced hepatic reactions from the dual potential hepatotoxic combinations. Initiation of ARV should be based on CD4+ count and risk of disease progression (Blumberg et al., 2003). There is yet to be a consensus on the time to introduce ARV. The commencement of ARV in HIV/TB should be individualized and balanced between potential overlapping drug toxicities, drug-drug interactions and increasing TB morbidity from immune reconstitution reactions, against the reciprocal beneficial effect each therapy has on each other, which is to the benefit of the patients (Blumberg et al., 2003).

HAART improve immune responses to TB and reduces the risk of relapse and re- infection, while anti- TB drugs results in quick lowering of the viral load thereby reducing the rate of CD4 cell losses (CDC, 2008). Good as this combination therapy may sound; it is associated with bidirectional pharmacokinetic interactions between the rifamycin components of anti-TB regimen and the protease inhibitors (PIs) and non-nucleoside reverse transcriptase inhibitor (NNRTI) components of antiretroviral therapy. Therefore diligent consideration of choice of drugs becomes imperative to prevent or minimize these drug-drug interactions. PIs and NNRTIs may inhibit or induce hepatic cytochrome (CYT -450) isoenzymes and thus

alter the serum concentration of rifamycins (Piscitelli and Gallicane, 2001). Rifamycins in turn can induce CYT-450 and therefore substantially decrease blood levels of the ARV drugs too. Rifampicin is the most potent CYT -450 inducer of all the rifamycins (Heylen and Miller, 2006), followed by rifabutin or rifapentine which has an intermediate activity. All the PIs inhibit CYT 450 with ritonavir as the most potent and saquinavir as the least potent while indinavir, neltinavir have intermediate inhibitory properties. The available NNRTIs have diverse effects on CYT - 450: nevirapine is an inducer, delavirdine is an inhibitor, and efavirenz is both an inducer and an inhibitor (Woolley et al 2006). In contrast to the PIS and the NNRTIs, the other class of ARV drugs, NRTIs; zidovudine, didanosine, zalcitabine, stavudine, and lamivudine are not metabolized by CYT -450, therefore, concurrent use of NRTIs and rifamycin is not contraindicated (Salami, 2006).

Also, no contraindication exists for the use of NRTIs, NNRTIs, and PIS with MH, pyrazinamide, ethambutol, or streptomycin. These first-line anti- TB medications, in contrast to the rifamycins, are not CYT -450 inducers or inhibitors. Commonly prescribed ARV ..for co-infected patients in Nigeria includes zidovudine or stavudine with lamiv"udine and efavirenz, other approved combinations are also possible as most of the HAART drugs are now available in the country. Efavirenz is contraindicated in pregnant women because of its teratogenicity .Squanvir/ ritonovir or abacavir with stavudine or zidovudine and lamivudine are the alternative to it. Adjunct therapy with cytokine inhibitors may have a role in the management of HIV-TB co-infection (Ellner, 2007) to limit HIV replication before initiation of ARV. Thalidomide, a specific TNF-a inhibitor and pentoxifylline a nonspecific inhibitor have been tried. However, inhibition of TNF- a was associated with profound immune defects akin to that of advanced AIDS and these predisposed patients to reactivation of old TB, which progressed to disseminated -form (Keane,2001). Full understanding of the role of cytokine inhibition in the pathogenesis of reactivation of TB in HIV -TB is therefore required. Good nutrition, including food supplements will serve as essential adjuncts to anti- TB chemotherapy (Salami, 2006).

2.10. Monitoring of HIV/TB Patients

HIV/PTB patients should be monitored by sputum smear microscopy during treatment and if available, sputum culture and susceptibility testing. HIV /EPTB should also be monitored, but the frequency and types of evaluations will depend on the involved sites and the ease with which specimens can be obtained from these sites (CDC, 2004). In resource limited

countries, a monthly clinical assessment has been recommended for three months followed by 3-6 monthly clinical evaluation to monitor improvement in AR V adherence and to identify possible drug reaction (Anne-christine,2002). Clinical and laboratory assessment should be more frequent for patients with underlying liver disease. In most developing countries, viral load measurement is unavailable and monitoring of therapy is by regular clinical assessment of signs & disease regression, increasing body weight and rising CD4 count (Salami et al., 2006).

Laboratory monitoring is prioritized by observing the trimmed down WHO guidelines for HIV treatment in poor countries (WHO, 2006). These are inexpensive tests that have been divided into basic and desirable tests and include hemoglobin, white cells and total lymphocyte count, liver enzymes and CD4+ cells. These should be done *every* 3- 6 months. Serum amylase, bilirubin and lipids are also desirable but optional (WHO, 2006). Some HIV/TB could experience temporary exacerbation of symptoms and signs of TB, and some may show worsening of the radiographic features of TB at the beginning of anti-TB treatment. This phenomenon is termed a paradoxical (or immune reconstitution) reaction (Anne-christine, 2002). It could also occur among HIV negative TB patients, but it is commoner amongst HI/TB co-infected while on HAART (Narita et al., 2008).

Features of a paradoxical reaction include high fevers, increase in size and inflammation of involved lymph nodes, new lymphadenopathy, expanding central nervous system lesions, worsening of pulmonary parenchyma infiltrations, and increasing pleural effusions (Narita et al., 2008). A reaction that is not severe should be treated symptomatically with non-steroidal anti-inflammatory agents without a change in anti- TB or ARV therapy (Navas et al., 2002). Those with severe reactions (e.g. airway compromise from enlarging lymph nodes, enlarging serosal fluid collections, and sepsis syndrome) may benefit from the prednisone or methylprednisolone I mg/kg body weight and gradually reduced after 1-2 weeks (Navas et al., 2002)

2.11 HIV-TB Co-infection in Sub-Saharan Africa

Sub-Saharan Africa, which is home to about 10% of the world population, bears the brunt of the dual epidemic, although HIV infection rates vary widely among the sub- Saharan countries. In 2009, there were about 22.5million individuals with HIV/AIDs in this region

(Global AIDS report, 2010). Sub-Saharan Africa has both the highest TB incidence rate and the highest annual rate of increase of TB cases in the world (WHO, 2010).

HIV complicates TB infection and is associated with a more rapid progression to disease. Infection with HIV increases the risk of reactivating latent TB infection. HIV-infected individuals who acquire new TB infection have higher rates of disease progression. However, HIV-positive individuals with TB may be less infectious than HIV-negative individuals with TB because HIV -positive individual are less smear positive than HIV negative individual (Goldfield and Ellner, 2007).

TB can also affect HIV infection and is now the most common opportunistic infection in individuals being treated with antiretroviral therapy in the developing world. It may present as the first manifestation of HIV infection. Also, paradoxical reactions from immune reconstitution syndrome continue to pose challenges for clinicians and scientists as more than 10% of TB cases are HIV seropositive (WHO, 2010). Between 30- 40% of deaths in HIV -positive adults in sub-Saharan Africa are due to TB. Because few countries with high incidence and prevalence of TB compile reliable statistics on the cause of death, the regional trends in TB deaths are uncertain.

2.11.1 Tuberculosis Control in Sub-Saharan Africa

TB control in Africa is generally based on the WHO promoted Directly Observed Therapy Short-course (DOTS) program. The aim of DOTS is to diagnose and immediately provide effective treatment for those with smear-positive TB. However, the HIV pandemic has challenged the DOTS concept as the sole TB control strategy in sub- Saharan Africa (FMOH, 2007).

2.11.2 Tuberculosis Control Program in Nigeria,

In recognition of public health significance of TB, the Federal Government of Nigeria established the National Tuberculosis control program in 1988 and was formally launched in 1991. The program formulated a co-coordinated, time-bound, target-oriented plan of action for effective control of TB. The PHC approach was adopted for programme implementation as this was the only way of achieving the widest coverage at reduced cost (FMOH, 2007).

In line with WHO recommendation, the NTBCP set out its objectives of increasing case detection to 70% of the existing smear positive cases by the year 2000, as well as to achieve a cure rate of at least 85% of the detected smear positive cases (FMOH, 2005). In view of increasing morbidity and mortality due to the increase in prevalence of HIV infection, a cure rate of 75% may be acceptable (FMOH, 2007).

In spite of implementation of DOTS programmes during the 1990s, the global targets were not met by 2000, and the target year was deferred to 2005 (Dauda, 2010).

The new stop TB strategy and the Global plan to stop TB, 2006-2015 came to limelight (WHO, 2010). The target set within the context of the MDGs is to halt and reverse the incidence of TB by 2015. The additional targets set by the stop TB partnership are to halve TB prevalence and death rates by 2015, compared with their levels in 1990 figures. The Stop TB strategy has six major components. The strategy addresses major issues which include pursuance of high quality DOTS expansion and enhancement; TB/HIV, MDR-TB and the needs of poor and vulnerable populations; Contribution of TB to health system strengthening based on PHC; Engaging all care providers; Empower people with TB, and communities through partnership; and promotion of research.

2.11.3. Goals, targets and indicators for TB-HIV control

The stop TB strategy has TB-free world as its vision. Health in the Millennium Development Goals (MDGs) set for 2015 in relation to HIV and TB is addressed by goal 6 which aimed at Combating HIV / AiIlS, malaria & other diseases. Target C under Goal 6 is to halt and begin to reverse the incidence of malaria and other major diseases. Indicator 9 and 10 of that goal 6 addresses Tuberculosis. While Indicator 9 centres on Incidence, prevalence and death rates associated with TB, Indicator, 10 bothers on proportion of tuberculosis detected and cured under DOTS.

In Broad terms, the Stop TB Partnership targets set for 2015 is to reduce the prevalence and death rates by 50% compared with their levels of 1990 and to reduce the global incidence of active TB cases to <1 case per 1million population per year by 2050.

2.12 TB/HIV Collaborative Activities

The extent to which HIV fuels TB depends on the degree of overlap between the population infected with TB and the population infected with HIV. Nigeria has a high degree of overlap between HIV and TB infected population among the 15-49year age group. The different services that are provided in different levels are presented in appendix 1.

Although TB and HIV programmes have often largely pursued separate courses (Anderson & Maher 2001), they share mutual concerns: prevention of HIV should be a priority for TB control; TB care and prevention should be priority concerns for HIV/AIDS programmes. TB and HIV programmes should collaborate in their support to general health service providers in implementing this expanded strategy and in monitoring its impact (WHO 2002a). National HIV programmes could dramatically diminish the extent to which HIV fuels the TB epidemic through substantial scaling up of HIV prevention measures and access to ART (Currie et al. 2003). TB and HIV programmes should collaborate in promoting access to isoniazid preventive treatment (IPT) for tuberculin-positive HIV-infected individuals who do not have TB (while recognizing that in some settings where tuberculin-testing is not feasible, IPT may be of benefit to HIV-infected individuals at high risk of TB) (WHO 1999a).

2.13 Articles on TB/HIV in Africa and Worldwide

In a study by Estifanos and Lindtjørn, 2005 on "DOTS improves treatment outcomes and service coverage for tuberculosis in South Ethiopia: a retrospective trend analysis", the findings revealed that population coverage by DOTS reached 75% in 2001, and the proportion of patients treated with short course chemotherapy increased from 7% in 1994 to 97% in 2001. Treatment success for smear-positive tuberculosis rose from 38% to 73% in 2000, default rate declined from 38% to 18%, and treatment failure declined from 5% to 1%. Being female patient, age 15–24 years, smear positive pulmonary tuberculosis, treatment with short course chemotherapy, and treatment at peripheral centres were associated with higher treatment success and lower defaulter rates. It was conclusively documented that the introduction and expansion of DOTS led to a significant increase in treatment success and decrease in default and failure rates.

Sharma et al., 2005 documented a review article done in India on "HIV-TB co-infection: Epidemiology, diagnosis & management" they disclosed that HIV-infected patients respond well to the standard 6-month anti-tuberculosis treatment regimens and that anti-tuberculosis

treatment is complicated by frequent drug-interactions with highly active antiretroviral therapy (HAART).

2.14 Previous studies on TB/HIV co-infections and treatment outcome in Nigeria

Njepuome and Odume in 2009 looked at 300 new sputum smear-positive acid fast bacilli (AFB) patients that had tested positive to HIV screening between diagnosis and second month of follow-up, and were treated between January and December 2006 in the Gombe State TB control programme. The method used was an analytical retrospective case-control study to compare the treatment outcome of new sputum smear-positive pulmonary tuberculosis (PTB) patients co-infected with HIV with the new sputum smear-positive PTB patients without HIV co-infection. The control for the study came from the same cohort of January to December 2006 of new sputum smear-positive AFB patients (595) who had tested negative to HIV screening. The cohort analysis looked at the HIV sero-prevalence and the treatment outcomes: cure rate, failure rate, death rate, default rate, and transfer out rate among new smear pulmonary tuberculosis (PTB) patients that are dually infected with HIV and TB as compared to those not dually infected. The majority of HIV-positive and HIV-negative PTB patients studied were aged 39 years and below. There was no statistically significant difference between the mean age of patients with co-infection and those without co-infection. The majority of the co-infected patients were aged up to 30 years. There was a statistically significant difference in the mean age of males and females. Of the 300 HIV co-infected patients in the study population that were HIV positive, males accounted for 58.3% compared with 41.7% females. This was not statistically significance. It was discovered that the TB patients that were HIV positive had a cure rate of 12.7%, while those that were HIV negative had a cure rate of 31.8%. The death rate among dually infected patients was higher compared with the HIV-negative patients. The treatment completion and default rates were higher in the HIV co-infected patient.

In a retrospective study by Enwuru et al., 2009 on bronchopulmonary tuberculosis laboratory and DOTS strategy outcome in a rural community in Nigeria from 2001 – 2006 From January 2001 to December 2006, a total of 1219 patients were tested for pulmonary tuberculosis by the Ziehl-Neelsen staining technique for acid fast bacilli. Out of this number, 350 (28.7%) were positive. This includes 198 (56%) males and 152 (43%) females, male to female ratio. 1.3:1. The year 2004 has the highest number of pulmonary tuberculosis patients. 76(21.7%): 39 males and 37 females, followed by the year 2003 with 62 smear positive patients (17.7%):

patients (17.7%): 31 males and 31 females. The year 2005 had the least smear positive patients (43, 12.3%). Mean age of occurrence of pulmonary tuberculosis was 35.4 ± 14.7 years. Peak age frequency was in the age range 20 to 29 (108, 30.9%). This was followed by the age range 30 to 39 (91, 26%). A total of 235 sputum smear positive patients were tested for the HIV antibodies. Of this, 63 (26.8%) were positive for HIV. There were more female HIV positive patients (34, 54%) than males (29, 46%) Again, the year 2004 had the highest HIV positive tuberculosis patients (20, 35.1%). There were more male HIV positive tuberculosis patients in the years 2001 and 2006 and more females in 2002, 2003 and 2005. Of the 350 sputum smear positive patients, 270 (77.1%) enrolled for the DOTS treatment while 80 (22.9%) did not show up despite extensive counselling by the medical officer. Out of the 270 patients that started the treatment, 201 (74.4%) completed the treatment. Of those that started the treatment, 39 (14.4%) defaulted and were lost in the study and 30 (1.1%) of those that started the treatment died before completion of the treatment. Of the 201 that completed the treatment, 195 (97%) were declared cured after follow-up sputum smear negative results at the end of treatment while 6 (3%) were declared failed following persistent sputum smear positive results at the end of the treatment period. Out of the 195 that were declared cured, 5 (2.6%) had under one year repeat episodes (i.e. presented back about a year later with recurrent sputum smear positive tuberculosis).

These findings led to their recommendations that case detection rates could be improved upon by providing culture facilities at the DOTS centres. Furthermore, efforts should be made to ensure that all positive cases are followed to a logical conclusion and that anti-retroviral drugs are provided for patients co-infected with HIV to reduce the mortality rate of pulmonary tuberculosis.

Mukhtar "2010" conducted a prospective study to assess the outcome of the directly observed treatment short course (DOTS) in tuberculosis patients with HIV co – infected in Kano, Nigeria between 2005 and 2006. The study group included one thousand six hundred and ninety two Tuberculosis patients (1066 men and 626 women) aged 15years and above. A total of six hundred and fifty (38.4%) sputum smear acid fast bacilli (AFB) positive patients(391 male and 259 female) were found to be sero positive for HIV. Standardized treatment regimen containing isoniazid, rifampicin, pyrazinamide and ethambutol were administered to the in patients for two months as intensive phase under the researchers direct clinical observation and monitoring. Treatment and follow up continued to the eighth month

while the outcome of cure, were assessed using standard protocols. It was discovered that treatment success rates after completion of dose regimen was 40% (261), of which 91% were sputum negative for AFB after the first treatment phase of two months. This increased to 94% and 97% by the 5th and 8th month respectively. He concluded that given the incidence of 38.4% of HIV/TB co-infection reported at the Kano State Government officially designated Infectious Disease Hospital (IDH) Kano (2005 – 2006), chemotherapy by DOTS was able to cure only 40% of patients, indicating efficacy much lower than the 85% targeted by the World Health Organization(WHO).

In another retrospective study on Treatment outcome of newly diagnosed sputum positive adult tuberculosis cases in the context of HIV infection by Ige and Oladokun, 2011, a total of 857 adult subjects were studied. There were 447 males (52.2%) and 410(47.8%) females. Their ages ranged between 15 and 65 years. The mean age in males was 36.39 ± 13.29 years and 33.62 ± 13.30 years in females. Table 2 shows the baseline characteristics of the study population. There were 77 (9.0%) cases below 20 years, 75.6% were within the 20 to 49 years age category. Only 69 (8.1%) cases were aged 60 years and above. The largest percentage of cases which was 46.8% (401) had (+) of AFB on sputum smear followed by (+++) recorded among 193 (22.5%). For the BMI, 207(24.1%) of the cases were underweight, 648 (75.1%) had normal weight while only 2 (0.2%) were obese. Out of 857 subjects studied, 199 were confirmed HIV positive giving a sero-prevalence of 23.2%.

The treatment outcome in relation to HIV status showed that out of a total of 658 HIV negative patients, 397(60.3%) were cured of TB compared with 121(60.8%) of the 199 HIV co-infected subjects (p=0.9, OR = 1.01, CI= 0.84 to 1.15). More HIV negative patients completed their treatment (109, 16.6%) compared with HIV positive patients (11, 5.5%). The treatment success rate was 506/658(76.9%) in HIV negative patients compared with 132/199(66.3%) in HIV co-infected patients (p=0.002) (OR= 1.45; 95% CI=1.15 to 1.85). The treatment failure rate was more in HIV sero-positive subjects 21/199 (10.6%) compared to HIV sero-negatives 1/658(0.2%) (p=0.01), OR= 69.44; CI= 9.4 to 512.9. Eighteen (2.7%) patients defaulted among the HIV negative subjects, while there was no defaults recorded among the HIV positive cases. The mortality rate was 4.9% in HIV positive cases which was significantly higher than the rate in HIV negative cases of 0.7% (p = 0.01, OR=23.2; CI = 9.99 to 53.64). From these findings, TB treatment success rate was good but fell short of the 85% target. HIV co-infection was associated with a poorer outcome. A recommendation for

community oriented programme, early identification and treatment of HIV was made as the essentials to improve treatment outcome was documented.

A Five year retrospective study by Ige and Akindele "2011" from April 2003 to March 2008 was conducted to evaluate the treatment outcome data of retreatment pulmonary TB who were also screened and confirmed for HIV at the outpatient clinic of the University College Hospital Ibadan, Nigeria. The effect of HIV status and treatment outcome was assessed so also the prevalence of HIV among recurrent PTB patients. The total number of cases assessed was 127. Majority of the patients were between the ages of 20 to 49(73.2%). Forty-two of the PTB patients were HIV positive (33.1%). The results showed that the treatment outcome was as follows: Cured 81(63.8); Treatment completed 13(10.2%); Died 22(17.3%); Defaulted four (3.1%) and transferred out seven (5.5%) More patients were cured and had treatment completion among the HIV negative patients compared with HIV positive patients ($p<0.0001$). The mortality was higher in those with HIV positive than negative patients ($p<0.0001$). They thus concluded that re-treatment pulmonary TB is frequent at this referral centre, and suggested that contribution to re-treatment prevention entails more rigorous management of new TB cases, particularly at lower levels of care as this effort will reduce the emergence of multi-drug resistant tuberculosis.

A longitudinal study conducted by Fatiregun et al, 2009 in which a total of 1,254 patients were followed up with mean age of 35+3.3 years, treatment outcome assessed in the study were cure (76.6%), failure (8.1%), default (6.6%), transferred out(4.8%) and death (1.9%). It was reported in this study that male has higher risk of poor treatment outcome than female and poor program implementation quality may be a modifiable determinant of treatment outcome.

Amoran et al also found out in 2011 in a retrospective study conducted between April 2004 to June 2007 of 983 patients. The overall defaulter rate among TB patients was 14.4% and was about half (44.3%) of the entire negative outcome. 743 (79.2%) of cases were cured or completed treatment and 9(1.0%) of cases were transferred out. He identified returned after default , extra-pulmonary presentation and defaulting after two months of commencement on treatment regimen as an associated factors with treatment outcome (P=0.000), and also mentioned that there was no statically significant difference in the defaulter rate between HIV positive and negative TB patients and distance of domicile to treatment centres (p=0.91). He

further suggest National program should pay a closer attention to the issues of home visit and monitoring especially among patients with smear negative PTB or EPTB and those returning after default.

further suggest National program should pay a closer attention to the issues of home visit and monitoring especially among patients with smear negative PTB or EPTB and those returning after default.

CHAPTER THREE

3.0 Methodology

3.1 Study Area

Oyo state is an inland state in south-western Nigeria was created in February 1974, with its capital at Ibadan which is reputed to be the largest city in Africa, south of the Sahara. It covers an area of 28,454 square kilometres and population of 5,591,589 (population census, 2006).Its bounded in the south by Ogun and in the north by Kwara, in the west is bounded by partly by ogun state and partly by the Republic of Benin while the east is bounded by osun state. Majority of people living in Oyo state are Yoruba from five major ethnic groups which are oyo, osun, oke-ogun, ife/ijesa and igboona, though the language of the groups is Yoruba and each group is clearly distinguished by its dialect. There also other ethnics groups from several parts of the country. Agriculture is the main occupation of the people of oyo state and its endowed with clay, Kaolin and aquamarine. Prominent landmark in oyo state is Cocoa House, the first skyscraper built in Africa. The state is also a home for NTA Ibadan, the first television in Africa and Liberty stadium Ibadan, the first stadium built in Africa. There are also various tourism sites such as Agodi garden, Mapo hall, Bowers tower and University of Ibadan Zoological garden. There are 33 local government areas (LGAs) in the state. Twelve of these LGAs are urban; nine are semi urban while twelve are located in the rural areas. Within the LGAs are few industries, private businesses, and other forms of trade and peasant jobs.

The activities of the DOTs centres are supervised by registered nurses, community health extension workers and health technicians which they collect sputum from Tuberculosis suspect and screen them for HIV, they also recommend chest radiograph for the symptomatic patients with sputum AFB negative for documentation and subsequently enrol the patients on treatment and follow the patients up with sputum examination every 2/3 months and then 5months of the patients on treatment to document progress on intervention.

3.2 Study design

The study was a cross sectional study design using 2009 - 2010 data from the NTBLCP standardised recording forms and patients records in all the DOTs centres in Oyo State.

3.3 Study population

The study population composed of tuberculosis patients registered on directly observed therapy short course in both public and private DOTs centres in the Oyo state between 2009 and 2010.

3.3.1 Inclusion criteria

- For an individual registered for treatment to be eligible, she/he must be older than 15 years of age and must be registered in any of the TB clinics.
- He or she must have been counselled and tested for HIV and TB.

3.3.2 Exclusion criteria

- Registered individuals younger than 15 years were excluded from the study.
- Any individual whose test results were incomplete for TB and HIV was also excluded from the study.

3.4 Sample size determination

Using the formula: $N = Z^2PQ/d^2$

Sample size (N): would be calculated using the Kish Leslie (1965) formula for cross sectional studies, thus $N = Z^2PQ/d^2$

Where

d = precision of the study. The precision of 1% would be used for the study

Z = standard normal deviate corresponding to the 95% CI = 1.96

P = 4.2% (prevalence of HIV among TB infected patients in Oyo state (Odaibo *et al* 2006)

Q = 1-P 83.8%

N = (1.96 x 1.96 x 0.042 x 0.958) / (0.01 x 0.01) = **1546**

Minimum sample size estimated to be 1546 was used for registered patients under in the DOTs centres.

3.5 Data management and analysisVariable Definition:

A profoma (data extraction form) was designed for data extraction from the NTBLCP reporting and recording form as attached in appendix.

Dependent variable: The dependent variable in this study was treatment outcome and it was categorised into two categories (0 = Treatment Unsuccessful, 1 = Treatment Successful)

There are six global treatment outcomes are cured, completed, default, died, failure and transfer out and these were further categorised into two categories as treatment success = cure and completed, treatment unsuccessful = failure, default, died and transfer out

Explanatory variables: The independent variables in this study included age, sex, marital status, education, ethnic group, religious, occupation, income level, HIV status, treatment categories, type of patients, patients point of care, patients receiving ART, and patients receiving CPT.

3.5.1 Data management

Data was obtained from the patients NTBLCP standardised reporting and recording forms using a data extraction form. The treatment outcome in six categories was coded into two categories as below;

Treatment Unsuccessful = 0

Treatment successful = 1

Treatment Unsuccessful was recoded as ''0'' were the failure, default, died and transfer out

Treatment Successful was recoded as ''1'' were cured and treatment completed.

Age group was recoded into four categories, 1= (15 -24), 2=(25 -34), 3=(35- 64), 4= (65 and above).

DOTs treatment centres in Tertiary health centres, comprehensive health centres and Primary health centres were categorised as Public and recoded as ''1'',

DOTs treatment centres in Missionary and Private were categorised as Private and recoded as ''2''

3.5.2 Data analysis

Data analysis was carried out using Statistical Package for Social Sciences (SPSS) version 16. Frequency tables, graphs, charts, mean and standard deviation were used to summarise the variables of interest. Proportion was used to summarise the care received by co-infected and non co- infected patients. Chi-square, as a test statistic was used to investigate if there were differences between the dependent variable (treatment outcome) and the independent variables. Statistical significance was set at 5% level. Logistic regression was used to determine the degree of relationship between dependent variables and its predictors. cut off used for independent variables in the logistic regression model was 10%

3.6 Ethical consideration

The permission to use patients' records for the study was obtained from Oyo state Ministry of Health TBL control program, Damien foundation Belgium- Nigeria TB Project and Ethical approval to Oyo state ethical review committee. With regards to the principles of ethics, confidentiality of data, steps was taken by ensuring that patients names and personnel information were not disclosed but rather relevant findings were made available to relevant authorities for proper disease control strategies and policies.

CHAPTER 4

4.0 RESULTS

4.1.1 Socio demography distribution of tuberculosis patients

Table 4.1.1 shows the basic socio-demographic characteristics of the tuberculosis patients. Eight thousand one hundred and six TB patients enrolled for DOTs, but 7905 accepted HCT with known HIV status. A high proportion (28.4%) of the patients were between 25-34 age groups. About twenty two percent of them were between 35-44 years compare to 15.4% who were in the 15-24 years age bracket and 9.2% were 55 – 64 years. About sixty percent of the patients (54.9%) were Yoruba ethnic group compared to Hausa (27.7%) and 17.4% of the patients were Ibo and others. Higher proportion (44.1%) of the patients had Primary education.

The patients were made up of 56% males. A greater proportion (56.4%) were single compared to 43.6% who were married. About sixty eight percent of the patients were employed. Eighty five percent of all the patients earned less than eighteen thousand naira monthly.

Table 4.1.1 Socio demography distribution of tuberculosis patients

Characteristics	*Frequency (N=7905)*	*Percentage (%)*
Age group		
15 – 24	1221	15.4
25 – 34	2245	28.4
35 – 44	1729	21.9
45 – 54	1127	14.3
55 – 64	728	9.2
65 and above	855	10.8
Sex		
Male	4427	56.0
Female	3478	44.0
Marital Status		
Single	4456	56.4
Married	3449	43.6
Educational status		
No formal education	1952	24.7
Primary	3483	44.1
Secondary	1572	19.9
Tertiary	898	11.4
Ethnicity		
Yoruba	4337	54.9
Hausa	2190	27.7
Ibo/others	1378	17.4
Occupation		
Unemployed	2508	31.7
Employed	5397	68.3
Monthly Income		
< N18,000	6701	84.8
N18,000 and above	1204	15.2

Mean age of TB patients 39.95±1.66 years

4.1.2: Distribution of Tuberculosis patients in relation with clinical characteristics

Table 4.1.2 Presents distribution of tuberculosis patients in relation with clinical characteristics. Majority of the respondent were new tuberculosis cases (81.4%).Nighty five percent presented with pulmonary tuberculosis and 88.6% of the patients were enrolled on CAT 1 regimen. A higher proportion of the patients were sputum negative (38.3%) compared to those who had sputum smear results of 3+ (21%), 2+(14%), 1+(15.7%) and scanty (7.4%). A much higher proportion received DOTs in Public health facilities (91.3%) compared to those who choose Private health facilities (8.7%) as their point of care and treatment.

Table 4.1.2: Distribution of Tuberculosis patients in relation with clinical characteristics

Characteristics	*Frequency (N=7905)*	*Percentage (%)*
Type of Patients		
New	6911	81.4
Relapse	244	3.1
Treatment failure	52	0.7
Treatment after failure	52	0.7
Transfer in	169	2.1
Others	477	6.0
Sputum AFB before treatment*		
0	3026	38.3
SC	582	7.4
+	1238	15.7
2+	1106	14.0
3+	1661	21.0
Not done	265	3.4
Disease site		
Pulmonary	7525	95.2
Extra-pulmonary	380	4.8
Treatment regimen		
Category 1	7004	88.6
Category 2	901	11.4
Type of facility		
Public	7211	91.3
Private	694	8.7

*Missing data

4.1.3 Socio-demography distribution of TB/HIV co-infected patients

Table 4.1.3 shows that, of 7905 tuberculosis patients, 1122 (14.2%) had HIV co-infection. This was made up of 32.5% in the 25 – 34 years age bracket and 31.9% in the 35 -44 age . A higher proportion was observed among females (58.7%) compared to males (41.3%). Single patients also had higher proportion of co-infection (54.5%). Higher prevalence was also observed among Ibo and other ethnic groups. TB/HIV co-infection was high among employed tuberculosis patients (98%), patients earning less than eighteen thousand naira (89%).

Table 4.1.3 Socio demography distribution of TB/HIV co- infected patients

Characteristics	*Frequency (N=1122)*	*Proportion (%)*
Age group		
15 – 24	103	9.2
25 – 34	365	32.5
35 – 44	358	31.9
45 – 54	185	16.5
55 – 64	66	5.9
64 and above	45	4.0
Sex		
Male	464	41.35
Female	658	58.65
Marital Status		
Single	611	54.46
Married	511	45.54
Educational status		
No formal education	278	24.78
Primary	486	43.32
Secondary	225	20.05
Tertiary	133	11.85
Ethnicity		
Yoruba	564	50.27
Hausa	322	28.70
Ibo/other	236	21.03
Occupation		
Unemployed	12	1.07
Employed	1110	98.03
Monthly Income		
< N18,000	998	88.95
N18,000 and above	124	11.05

Mean age of TB/HIV co-infected patients 37.95±1.22yrs

4.1.4: Distribution of TB/HIV co-infected patients in relation to clinical information

Table 4.1.4 summarises the distribution of TB/HIV co-infection in relation to clinical characteristics of tuberculosis patients. A higher proportion of the co-infected patients were new (88.7%), about fifty eight presented with sputum AFB negative before the commencement of treatment compared to those who presented with scanty (6.%), 1+ (11.7%), 2+ (9%) and 3+ (11.9%).And 91.7.7% of the co-infected patients were enrolled on CAT 1 regimen based on form of presentation, but 87.9.6% received care and treatment at Public health facilities though 97% were pulmonary form of tuberculosis.

Table 4.1.4: Distribution of TB/HIV patients in relation to clinical information.

Characteristics	*Frequency (N= 1122)*	*Proportion (%)*
Type of Patients		
New	995	88.65
Relapse	23	2.04
Treatment failure	6	0.53
Treatment after failure	4	0.36
Transfer in	42	3.74
Others	52	4.63
Sputum AFB before treatment		
0	649	57.84
SC	69	6.15
+	131	11.67
2+	102	9.09
3+	134	11.94
Not done	336	29.95
Type of facility		
Public	986	87.88
Private	136	12.12
Disease site		
Pulmonary	1088	96.97
Extra-pulmonary	34	3.03
Treatment regimen		
Category 1	1029	91.71
Category 2	93	8.29

4.2.1: Prevalence of TB/HIV co-infection among tuberculosis patients

Table 4.2.1 summarizes the prevalence of TB/HIV co-infected among tuberculosis patients with age group, sex, ethnicity, occupation and monthly income *(P<0.05)*. It was observed that TB-HIV co-infection was more prevalent in females (18.9%) compared to males (10.5%), age group 35 – 64 years (17.0%) compared to 25-34 years age bracket (16.3%) other age groups, Higher among employed (20.6%) compared to non employed (0.5%) and patients who earned less than N18, 000 (14.9%) compared with those earning N18. 000 and above (10.3%). Among the ethnic tribes studied, the prevalence of co-infection was seen to be higher among the Ibo/others tribes (17.1%) followed by the Hausa tribe (14.7%) and lastly the Yoruba tribe (13%).

.

Table 4.2.1: Prevalence of TB/HIV co-infection among tuberculosis patients

Variables	*TB/HIV co-infection*		*Total*	χ^2	*P value*
	Yes	*No*			
Age group					
15 – 24	103(8.4)	1118(91.6)	1221		
25 – 34	365(16.3)	1880(83.7)	2245		
35 – 64	609(17.0)	2975(83.0)	3584	1.201	0.001*
65 and above	45(5.3)	810(94.7)	855		
Sex					
Male	464(10.5)	3965(89.5)	4429		
Female	658(18.9)	2818(81.1)	3476	1.143	0.001*
Marital Status					
Single	611(13.7)	3845(86.3)	4456		
Married	511(14.8)	2938(85.2)	3449	1.946	0.163
Educational status					
No formal education	278(14.2)	1674(85.8)	1952		
Primary	486(14.0)	2997(86)	3483		
Secondary	225(14.3)	1347(85.7)	1572	0.468	0.926
Tertiary	133(14.8)	765(85.2)	898		
Ethnicity					
Yoruba	564(13)	3773(87)	4337		
Hausa	322(14.7)	1868(85.3)	2190	15.234	0.001*
Ibo/others	236(17.1)	1142(82.9)	1378		
Occupation					
Unemployed	12(0.5)	2496(99.5)	2508		
Employed	1110(20.6)	4287(79.4)	5397	5.674	0.001*
Monthly Income					
< N18,000	998(14.9)	5703(85.1)	6701		
N18,000 and above	124(10.3)	15.9(89.7)	1204	17.689	0.001*

*$P < 0.05$

Table 4.2.2: Prevalence of TB/HIV co-infection among tuberculosis patients in relation to clinical characteristics

Table 4.2.2 summarizes the prevalence of TB/HIV co-infected among tuberculosis patients in relation to clinical characteristics with type of facility, disease site and treatment regimen *(P<0.05)*. It was observed that co-infection was more prevalent in private facility (19.6%) compared to public facility (13.7%), pulmonary disease site (14.5%) compared to extra pulmonary disease site (8.9%) and lastly among CAT 2 treatment (82.8%) compared to CAT 1 treatment (77%).

Table 4.2.2: Prevalence of TB/HIV co-infected among tuberculosis patients in relation to clinical characteristics

Variables	*TB/HIV co-infection*		*Total*	χ^2	*P value*
	Yes	*No*			
Type of facility					
Public	986(13.7)	6225(21.6)	7211		
Private	136(19.6)	558(80.4)	694	18.236	0.001*
Disease site					
Pulmonary	1088(14.5)	6437(85.5)	7525		
Extra-pulmonary	34(8.9)	346(91.1)	380	9.021	0.003*
Treatment regimen					
Category 1	1029(77.0)	5975(85.3)	7004		
Category 2	93(82.8)	808(89.7)	901	12.516	0.001*
ART*					
Yes	405(99.3)	3(0.7)	408	0.128	0.720
No	710(99.4)	4(0.6)	714		

**P< 0.05*

Table 4.2.2: Prevalence of TB/HIV co-infected among tuberculosis patients in relation to clinical characteristics

Variables	*TB/HIV co-infection*		*Total*	χ^2	*P value*
	Yes	*No*			
Type of facility					
Public	986(13.7)	6225(21.6)	7211		
Private	136(19.6)	558(80.4)	694	18.236	0.001*
Disease site					
Pulmonary	1088(14.5)	6437(85.5)	7525		
Extra-pulmonary	34(8.9)	346(91.1)	380	9.021	0.003*
Treatment regimen					
Category 1	1029(77.0)	5975(85.3)	7004		
Category 2	93(82.8)	808(89.7)	901	12.516	0.001*
ART*					
Yes	405(99.3)	3(0.7)	408	0.128	0.720
No	710(99.4)	4(0.6)	714		

**P< 0.05*

4.2.3: Logistic regression of tuberculosis patients' characteristics and TB/HIV co-infection

Table 4.2.3 summarizes the strength of association between tuberculosis patients' characteristics and TB/HIV co-infection *(P<0.05)*. It was found that those in age group 25 – 34 years and those in 35 – 64years were 3.412 (CI= 0.228 – 0.376) and 2.90 (CI= 0.274 – 0.434) less likely to be co-infected respectively compared to age group 15 – 24 years while those in age group 65years and above were found to be 1.287 times more likely to be co-infected (CI= 0.887 – 1.868) compared to age group 15 – 24 years. It was also observed that those earning N18. 000 and above were 2.962 times more likely to have co-infection compared to those earning less than N18, 000 (CI=2.380 – 3.687) and also that those under CAT 2 regimen are 1.544 (CI= 1.216 – 1.959) more likely to have TB/HIV co-infection compared to those under CAT 1 regimen. Furthermore, females patients were found to be 1.972 times less likely to be co-infected compared to males patients (CI= 0.441 – 0.581), in addition, it was seen that patients in private facility was 1.615 times less likely to be co-infected compared to patients in public facility (CI = 0.462 – 0.718). Lastly, the employed patients was found to be 55.556 times less likely to be co-infected compared to the unemployed patients (CI= 0.009 – 0.030).

Table 4.2.3: Logistic regression of tuberculosis patients' characteristics and TB/HIV co-infection.

Characteristics	*OR*	*95% C.I for OR*	*P Value*
Age group			
15 – 24 (Ref)	1		
25 – 34	0.293	0.228 - 0.376	0.001*
35 – 64	0.345	0.274 - 0.434	0.001*
65 and above	1.287	0.887 -1.868	0.183
Sex			
Male (Ref)	1		
Female	0.507	0.441 - 0.581	0.001*
Ethnicity			
Yoruba (Ref)	1		
Hausa	0.871	0.743 - 1.021	0.089
Ibo/others	0.783	0.655 - 0.937	0.008*
Occupation			
Unemployed (Ref)	1		
Employed	0.017	0.009 - 0.030	0.001*
Monthly Income			
<N18,000	2.962	2.380 - 3.687	0.001*
N18,000 and above(Ref)	1		
Type of facility			
Public (Ref)	1		
Private	0.576	0.462 - 0.718	0.001*
Disease site			
Pulmonary (Ref)	1		
Extra-pulmonary	1.456	0.994 - 2.133	0.053
Treatment regimen			
Category 1 (Ref)	1		
Category 2	1.544	1.216 - 1.959	0.001*

**P<0.05*

4.3.1: Association of socio-demographic characteristics of TB/HIV co-infected patients with treatment success

Table 4.3.1 summarises a statistically significant association between socio-demographic variables and treatment success and sex , religion and ethnicity *(P<0.05)*. It was observed that patients within the age group of 25 – 34 year (80.8%) were successfully treated compared to others. More female patients (80.2%), those with tertiary education (81.2%). employed (77.5%) and the less income earners (78.1%) were also successfully treated but the association between them was not statistically significant.

4.3.1: Association of socio-demographic characteristics of TB/HIV co-infected patients with treatment success

Variables	*Treatment success*		*Total*	χ^2	*P value*
	Yes	*No*			
Age group					
15 – 24	78(75.7)	25(24.3)	103		
25 – 34	295(80.8)	70(19.2)	365		
35 – 64	465(76.4)	144(23.6)	609	4.858	0.182
65 and above	31(68.9)	253(31.1)	45		
Sex					
Male	341(73.5)	123(26.5)	464		
Female	528(80.2)	130(19.8)	658	7.103	0.008*
Marital Status					
Single	486(79.5)	125(20.5)	611		
Married	383(75.0)	128(25.0)	511	3.358	0.067
Educational status					
No formal education	209(75.2)	69(24.8)	278		
Primary	378(77.8)	108(22.2)	486		
Secondary	174(77.3)	51(22.7)	225	1.925	0.588
Tertiary	108(81.2)	25(18.8)	133		
Ethnicity					
Yoruba	416(73.8)	148(26.2)	564		
Hausa	251(78.0)	71(22.0)	322	13.407	0.001*
Ibo/others	202(85.6)	34(14.4)	202		
Occupation					
Unemployed	9(75.0)	3(25.0)	12		
Employed	860(77.5)	250(22.5)	1110	0.042	0.838
Monthly Income					
< N18,000	779(78.1)	216(21.9)	998		
N18,000 and above	90(72.6)	34(27.4)	124	1.893	0.169

*$P< 0.05$

4.3.2 Association between treatment success with clinical characteristics of TB/HIV co-infected patients

Table 4.3.2 shows statistically significant association between treatment success and patient point of care, more treatment success reported from this table among co-infected patients receiving DOTs in Public facilities (78.4%), though there were also more treatment success among patients who presented with pulmonary tuberculosis(77.6%), patients on ART (79.8%), but all these observations were not statistically significant.

Table 4.3.2 Association between treatment success with clinical characteristics of TB/HIV co-infected patients

Variables	*Treatment Success*		*Total*	χ^2	*P value*
	Yes	*No*			
Type of facility					
Public	773(78.4)	213(21.6)	986		
Private	96(70.6)	40(29.4)	136	4.173	0.041*
Disease site					
Pulmonary	844(77.6)	244(22.4)	1088		
Extra-pulmonary	25(73.5)	9(26.5)	34	0.309	0.578
Treatment regimen					
Category 1	792(77.0)	237(23.0)	1029		
Category 2	77(82.8)	16(17.2)	93	1.659	0.198
ART*					
Yes	232(79.8)	82(20.2)	405	2.165	0.141
No	539(75.9)	171(24.1)	710		

**P< 0.05*

4.3.3: Association between TB/HIV co-infection patients and treatment success

Table 4.3.3 summarizes the strength of association between TB/HIV co-infected patients and treatment success *(P<0.05)*. It was found that TB/HIV co-infected females were found to be 1.347 times more likely to have treatment success compared to TB/HIV co-infected males (CI= 1.010 – 1.795). Furthermore, it was also found that patients in private facilities was 1.613 times less likely to have treatment success compared to patients receiving care in public facilities (CI = 0.414 – 0.930).

Table 4.3.3: Logistic regression of TB/HIV co-infected patients' characteristics and treatment success

Characteristics	*OR*	*95% C.I for OR*	*P Value*
Sex			
Male (Ref)	1		
Female	1.347	1.010 - 1.795	0.042*
Ethnicity			
Yoruba (Ref)	1		
Hausa	1.220	0.880 - 1.692	0.233
Ibo/others	2.050	1.764 – 2.008	0.001*
Marital status	1		
Single (Ref)	0.761	0.573 - 1.011	0.060
Married			
Type of facility	1		
Public (Ref)	0.620	0.414 - 0.930	0.021*
Private			

*$P<0.05$

4.4.1: Association of socio-demographic characteristics of TB/HIV co-infected patients with Cure

Table 4.4.1 shows a statistically significant association between socio-demography variables and cured. It was observed that employed co-infected patients (30%) and Ibo with other groups (39%) were cured and the observations were statistically significant. Slightly higher pproportion of those within the age bracket 25-34 year (47.7%) and 35 -64 (47.6%) attained cured compared to others, male patients (31.3%) , those that practised Christianity (30.9%) and co-infected patients earning N18,000 and more (33.9%) attained cured, but the observations were not statistically significant.

4.4.1: Association of socio-demographic characteristics of TB/HIV co-infected patients with Cure

Table 4.4.1 shows a statistically significant association between socio-demography variables and cured. It was observed that employed co-infected patients (30%) and Ibo with other groups (39%) were cured and the observations were statistically significant. Slightly higher pproportion of those within the age bracket 25-34 year (47.7%) and 35 -64 (47.6%) attained cured compared to others, male patients (31.3%) , those that practised Christianity (30.9%) and co-infected patients earning N18,000 and more (33.9%) attained cured, but the observations were not statistically significant.

Table 4.4.1 Association of socio-demographic characteristics of TB/HIV co-infected patients with Cure

Variables	*Cured*		*Total*	χ^2	*P value*
	Yes	*No*			
Age group					
15 – 24	47(45.6)	56(54.4)	103		
25 – 34	174(47.7)	191(52.3)	365		
35 – 64	290(47.6)	319(52.4)	609	0.624	0.891
65 and above	19(42.2)	26(57.8)	45		
Sex					
Male	191(31.3)	420(68.7)	611		
Female	148(29.0)	363(71.0)	511	0.808	0.369
Marital Status					
Single	486(79.5)	125(20.5)	611		
Married	383(75.0)	128(25.0)	511	0.697	0.404
Educational status					
No formal	83(29.9)	195(70.1)	278		
education	156(32.1)	330(67.9)	486		
Primary	67(29.8)	158(70.2)	225	2.697	0.441
Secondary	33(24.8)	100(75.2)	133		
Tertiary					
Ethnicity					
Yoruba	142(25.2)	422(74.8)	564		
Hausa	105(32.6)	217(67.4)	322	16.268	0.000*
Ibo/others	92(39.0)	144(61.0)	202		
Occupation					
Unemployed	0(0)	12(100)	12		
Employed	339(30.5)	771(69.5)	1110	5.252	0.023*
Monthly Income					
< N18,000	297(29.8)	701(70.2)	998		
N18,000 and above	42(33.9)	82(66.1)	124	0.884	0.347

$P < 0.05$

4.4.2: Association of clinical characteristics of TB/HIV co-infected patients with cured

Table 4.4.2 shows statistically significant association between cured and site of disease. A higher proportion of the co-infected patients presented with pulmonary tuberculosis (30.8%) were cured, this observation was statistically significant. There were 30.7% who received DOTs in Public facilities and 33.3% were enrolled on CAT 2 regimen attained cured, but these observations were not statistically significant.

Table 4.4.2 Association of clinical characteristics of TB/HIV co-infected patients with cured

Variables	*Cured*		*Total*	χ^2	*P value*
	Yes	*No*			
Type of facility					
Public	303(30.7)	683(69.3)	986		
Private	36(26.5)	100(73.5)	136	1.028	0.311
Disease site					
Pulmonary	335(30.8)	753(69.2)	1088		
Extra-pulmonary	4(11.8)	30(88.2)	34	5.660	0.017*
Treatment regimen					
Category 1	308(29.9)	721(70.1)	1029	0.468	0.494
Category 2	31(33.3)	62(66.7)	93		
ART					
Yes	123(30.4)	282(69.6)	405		
No	213(30.0)	497(70.0)	710	0.017	0.897

*$P<0.05$

4.4.3: Logistic regression of TB/HIV co-infected patients' characteristics and cured

Table 4.4.3 summarizes the association of TB/HIV co-infected patients clinical characteristics and cured (*P< 0.05) after adjusting for confounders.* It was observed that patients with disease site on the extra pulmonary was 3.219 times more likely to be cured compared to patients with the disease site on the pulmonary (CI= 1.120 – 9.251).

Table 4.4.3: Logistic regression of TB/HIV co-infected patients' characteristics and cured

Characteristics	*OR*	*95% C.I for OR*	*P Value*
Ethnicity			
Yoruba (Ref)	1		
Hausa	0.687	0.508 - 0.930	0.233
Ibo/others	0.537	0.388 - 0.742	0.001*
Disease site			
Pulmonary(Ref)	1		
Extra-pulmonary	3.219	1.120 - 9.251	0.030*

**p<0.05*

Table 4.4.3: Logistic regression of TB/HIV co-infected patients' characteristics and cured

Characteristics	*OR*	*95% C.I for OR*	*P Value*
Ethnicity			
Yoruba (Ref)	1		
Hausa	0.687	0.508 - 0.930	0.233
Ibo/others	0.537	0.388 - 0.742	0.001*
Disease site			
Pulmonary(Ref)	1		
Extra-pulmonary	3.219	1.120 - 9.251	0.030*

**p<0.05*

4.4.4: Association of socio-demographic characteristics of TB/HIV co-infected patients with treatment completed

Table 4.4.4 presents association between socio-demographic characteristics and treatment completed among co-infected patients. A higher proportion of those that completed their treatment were female (51.1%) and those patients that were earning less than eighteen thousand naira (48.3%), these observations were statistically significant. Slightly higher pproportion of those within the age bracket 25-34 year (47.7%) and 35 -64 (47.6%) compared to others, female (51.1%), those attained tertiary education (56.4%) and the unemployed (75%) completed their treatment but these observations were not statistically significant.

Table 4.4.4 : Association of socio-demographic characteristics of TB/HIV co-infected patients with treatment completed

Variables	*Treatment completed*		*Total*	χ^2	*P value*
	Yes	*No*			
Age group					
15 – 24	47(45.6)	56(54.4)	103		
25 – 34	174(47.7)	191(52.3)	365		
35 – 64	290(47.6)	319(52.4)	609	0.624	0.891
65 and above	19(42.2)	26(57.8)	45		
Sex					
Male	194(41.8)	270(58.2)	464		
Female	336(51.1)	322(48.9)	658	9.349	0.002*
Marital Status					
Single	295(48.3)	316(51.7)	611		
Married	253(46.0)	276(56.0)	511	0.587	0.443
Educational status					
No formal	126(45.3)	152(54.7)	278		
education	222(45.7)	264(54.3)	486		
Primary	107(47.6)	118(52.4)	225	5.362	0.147
Secondary	75(56.4)	58(43.6)	133		
Tertiary					
Ethnicity					
Yoruba	274(48.6)	290(51.4)	564		
Hausa	146(45.3)	176(54.7)	322	0.910	0.634
Ibo/others	110(46.6)	126(53.4)	202		
Occupation					
Unemployed	9(75.0)	3(25.0)	12		
Employed	521(46.9)	250(53.1)	1110	3.751	0.053
Monthly Income					
< N18,000	482(48.3)	516(51.7)	998		
N18,000 and above	48(38.7)	76(61.3)	124	4.067	0.044*

P< 0.05

4.4.5: Association of clinical characteristics of TB/HIV co-infected patients with treatment completed

Table 4.4.5 shows an association between clinical characteristic of the co-infected patients and treatment completion, A higher proportion of the patients that completed their treatment presented with Extra-pulmonary tuberculosis (61.8%) and received care from public health facilities (47.7%) compared to those seek care from private health facilities (44.1%). But these observations were not significant.

Table 4.4.5: Association of clinical characteristics of TB/HIV co-infected patients with treatment completed

Variables	*Treatment Completed*		*Total*	χ^2	*P value*
	Yes	*No*			
Type of facility					
Public	470(47.7)	516(52.3)	986		
Private	60(44.1)	76(55.9)	136	0.604	0.437
Disease site					
Pulmonary	509(46.8)	579(53.2)	1088		
Extra-pulmonary	21(61.8)	13(38.2)	34	2.398	0.121
Treatment regimen					
Category 1	484(47.0)	545(53.0)	1029		
Category 2	46(49.5)	47(50.5)	93	0.201	0.654
ART					
Yes	200(49.4)	205(50.6)	405		
No	326(45.9)	384(54.1)	710	1.244	0.265

*$P<0.05$

4.4.6: Logistic regression of TB/HIV co-infected patients' characteristics and treatment completed

Table 4.4.6 shows the logistic regression analysis of TB/HIV co-infected patients and treatment completed (*P< 0.05)*. It was found that TB/HIV co-infected females were found to be 1.462 times more likely to have treatment completed compared to TB/HIV co-infected males (CI= 0.538 – 0.871).

Table 4.4.6: Logistic regression of TB/HIV co-infected patients and treatment completed

Characteristics	*OR*	*95% C.I for OR*	*P Value*
Sex			
Male (Ref)	1		
Female	0.684	0.538 - 0.871	0.020*
Occupation			
Unemployed (Ref)	1		
Employed	3.733	1.000 - 13.930	0.500
Monthly Income	1		
< N18,000 (Ref)	1.441	0.981 - 2.117	0.063
N18,000 and above			

p<0.05

4.4.7: Association of socio-demographic characteristics of TB/HIV co-infected patients with treatment failure.

Table 4.4.7 summarises an association between socio demographic characteristics of co-infected patients and treatment failure with age group, ethnicity and monthly income (*P< 0.05)*. A high proportion of patients with treatment failure were in age group 65years and above (6.7%) followed by age group 35-64years (5.7%) compared to other age groups. The Yoruba tribe (6.4%) had a higher proportion of treatment failure compared to Hausa (3.7%) and Ibo/others (1.7%). There was a higher proportion of treatment failure among patients with monthly income N18, 000 and above (10.5%).

Table 4.4.7: Association of socio-demographic characteristics of TB/HIV co-infected patients with treatment failure

Variables	*Treatment failure*		*Total*	χ^2	*P value*
	Yes	*No*			
Age group					
15 – 24	4(3.9)	99(96.1)	103		
25 – 34	10(2.7)	355(97.3)	365		
35 – 64	35(5.7)	574(94.3)	609	5.223	0.063
65 and above	3(6.7)	42(93.3)	45		
Sex					
Male	24(5.2)	440(94.8)	464		
Female	28(4.3)	630(95.7)	658	0.518	0.472
Marital Status					
Single	22(3.6)	589(96.4)	611		
Married	30(5.9)	481(94.1)	511	3.245	0.072
Educational status					
No formal	15(5.4)	263(94.6)	278		
education	22(4.5)	464(95.5)	486		
Primary	11(4.9)	214(95.1)	225	1.207	0.751
Secondary	4(3.0)	129(97.0)	133		
Tertiary					
Ethnicity					
Yoruba	36(6.4)	528(93.6)	564		
Hausa	12(3.7)	310(96.3)	322	9.116	0.010*
Ibo/others	4(1.7)	232(98.3)	202		
Occupation					
Unemployed	0(0)	12(100)	12		
Employed	52(4.7)	1058(95.3)	1110	0.589	1.000
Monthly Income					
< N18,000	39(3.9)	959(96.1)	998		
N18,000 and above	13(10.5)	111(89.5)	124	10.792	0.001*

P< 0.05

4.4.8: Association of clinical characteristics of TB/HIV co-infected patients with treatment failure

Table 4.4.8 shows the association of clinical characteristics of TB/HIV co-infected patients with treatment failure and ART ($P< 0.05$). Those who had no ART was observed to have a higher proportion (6.1%) of treatment failure while those who had ART and also experienced treatment failure were lower (2.2%) in proportion. All other clinical characteristics studied which include type of facility, disease site, treatment regimen and CPT showed no statistical significant relationship with treatment failure.

Table 4.4.8: Association of clinical characteristics of TB/HIV co-infected patients with treatment failure

Variables	*Treatment Failure*		*Total*	χ^2	*P value*
	Yes	*No*			
Type of facility					
Public	49(5.0)	937(95.0)	986		
Private	3(2.2)	133(97.8)	136	2.065	0.151
Disease site					
Pulmonary	51(4.7)	1037(95.3)	1088		
Extra-pulmonary	1(2.9)	33(97.1)	34	0.227	0.633
Treatment regimen					
Category 1	49(4.8)	980(95.2)	1029		
Category 2	3(3.2)	90(96.8)	93	0.455	0.500
ART					
Yes	9(2.2)	396(97.8)	405		
No	43(6.1)	667(93.9)	710	8.527	0.003*

*$P< 0.05$

4.4.9: Logistic regression of TB/HIV co-infected patients' chacterristics and treatment failure

Table 4.4.9 shows the logistic regression analysis of TB/HIV co-infected patients and treatment failure ($P< 0.05$). It was found that married TB/HIV co-infected patients were found to be 1.825 times less likely to have treatment failure compared to single TB/HIV co-infected patients (CI= 0.306– 0.983). It was also observed that those earning N18. 000 and above were 3.584 times less likely to have co-infection compared to those earning less than N18, 000 (CI=0.128 – 0.608). Lastly, the odds of treatment failure among patients having ART was found to be 3.378 times less likely compared patients under ART (CI=0.141-0.622).

Table 4.4.9: Logistic regression of TB/HIV co-infected patients' characteristics and treatment failure

Characteristics	*OR*	*95% C.I for OR*	*P Value*
Age group			
15 – 24	1		
25 – 34	1.281	0.388 - 4.227	0.684
35 – 64	0.823	0.275 - 2.465	0.728
65 and above	0.644	0.135 - 3.075	0.581
Ethnicity			
Yoruba	1		
Hausa	1.680	0.852 - 3.313	0.134
Ibo/others	4.455	1.548 - 12.823	0.006*
Marital Status			
Single	1		
Married	0.552	0.308 - 0.987	0.045*
Monthly Income			
< N18,000 (Ref)	1		
N18,000 and above	0.350	0.168 - 0.727	0.005*
ART			
Yes	1		
No	0.296	0.141 - 0.621	0.001*

$p<0.05$

4.4.10: Association of socio-demographic characteristics of TB/HIV co-infected patients with Death

Table 4.4.10 shows the association of socio-demographic characteristics of TB/HIV co-infected patients with Died (*P< 0.05)*. A higher proportion of male patients (12.9%) death compared to female patients (9.0%). The other socio demographic characteristics studied which include age group, marital status, educational status, religion, ethnicity, occupation and monthly income was found to have no statistical significant relationship with the outcome died.

Table 4.4.10: Association of socio-demographic characteristics of TB/HIV co-infected patients with Death

Variables	*Death*		*Total*	χ^2	*P value*
	Yes	*No*			
Age group					
15 – 24	13(12.6)	90(87.4)	103		
25 – 34	33(9.0)	332(91.0)	365		
35 – 64	68(11.2)	541(88.8)	609	1.597	0.660
65 and above	5(11.1)	40(88.9)	45		
Sex					
Male	60(12.9)	404(87.1)	464		
Female	59(9.0)	599(91.0)	658	4.511	0.034*
Marital Status					
Single	65(10.6)	546(89.4)	611		
Married	54(10.6)	457(89.4)	511	0.001	0.067
Educational status					
No formal	37(13.3)	241(86.7)	278		
education	46(9.5)	440(90.5)	486		
Primary	22(9.8)	203(90.2)	225	2.974	0.396
Secondary	14(10.5)	119(89.5)	133		
Tertiary					
Ethnicity					
Yoruba	67(11.9)	497(88.1)	564		
Hausa	29(9.0)	293(91.0)	322	2.018	0.365
Ibo/others	23(9.7)	213(90.3)	236		
Occupation					
Unemployed	2(16.7)	10(83.3)	12		
Employed	117(10.5)	993(89.5)	1110	0.470	0.493
Monthly Income					
< N18,000	105(10.5)	893(89.5)	998		
N18,000 and above	14(11.3)	110(88.7)	124	0.069	0.793

*$P < 0.05$

4.4.11: Association of clinical characteristics of TB/HIV co-infected patients with Died

Table 4.4.11 shows the association of clinical characteristics of TB/HIV co-infected patients with Died ($P< 0.05$). Among the clinical characteristics studied which include type of facility, disease site, treatment regimen, ART, and CPT only type of facility was found to be statistically significantly related to the outcome died. A higher proportion of patients who died were found to be in private facility (16.2%) compared to public facility (9.8%).

Table 4.4.11: Association of clinical characteristics of TB/HIV co-infected patients with Death

Variables	*Death*		*Total*	χ^2	*P value*
	Yes	*No*			
Type of facility					
Public	97(9.8)	889(90.2)	986		
Private	22(16.2)	114(83.8)	136	5.065	0.024*
Disease site					
Pulmonary	114(10.5)	974(89.5)	1088		
Extra-pulmonary	5(14.7)	29(85.3)	34	0.622	0.430
Treatment regimen					
Category 1	112(10.9)	917(89.1)	1029	1.014	0.314
Category 2	7(7.5)	86(92.5)	93		
ART					
Yes	42(10.4)	363(89.6)	405		
No	77(10.8)	633(89.2)	710	0.061	0.805

*$P<0.05$

Table 4.4.11: Association of clinical characteristics of TB/HIV co-infected patients with Death

Variables	*Death*		*Total*	χ^2	*P value*
	Yes	*No*			
Type of facility					
Public	97(9.8)	889(90.2)	986		
Private	22(16.2)	114(83.8)	136	5.065	0.024*
Disease site					
Pulmonary	114(10.5)	974(89.5)	1088		
Extra-pulmonary	5(14.7)	29(85.3)	34	0.622	0.430
Treatment regimen					
Category 1	112(10.9)	917(89.1)	1029	1.014	0.314
Category 2	7(7.5)	86(92.5)	93		
ART					
Yes	42(10.4)	363(89.6)	405		
No	77(10.8)	633(89.2)	710	0.061	0.805

$P<0.05$

4.4.11: Logistic regression of TB/HIV co-infected patients' characteristics and death

Table 4.4.11 shows the logistic regression analysis of TB/HIV co-infected patients and died *(P< 0.05)*. The odds of the outcome died was found to be 1.508 times more likely among females compared to males (CI=1.029 - 2.209) and 1.770 times less likely among patients in the private facility compared to public facility (CI= 0.342 – 0.936).

Table 4.4.11: Logistic regression of TB/HIV co-infected patients charateristics and death

Characteristics	*OR*	*95% C.I for OR*	*P Value*
Sex			
Male (Ref)	1		
Female	1.508	1.029 - 2.209	0.035*
Marital status			
Single (Ref)	1		
Married	1.000	0.682 - 1.468	1.000
Type of facility			
Public (Ref)	1		
Private	0.565	0.342 - 0.936	0.027*

*p<0.05

4.4.12: Association of socio-demographic characteristics of TB/HIV co-infected patients with default

Table 4.4.12 shows the association of socio-demographic characteristics of TB/HIV co-infected patients with default. All the variables studied showed no statistical significant relationship with default. However, little differences in the proportion of patients who defaulted within all the age groups. There also a higher proportion of default among the employed (3.7%) compared to the unemployed (0).

Table 4.4.12: Association between socio-demographic characteristics of TB/HIV co-infected patients and default

Variables	*Default*		*Total*	χ^2	*P value*
	Yes	*No*			
Age group					
15 – 24	4(3.9)	448(96.1)	103		
25 – 34	16(4.4)	526(95.6)	365		
35 – 64	19(3.1)	96(96.9)	609	1.141	0.767
65 and above	2(4.4)	11(95.6)	45		
Sex					
Male	16(3.4)	448(96.6)	464		
Female	25(3.8)	633(92.6)	658	0.095	0.758
Marital Status					
Single	18(2.9)	593(97.1)	611		
Married	23(4.5)	488(95.5)	511	1.911	0.167
Educational status					
No formal	6(2.2)	272(97.8)	278		
education	18(3.7)	468(96.3)	486		
Primary	11(4.9)	214(95.1)	225	3.022	0.388
Secondary	6(4.5)	127(95.5)	133		
Tertiary					
Ethnicity					
Yoruba	25(4.4)	539(95.6)	564		
Hausa	11(3.4)	311(96.6)	322	2.603	0.272
Ibo/others	5(2.1)	231(97.9)	202		
Occupation					
Unemployed	0(0)	12(100)	12		
Employed	41(3.7)	1069(96.3)	1110	0.460	1.000
		1081(96.3)	1122		
Monthly Income					
< N18,000	37(3.7)	961(96.3)	998		
N18,000 and above	4(3.2)	120(96.8)	124	0.073	0.787

*$P < 0.05$

4.4.13: Association of clinical characteristics between TB/HIV co-infected patients and treatment default

Table 4.4.13 shows the association of clinical characteristics of TB/HIV co-infected patients with treatment default. A higher proportion of patients in the private facility (8.1%) were observed to have treatment default compared to those in the public facility (3.0%) and this was statistically significant. Other clinical characteristics studied showed no statistical significant relationship with treatment default.

Table 4.4.13: Association of clinical characteristics between TB/HIV co-infected patients and treatment default

Variables	*Treatment Default*		*Total*	χ^2	*P value*
	Yes	*No*			
Type of facility					
Public	30(3.0)	956(97.0)	986		
Private	11(8.1)	125(91.9)	136	8.642	0.003*
Disease site					
Pulmonary	40(3.7)	1048(96.3)	1088		
Extra-pulmonary	1(2.9)	33(97.1)	34	0.051	0.822
Treatment regimen					
Category 1	36(3.5)	993(96.5)	1029		
Category 2	5(5.4)	88(94.6)	93	0.854	0.355
ART					
Yes	13(3.2)	392(96.8)	405	0.392	0.531
No	28(3.9)	682(96.1)	710		

*$P<0.05$

4.4.14: Logistic regression of TB/HIV co-infected patients characteristics and default

Table 4.4.14 shows the regression analysis of TB/HIV co-infected patients and default. It was found that the odds of treatment default was 3.165 times less likely in the private facility compared to the public facility (CI = 0.151 – 0.664).

Table 4.4.14: Logistic regression of TB/HIV co-infected patients and default

Characteristics	*OR*	*95% C.I for OR*		*P Value*
Type of facility				
Public (Ref)	1			
Private	0.316	0.151	0.664	0.002*

*p<0.05

4.4.15: Association of socio-demographic characteristics between TB/HIV co-infected patients and transfer out

Table 4.4.15 shows the association of socio-demographic characteristics of TB/HIV co-infected patients with transfer out. It was observed that a higher proportion of patients with transfer out were from the Hausa tribe (5.9%), the Yoruba was 3.5% while Ibo/others were 0.8% with transfer out. Sex, age group, marital status, educational status, occupation, and monthly income showed no statistical significant relationship with transfer out.

4.4.15: Association of socio-demographic characteristics between TB/HIV co-infected patients and transfer out

Table 4.4.15 shows the association of socio-demographic characteristics of TB/HIV co-infected patients with transfer out. It was observed that a higher proportion of patients with transfer out were from the Hausa tribe (5.9%), the Yoruba was 3.5% while Ibo/others were 0.8% with transfer out. Sex, age group, marital status, educational status, occupation, and monthly income showed no statistical significant relationship with transfer out.

Table 4.4.15: Association of socio-demographic characteristics of TB/HIV co-infected patients with transfer out

Variables	*Transfer out*		*Total*	χ^2	*P value*
	Yes	*No*			
Age group					
15 – 24	4(3.9)	99(96.1)	103		
25 – 34	11(3.0)	354(97.0)	365		
35 – 64	22(3.6)	587(96.4)	609	3.946	0.267
65 and above	4(8.9)	41(91.1)	45		
Sex					
Male	23(5.0)	441(95.0)	464		
Female	18(2.7)	640(97.3)	658	3.814	0.051
Marital Status					
Single	20(3.3)	591(96.7)	611		
Married	21(4.1)	490(95.9)	511	0.553	0.279
Educational status					
No formal	11(4.0)	267(96.0)	278		
education	22(4.5)	464(95.5)	486		
Primary	7(3.1)	218(96.9)	225	4.494	0.213
Secondary	1(0.8)	132(99.2)	133		
Tertiary					
Ethnicity					
Yoruba	20(3.5)	544(96.5)	564		
Hausa	19(5.9)	303(94.1)	322	9.915	0.007*
Ibo/others	2(0.8)	34(99.2)	202		
Occupation					
Unemployed	1(8.3)	11(91.7)	12		
Employed	40(3.6)	1070(96.4)	1110	0.754	0.362
Monthly Income					
< N18,000	38(3.8)	960(96.2)	998		
N18,000 and above	3(2.4)	121(97.6)	124	0.604	0.317

*$P < 0.05$

4.4.16 Association of clinical characteristics between TB/HIV co-infected patients and transfer out

Table 4.4.16 shows the association of clinical characteristics of TB/HIV co-infected patients with transfer out. In the clinical characteristics studied which include type of facility, disease site, treatment regimen, ART, and CPT none was found to be statistically significantly related with transfer out.

Table 4.4.16 Association of clinical characteristics of TB/HIV co-infected patients with transfer out

Variables	*Transfer out*		*Total*	χ^2	*P value*
	Yes	*No*			
Type of facility	37(3.8)	949(96.2)	986		
Public	4(2.9)	132(97.1)	136	0.223	0.809
Private					
Disease site					
Pulmonary	39(3.6)	1049(96.4)	1088		
Extra-pulmonary	2(5.9)	32(94.1)	34	0.494	0.355
Treatment regimen	40(3.9)	989(96.1)	1029		
Category 1	1(1.1)	92(98.9)	93	1.916	0.247
Category 2					
ART					
Yes	18(4.4)	387(95.6)	405	1.057	0.304
No	23(3.2)	687(96.8)	710		

*$P<0.05$

4.4.16: Logistic regression of TB/HIV co-infected patients with transfer out

Table 4.8.3 shows the logistic regression analysis of TB/HIV co-infected patients with transfer out.

Table 4.4.16: Logistic regression analysis of TB/HIV co-infected patients with transfer out

Characteristics	*OR*	*95% C.I for OR*	*P Value*
Sex			
Male	1		
Female (Ref)	1.720	0.910 - 3.250	0.095
Marital status			
Single (Ref)	1		
Married	0.746	0.398 - 1.401	0.363
Ethnicity			
Yoruba (Ref)	1		
Hausa	0.546	0.285 - 1.045	0.068
Ibo/others	3.813	0.877 - 16.576	0.074

**=p<0.05

4.5.1: Association of pulmonary tuberculosis patients with or without HIV and global treatment outcome.

Table 4.5.1 summarises global treatment outcome among tuberculosis patients with or without HIV. There is a statistical significant association between tuberculosis patients with or without HIV that were cured, completed treatment, failed treatment and those who died ($P<0.001$) as a higher proportion (91.3%) of tuberculosis patients who were cured were HIV negative as compared to (8.7%) who tested positive to HIV while among tuberculosis patients who completed their treatment (81.1%) tested HIV negative as compared to (18.9%) of patients that tested positive, meanwhile (76.6%) of HIV tested negative patients failed as compared to (23.4%) HIV tested positive patients, also, among tuberculosis patient that died (83.1%) were HIV tested negative compared to (16.9%) that were HIV tested positive patients.

Table 4.5.1: Association between pulmonary tuberculosis patients with or without HIV co-infection and global treatment outcomes

Treatment outcomes	*TB/HIV co-infection*		*Total*	χ^2	*P value*
	Yes	*No*			
	Frequency (%) (N = 1122)	*Frequency (%) (N = 6783)*			
Cured					
Yes	339(30.2)	3565(52.6)	3904	1.923	0.001*
No	783(69.78)	3218(47.4)	4001		
Completed					
Yes	530(47.2)	2274(33.5)	2804	79.084	0.001*
No	592(52.8)	4509(66.5)	5101		
Failure					
Yes	52(4.6)	170(2.5)	222	15.977	0.001*
No	1070(95.4)	6613(97.5)	7683		
Default					
Yes	43(3.8)	201(3.0)	244	1.549	0.213
No	1079(96.2)	6582(97.0)	7661		
Death					
Yes	119(10.6)	359(5.3)	478	47.844	0.001*
No	1003(89.4)	6424(94.7)	7427		
Transfer out					
Yes	41(3.6)	214(3.2)	255	0.769	0.381
No	1081(96.4)	6569(96.8)	7650		

*P<0.05

4.5.2: Logistic regression of treatment success among TB patients with or without HIV co-infection.

Table 4.5.2 summarizes the logistic regression analysis of predictors of treatment success among TB patients with or without HIV *(P<0.05) after adjusting for confounders*. It was found that the females were 1.227 (CI= 1.077-1.398) more likely to have treatment success compared to men. On ethnicity, it was shown that the Hausa were 2.178 (CI= 1.823-2.602) more likely to have treatment success compared to the Yoruba while the Ibo/others were found to be 1.733 times less likely have treatment success (CI= 0.497 – 0.670) compared to the Yoruba. It was also observed that the employed were 2.123 times less likely to have treatment success compared to the unemployed (CI=0.400-0.555) and also that those under private facility are 1.828 times (CI= 0.451-0.665) less likely to have treatment success compared to those under public facility.

Table 4.5.2: Logistic regression of treatment success among TB patients with or without HIV co-infection.

Characteristics	*OR*	*95% C.I for OR*		*P Value*
TB/HIV co-infection				
Yes (Ref)	1			
No	1.479	1.248 -	1.754	0.001*
Age group				
15 – 24 (Ref)	1			
25 – 34	0.886	0.714 -	1.099	0.271
35 – 64	0.967	0.796 -	1.175	0.736
65 and above	1.890	0.687 -	1.152	0.375
Sex				
Male (Ref)	1			
Female	1.227	1.077 -	1.398	0.002*
Ethnicity				
Yoruba (Ref)	1			
Hausa	2.178	1.823 -	2.602	0.001*
Ibo/others	0.577	0.497 -	0.670	0.001*
Occupation				
Unemployed (Ref)	1			
Employed	0.471	0.400 -	0.555	0.001*
Monthly Income				
< N18,000 (Ref)	1			
N18,000 and above	2.932	0.774 -	1.122	0.455
Type of facility				
Public (Ref)	1			
Private	0.547	0.451 -	0.665	0.001*
Disease site				
Pulmonary (Ref)	1			
Extra-pulmonary	0.961	0.709 -	1.302	0.797
Treatment regimen				
Category 1 (Ref)	1			
Category 2	0.757	0.628 -	0.911	0.003*

** P<0.05*

4.5.3 Logistic regression of cured among TB patients with or without HIV co-infection.

Table 4.5.3 summarizes the logistic regression analysis of predictors of cured among TB patients with or without HIV *(P<0.05) after adjusting for confounders*. It was found that those in age group 35-64 years and those in 64years and above were 1.424 (CI= 1.240 – 1.636) and 3.620 (CI= 3.984-4.393) more likely to be cured respectively compared to age group 15 – 24years old. It was also observed that those under CAT 2 regimen are 1.658 (CI= 1.433-1.918) more likely to be cured compared to those under CAT 1 regimen. Furthermore, those with extra pulmonary TB were found to be 10.003 (CI=7.129-14.036) more likely to be cured compared with those with pulmonary TB. In addition, those without HIV showed to be 2.882 times less likely to be cured compared to those with HIV (CI=0.300-0.402).

4.5.3 Logistic regression of cured among TB patients with or without HIV co-infection.

Table 4.5.3 summarizes the logistic regression analysis of predictors of cured among TB patients with or without HIV *(P<0.05) after adjusting for confounders*. It was found that those in age group 35-64 years and those in 64years and above were 1.424 (CI= 1.240 – 1.636) and 3.620 (CI= 3.984-4.393) more likely to be cured respectively compared to age group 15 – 24years old. It was also observed that those under CAT 2 regimen are 1.658 (CI= 1.433-1.918) more likely to be cured compared to those under CAT 1 regimen. Furthermore, those with extra pulmonary TB were found to be 10.003 (CI=7.129-14.036) more likely to be cured compared with those with pulmonary TB. In addition, those without HIV showed to be 2.882 times less likely to be cured compared to those with HIV (CI=0.300-0.402).

Table 4.5.3: Logistic regression of cured among TB patients with or without HIV co-infection.

Characteristics	*OR*	*95% C.I for OR*	*P Value*
TB/HIV co-infection			
Yes (Ref)	1		
No	0.347	0.300 - 0.402	0.001*
Age group			
15 – 24 (Ref)	1		
25 – 34	1.041	0.892 - 1.216	0.607
35 – 64	1.424	1.240 - 1.636	0.001*
65 and above	3.620	2.984 - 4.392	0.001*
Sex			
Male (Ref)	1		
Female	1.062	0.966 - 1.167	0.216
Ethnicity			
Yoruba (Ref)	1		
Hausa	0.781	0.701 - 0.871	0.001*
Ibo/others	1.203	1.059 - 1.367	0.005*
Occupation			
Unemployed (Ref)	1		
Employed	1.032	0.929 - 1.146	0.555
Monthly Income			
< N18,000 (Ref)	1		
N18,000 and above	0.955	0.831 - 1.098	0.520
Type of facility			
Public (Ref)	1		
Private	1.122	0.949 - 1.327	0.177
Disease site			
Pulmonary (Ref)	1		
Extra-pulmonary	10.003	7.129 - 14.036	0.001*
Treatment regimen			
Category 1 (Ref)	1		
Category 2	1.658	1.433 - 1.918	0.001*

**P<0.05*

4.5.4: Logistic regression of treatment completed among TB patients with or without HIV co-infection.

Table 4.5.4 summarizes the logistic regression analysis of predictors of treatment completed among TB patients with or without HIV *(P<0.05) after adjusting for confounders*. It was found that those in age group 25-34 years and those in 35-64years were 1.466 (CI= 0.588-0.792) and 3.436 (CI= 0.241-0.352) less likely to have treatment completed compared to age group 15 – 24. Furthermore, females patients were found to be 1.205 times less likely to be co-infected compared to males patients (CI= 0.752 – 0.916). It was seen that patients in private facility was 1.367 times more likely to have treatment completed compared to patients in public facility (CI =1.145-1.632). It was observed that the employed patients was found to be 1.134 times more likely to have treatment completed compared to the unemployed patients (CI= 1.271-1.580).

4.5.4: Logistic regression of treatment completed among TB patients with or without HIV co-infection.

Table 4.5.4 summarizes the logistic regression analysis of predictors of treatment completed among TB patients with or without HIV *(P<0.05) after adjusting for confounders*. It was found that those in age group 25-34 years and those in 35-64years were 1.466 (CI= 0.588-0.792) and 3.436 (CI= 0.241-0.352) less likely to have treatment completed compared to age group 15 – 24. Furthermore, females patients were found to be 1.205 times less likely to be co-infected compared to males patients (CI= 0.752 – 0.916). It was seen that patients in private facility was 1.367 times more likely to have treatment completed compared to patients in public facility (CI =1.145-1.632). It was observed that the employed patients was found to be 1.134 times more likely to have treatment completed compared to the unemployed patients (CI= 1.271-1.580).

Table 4.5.4 Logistic regression of treatment completed among TB/HIV co-infected and TB patients without HIV co-infection.

Characteristics	*OR*	*95% C.I for OR*	*P Value*
TB/HIV co-infection			
Yes (Ref)	1		
No	2.310	2.006 - 2.660	0.001*
Age group			
15 – 24 (Ref)	1		
25 – 34	1.025	0.867 - 1.211	0.773
35 – 64	0.682	0.588 - 0.792	0.001*
65 and above	0.291	0.241 - 0.352	0.001*
Sex			
Male (Ref)	1		
Female	0.830	0.752 - 0.916	0.001*
Ethnicity			
Yoruba (Ref)	1		
Hausa	0.910	0.814 - 1.017	0.098
Ibo/others	1.247	1.088 - 1.428	0.002
Occupation			
Unemployed (Ref)	1		
Employed	1.417	1.271 - 1.580	0.001*
Monthly Income			
< N18,000 (Ref)	1		
N18,000 and above	1.134	0.976 - 1.318	0.101
Type of facility			
Public (Ref)	1		
Private	1.367	1.145 - 1.632	0.001*
Disease site			
Pulmonary (Ref)	1		
Extra-pulmonary	0.160	0.125 - 0.204	0.001*
Treatment regimen			
Category 1 (Ref)	1	0.595 - 0.799	0.001*
Category 2	0.689		

*P<0.05

4.5.5: Logistic regression of treatment failure among TB patients with or without HIV co-infection.

Table 4.5.5 summarizes the logistic regression analysis of predictors of treatment failure among TB patients with or without HIV *(P<0.05) after adjusting for confounders*. It was found that those in age group 25-34 years and those in 35-64years were 1.763 (CI= 1.103-2.816) and 2.361 (CI= 1.499 – 3.719) more likely to have treatment failure compared to age group 15 – 24 years. It was also observed that those earning N18. 000 and above were 6.135 times less likely to have treatment failure compared to those earning less than N18, 000 (CI=0.117-0.229). Furthermore, the employed patients was found to be 1.733 times less likely to have treatment failure compared to the unemployed patients (CI= 0.382 – 0.871).

Table 4.5.5: Logistic regression of treatment failure among TB/HIV co-infected and TB patients without HIV co-infection.

Characteristics	*OR*	*95% C.I for OR*	*P Value*
TB/HIV co-infection			
Yes (Ref)	1		
No	2.236	1.560 - 3.206	0.001*
Age group			
15 – 24 (Ref)	1		
25 – 34	1.763	1.103 - 2.816	0.018*
35 – 64	2.361	1.499 - 3.719	0.001*
65 and above	1.303	0.709 - 2.395	0.393
Sex			
Male (Ref)	1		
Female	1.072	0.812 - 1.417	0.622
Ethnicity			
Yoruba (Ref)	1		
Hausa	2.622	1.723 - 3.992	0.001*
Ibo/others	0.744	0.539 - 1.028	0.073
Occupation			
Unemployed (Ref)	1		
Employed	0.577	0.382 - 0.871	0.009*
Monthly Income			
< N18,000 (Ref)	1		
N18,000 and above	0.163	0.117 - 0.229	0.001*
Type of facility			
Public (Ref)	1		
Private	0.972	0.601 - 1.570	0.907
Disease site			
Pulmonary (Ref)	1		
Extra-pulmonary	2.264	0.829 - 6.187	0.111
Treatment regimen			
Category 1 (Ref)	1	0.579 - 1.294	0.483
Category 2	0.866		

*$P<0.05$

4.5.6: Logistic regression of death among TB/HIV co-infected and TB patients without HIV co-infection.

Table 4.5.6 summarizes the logistic regression analysis of predictors of death among TB patients with or without HIV *(P<0.05) after adjusting for confounders*. The odds of death was shown to be 1.504 times less likely in age group 65 and above (CI=0.459-0.964) compared to 15-24 years age group. The female patients was seen to be 1.271(CI= 1.045-1.546) times more likely to be dead compared to males patients. It was also observed that employed patients were 1.416 times (CI=0.559-0.890) less likely to experience death compared the unemployed patients. In addition, those earning N18, 000 and above was seen to be 1.869 (CI = 1.329 – 3.628) times more likely to be dead compared those earning less than N18, 000. It was further observed that patients in private facility was found to be 1.733 times less likely to be dead (CI=0.440-0.757) compared to the those in public facility and also the odds of death was seen to be 1.553 less likely among extra pulmonary TB patients compared to pulmonary TB patients (CI=0.440-0.942). Lastly, HIV negative TB patients was found to be 1.919 times more likely to be dead compared to the HIV positive TB patients (CI= 1.509 – 2.440).

Table 4.5.6: Logistic regression of death among TB/HIV co-infected and TB patients without HIV co-infection.

Characteristics	*OR*	*95% C.I for OR*		*P Value*
TB/HIV co-infection				
Yes (Ref)	1			
No	1.919	1.509 -	2.440	0.001*
Age group				
15 – 24 (Ref)	1			
25 – 34	0.897	0.643 -	1.251	0.522
35 – 64	0.756	0.564 -	1.015	0.063
65 and above	0.665	0.459 -	0.964	0.031*
Sex				
Male (Ref)	1			
Female	1.271	1.045 -	1.546	0.017*
Ethnicity				
Yoruba (Ref)	1			
Hausa	2.320	1.746 -	3.084	0.001*
Ibo/others	0.577	0.466 -	0.714	0.001*
Occupation				
Unemployed (Ref)	1			
Employed	0.706	0.559 -	0.890	0.003*
Monthly Income				
< N18,000 (Ref)	1			
N18,000 and above	1.869	1.329 -	2.628	0.001*
Type of facility				
Public (Ref)	1			
Private	0.577	0.440 -	0.757	0.001*
Disease site				
Pulmonary (Ref)	1			
Extra-pulmonary	0.644	0.440 -	0.942	0.723*
Treatment regimen				
Category 1 (Ref)	1	0.614 -	1.072	
Category 2	0.811			0.141

$p<0.05$

4.5.7: Logistic regression of treatment default among TB/HIV co-infected and TB patients without HIV co-infection.

Table 4.5.7 summarizes the logistic regression analysis of predictors of treatment default among TB patients with or without HIV *(P<0.05) after adjusting for confounders*. The odds of treatment default was shown to be 1.751 and 1.701 times less likely in age group 25-35 years (CI=0.357-0.911) and 35- 65years (CI=0.386-0.896) respectively compared to 15-24 years age group. It was also observed that employed patients were 3.367 times (CI=0.202-0.437) less likely to experience treatment default compared the unemployed patients. In addition, those earning N18, 000 and above was seen to be 1.927 (CI = 1.125 – 2.971) times more likely to have treatment default compared those earning less than N18, 000. It was further observed that patients in private facility was found to be 2.519 times less likely to experience treatment default (CI=0.283-0.559) compared to those in public facility. The odds of treatment default was seen to be 1.583 less likely among CAT 2 treatment regimen compared to CAT 1 treatment regimen (CI=0.448-0.891).

Table 4.5.6: Logistic regression of treatment default among TB/HIV co-infected and TB patients without HIV co-infection.

Characteristics	*OR*	*95% C.I for OR*		*P Value*
TB/HIV co-infection				
Yes (Ref)	1			
No	0.831	0.582 -	1.186	0.308
Age group				
15 – 24 (Ref)	1			
25 – 34	0.571	0.357 -	0.911	0.019*
35 – 64	0.588	0.386 -	0.896	0.014*
65 and above	1.110	0.594 -	2.076	0.743
Sex				
Male (Ref)	1			
Female	1.148	0.897 -	1.501	0.312
Ethnicity				
Yoruba (Ref)	1			
Hausa	1.931	1.324 -	2.816	0.001*
Ibo/others	0.621	0.462 -	0.834	0.002*
Occupation				
Unemployed (Ref)	1			
Employed	0.297	0.202 -	0.437	0.001*
Monthly Income				
< N18,000 (Ref)	1			
N18,000 and above	1.927	1.250 -	2.971	0.003*
Type of facility				
Public (Ref)	1			
Private	0.397	0.283 -	0.559	0.001*
		-		
Disease site				
Pulmonary (Ref)	1			
Extra-pulmonary	1.569	0.728 -	3.384	0.251
Treatment regimen				
Category 1 (Ref)	1			
Category 2	0.632	0.448 -	0.891	0.009*

*$p<0.05$

4.5.8: Logistic regression of transfer out among TB/HIV co-infected and TB patients without HIV co-infection.

Table 4.5.8 summarizes the logistic regression analysis of predictors of transfer out among TB patients with or without HIV *(P<0.05) after adjusting for confounders*. The odds of transfer out was shown to be 2.392 times less likely (CI=0.298-0.587) among employed patients compared to the unemployed patients. In addition, those earning N18, 000 and above was seen to be 1.672 (CI = 1.101-2.538) times more likely to have transfer out compared to those earning less than N18, 000. On ethnicity, it was shown that the Hausa were 1.435 (CI= 1.028-2.004) more likely to have transfer out compared to the Yoruba while the Ibo/others were found to be 1.548 times less likely have treatment success (CI= 0.480 – 0.870) compared to the Yoruba.

Table 4.5.8: Logistic regression of transfer out among TB/HIV co-infected and TB patients without HIV co-infection.

Characteristics	*OR*	*95% C.I for OR*		*P Value*
TB/HIV co-infection				
Yes (Ref)	1			
No	0.902	0.628 -	1.297	0.579
Age group				
15 – 24 (Ref)	1			
25 – 34	0.847	0.572 -	0.911	1.256
35 – 64	1.387	0.964 -	0.896	1.996
65 and above	1.042	0.647 -	2.076	1.679
Sex				
Male (Ref)	1			
Female	1.190	0.917 -	1.501	1.543
Ethnicity				
Yoruba (Ref)	1			
Hausa	1.435	1.028 -	2.004	0.034*
Ibo/others	0.646	0.480 -	0.870	0.004*
Occupation				
Unemployed (Ref)	1			
Employed	0.418	0.298 -	0.587	0.001*
Monthly Income				
< N18,000 (Ref)	1			
N18,000 and above	1.672	1.101 -	2.538	0.016*
Type of facility				
Public (Ref)	1			
Private	0.775	0.517 -	1.162	0.218
Disease site				
Pulmonary (Ref)	1			
Extra-pulmonary	1.032	0.555 -	1.921	0.920
Treatment regimen				
Category 1 (Ref)	1			
Category 2	0.867	0.598 -	1.257	0.451

*$p<0.05$

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.0 Discussion

5.1 Socio demography distribution

In this study, there were a total of seven thousand nine hundred and five TB patients among whom socio-demography background and clinical manifestation, distribution of TB/HIV co-infected patients clinical and socio-economic background were examined. A higher proportion of the proportion of the patients were within the age pracket of 25-34years and 35-44years. This figures are in line with documentation by the US in 2010 who reported that age groups commonly affected by TB are the most productive age groups, with a higher proportion within 25 – 34 age group accounting for 33.6% (15, 303) of smear positive cases registered in Nigeria in 2010 (www.nigeria.usembassy.gov). There were also more of males compared to females with tuberculosis but more female (58.7%) with TB/HIV co-infection which is different from a similar study 39.8% in Kano (Mukhtar 2010).

The proportion of new cases of tuberculosis in this study population compared to TB/HIV patients were (81.4% vs 88.7%), relapse (3.1% vs 2.04), treatment failure (0.7% vs 0.5%), treatment after failure 52 (0.7% vs 0.4%). Majority of the study participants presented with pulmonary TB which was similar form of presentation among TB/HIV co-infected patients. Higher proportion of them had CAT 1 treatment regimen though more clients recievd care and support the public facilities when compared to their patronage in private facilities probably because of additional cost of consultation.

Though there were eight thousand one hundred and six tuberculosis who were enrolled between January 2009 and Dec 2010, seventhousand nine hundred and five gave consent for HIV testing and counselling out of which 1122 participants were co-infected thereby giving the rate of co-infection for this study to be 14.2% and this rate is not too different from reports of similar studies in Nigeria which reported 19.8% in Benin (Okoh and Omuemu, 2012), 12.0% in Ile-Ife (Onipede et al., 1999), 10.0% in Kano (Iliyasu, 2009), 10.5% and 14.9% among children and adults respectively in Sagamu (Daniel et al., 2004) and 28.12% in Ibadan (Odaibo et al., 2006). These rates are however low when compared to the rate of 41.2% in Keffi documented by 'Pennap et al., 2010'. A higher proportion of the co – infected

were within age group 35 – 64years (17.0%) and more of females (18.9%) compared to the males (10.5%). Pennap et al., 2010 in relation to gender also had similar findings of which 44.83% of the female patients tested positive while 38.30% of the male patients tested positive for HIV infection.This may be due to contact of the TB infection from children of women within this age group.

5.2 Prevalence of HIV/TB among TB patients

The prevalence of HIV among TB patients increased from 2.2% in 1991 to 19.1% in 2001 and 25% in 2010. This indicates that the TB situation in the country is HIV-driven. The TB burden is compounded by a high prevalence of HIV in the country which stands at about 4.1% in general population (WHO, 2006; http://nigeria.usembassy.gov). In Africa, ranking countries by the number of TB cases attributable to HIV (per 100000 population), places Nigeria third at 49.9 after South Africa and Ethiopia (WHO, 2003).

In this study, the percentage of TB male patients was 56% and this rate is slightly lower compared to the national values for 2007 TB with up to 65% of males with sputum smear-positive results (FMOH, 2007). This value is expected as males in sub-Saharan Africa are more exposed to predisposing factors for infection than females, being more outgoing (Njepuome and Odume, 2009). It was also discovered that the prevalence HIV was higher (17.0%) among age group 35-64years and lowest (5.3%) in age group 65years and above. This finding probably may be because the older people especially those greater than 70 are less involved in risky behaviours but vulnerable due to their age and reduced immunity.

The prevalence of HIV was 18.9 and higher in females compared to males in this study. The findings of this study are in line with a cross sectional study in Cross River state in which 738 TB patients were recruited in 2009 and 377 TB patients in 2010, and their HIV status determined. This study in Rivers state documented that the prevalence of co-infection was higher among females (32.52%) than males (13.28%) in 2009. Similar result was observed in 2010, with higher prevalence in females 21.22%, than males 6.63% (Olugbe and Onuoha, 2012). According to Sweet and Denison in 2008, they explained that social inequalities, including gender and power relations, have an important impact on HIV transmission. Recent reviews also suggest that women in many parts of the developing world are less likely to control how, when, and where sex takes place thereby increasing the likelihood of HIV infection (Aggleton and Rivers, 2007).

were within age group 35 – 64years (17.0%) and more of females (18.9%) compared to the males (10.5%). Pennap et al., 2010 in relation to gender also had similar findings of which 44.83% of the female patients tested positive while 38.30% of the male patients tested positive for HIV infection.This may be due to contact of the TB infection from children of women within this age group.

5.2 Prevalence of HIV/TB among TB patients

The prevalence of HIV among TB patients increased from 2.2% in 1991 to 19.1% in 2001 and 25% in 2010. This indicates that the TB situation in the country is HIV-driven. The TB burden is compounded by a high prevalence of HIV in the country which stands at about 4.1% in general population (WHO, 2006; http://nigeria.usembassy.gov). In Africa, ranking countries by the number of TB cases attributable to HIV (per 100000 population), places Nigeria third at 49.9 after South Africa and Ethiopia (WHO, 2003).

In this study, the percentage of TB male patients was 56% and this rate is slightly lower compared to the national values for 2007 TB with up to 65% of males with sputum smear-positive results (FMOH, 2007). This value is expected as males in sub-Saharan Africa are more exposed to predisposing factors for infection than females, being more outgoing (Njepuome and Odume, 2009). It was also discovered that the prevalence HIV was higher (17.0%) among age group 35-64years and lowest (5.3%) in age group 65years and above. This finding probably may be because the older people especially those greater than 70 are less involved in risky behaviours but vulnerable due to their age and reduced immunity.

The prevalence of HIV was 18.9 and higher in females compared to males in this study. The findings of this study are in line with a cross sectional study in Cross River state in which 738 TB patients were recruited in 2009 and 377 TB patients in 2010, and their HIV status determined. This study in Rivers state documented that the prevalence of co-infection was higher among females (32.52%) than males (13.28%) in 2009. Similar result was observed in 2010, with higher prevalence in females 21.22%, than males 6.63% (Olugbe and Onuoha, 2012). According to Sweet and Denison in 2008, they explained that social inequalities, including gender and power relations, have an important impact on HIV transmission. Recent reviews also suggest that women in many parts of the developing world are less likely to control how, when, and where sex takes place thereby increasing the likelihood of HIV infection (Aggleton and Rivers, 2007).

5.3 Factors affecting treatment success among TB/HIV co-infected patients

The treatment of tuberculosis especially when complicated by HIV seems to be difficult even with DOTS therapy (Daniel, et al., 2006; Eno and Edem, 2008; Daniel and Alausa, 2006; Bassey et al., 2008). Global success rate for treatment of HIV/Tb co-infection targets 85% but from most studies conducted in Nigeria none has been able to reach this target. Slightly greater success was reported in one study in Ilorin, Nigeria, that observed a 43.7% cure rate. Another Study in Sagamu reported a 76.8% success (Daniel and Alausa, 2006). However, in Calabar south- eastern Nigeria 42% cure rate was found (Eno and Edem, 2008). Mukhtar, 2010 reported a much lesser success rate in Kano state while a 63.8% success rate was documented by Ige and Akindele in 2011.

This study explored both socio-demographic and clinical factors likely to affect success rate for HIV/TB co-infected patients in Oyo state. In a bi-variate analysis, gender and ethnicity were socio-demographic factors found to significantly have a relationship with success rate while type of facility with regards to it been either public or private was the clinical factor identified to significantly affect success rates. A further multi-variate analysis showed significant association for gender, type of facility, ART, monthly income, with success rates. It can be deduced from this findings that gender, type of facility, monthly income and age could be a major contributing factors for success rates.

The findings from this study are similar to findings documented from other studies by Ige and Oladokun, 2011 in Nigeria, and other parts of the world (Mallory et al., 2000; El-Sadr et al., 2001; Nahid, 2007) which stated that success rate was significantly related to the HIV status of the patients. The rising TB/HIV epidemic no doubt impacts negatively on AIDS and TB control programmes in many ways. The impact ranges from increased caseload of active TB attributable to HIV, HIV-related morbidity and mortality in TB patients, higher default rates and low cure rates, high rate of adverse drug reactions, increased risk of TB transmission and delay of access to health services for TB suspects due to the stigma of HIV/AIDS (WHO, 2004).

This study also found out that there is significantly relationship between sex, ethnicity ,point of care and treatment success rate. However, female sex and DOT centres in the public

facilties could predict success of antituberculosis treatment. Probably because the health seeking behavious among female is better and treatment in the public health facilities attract little or no cost

5.4 Factors associated with global treatment outcomes among TB/HIV co-infected patients

In this study, there was a higher proportion among the HIV positive patients who completed their treatment (47.2%) and were cured (30.2%) also high mortality (10.6%) compared to treatment default (3.8%), transfer out (3.6%), failure (4.6%) as can be seen in Table 4.5.1. In 2001, Mukadi et al, did a retrospective study on Tuberculosis case fatality rates (CFR) in high HIV prevalence populations in sub-Saharan Africa with the aim of analysing the extent of the increased tuberculosis CFR in high HIV prevalence populations in sub-Saharan Africa, the reasons for this increase and the causes of death, in order to identify possible ways of tackling this problem. The methodology involved searching the MEDLINE on 'tuberculosis', 'HIV infection', and 'mortality' (MesH or textword). In addition, available data from National Tuberculosis Programme reports were reviewed. The findings were that Tuberculosis CFR is closely linked to HIV prevalence. Limited autopsy data suggest that death from HIV-related diseases other than tuberculosis is probably the main reason for the increased CFR in HIV-infected tuberculosis patients. Among HIV-infected tuberculosis patients, the higher tuberculosis CFR in sputum smear-negative and extra pulmonary than in sputum smear-positive tuberculosis cases can also be attributed to misdiagnosis of HIV-related diseases as tuberculosis. The adverse effect of the HIV/AIDS epidemic on general health service performance probably accounts for the higher tuberculosis CFR among HIV-negative tuberculosis patients in high prevalence populations than that in low HIV-prevalence populations.

Risk of death during and after TB treatment is higher among HIV-positive than HIV-negative patients with smear-positive pulmonary TB, and higher still among HIV-positive patients with smear-negative TB (probably reflecting their greater degree of immunosuppression) (Mukadi *et al.* 2001). Excess deaths in HIV-infected TB patients during and after treatment are partly due to TB itself and other HIV-related problems (Harries *et al.* 2001). In sub-Saharan Africa up to 30% of HIV-infected TB patients die within 12 months of starting treatment (Harries *et al.* 2001).

5.5 Comparison of anti tuberculosis treatment outcome among TB/HIV co infected and TB patients

In Nigeria, Daniel and Alausa, 2006 conducted a study on Treatment outcome of TB/HIV positive and TB/HIV negative patients on directly observed treatment, short course (DOTS) in Sagamu, Nigeria. This was A prospective study of 353 smear positive TB patients aged 15 years and above who were registered for 8 months anti-tuberculosis (DOTS) therapy between January 2001 and December 2003 at the Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria. Treatment outcome indicators of cure, default, transfer to another district and death were assessed in relation to the HIV status of the patients. There were 353 eligible patients of which 58 (16.4%) were HIV positive. The clinical symptoms and signs of TB were similar in both HIV positive and negative TB patients. The cure rate was 76.8%.patients. The cure rate was significantly lower in HIV infected compared with non-HIV infected TB patients (60.3% v 80.0%).

This study found out that there was a sigficant association between TB/HIV co-infection and cure rate, treatment completed, treatment failure and death. After adjusting for confunder it was discovered that sex, ethnicity, occupation, point of care and treatment regimen could predict treatment success as this can be seen in Table 4.5.2. Also the cure rate among tuberculosis patient with or without (52.6% vs 30.2%) could also be predicted by age, ethinicity, disease site and treatment regimen as this can be seen in table 4.5.3,also the predictors of treatment completed were age,sex,occupation, disease site and treatment regimen as this can be seen in table 4.5.4

Another study carried out in Gombe reported that TB patients that were HIV positive had a cure rate of 12.7%, while those that were HIV negative had a cure rate of 31.8%. The death rate among dually infected patients was higher compared with the HIV-negative patients. The treatment completion and default rates were higher in the HIV co-infected patients (Njeptiome and Odume, 2009). In 2011, Dagnra et al. conducted a study with the aim to determine the prevalence of HIV infection in tuberculosis patients and its impact on the TB treatment. They enrolled 569 pulmonary TB patients in four diagnosis and treatment centres in Togo. They findings were that the rate of treatment success was lower (64.3%) in TB/HIV positive patients than in TB/HIV negative patients (87.5%). The

mortality rates were 25.6% and 11.8% in TB/HIV+ patients and TB/HIV- patients, respectively, with a statistically significant difference.

5.6 CONCLUSION

This study established that the prevalence of TB/HIV co-infection among tuberculosis patients enrolled on directly observed therapy short-course in oyo state was 14.9% bearing in mind that it is purely a clinical cross sectional study with its attendant limitations (e.g. the unavoidable Becksonian bias in hospital based studies). This prevalence was more among age group of 35 -64 years (17.0%) which is majorly the productive and reproductive age group thereby then poses a lot of risk unto the present population and those in utero.

It was also discovered in this study that female patients, patients receiving care in the public facilities, pulmonary tuberculosis patients and patients on category 1 regimen are more likely to be succefully treated and do well in the global outcomes which could be predicted by age, income, occupation and ethnicity group

Cure rate, treatment completed, treatment failure and death rate have statistically significant association with the HIV status of tuberculosis patients. More effort by the state program to ensure active monitoring and collaborative effort in TB and HIV activities to improve cure rate and treatment success and reduce death rate among TB/HIV co-infected patients in Oyo state.

5.7 Recommendations

As a follow up to the findings of this study;

Urgent strategies that lead to routine screening, rapid diagnosis (Gene Xpert machine) and prompt treatment of co-infected patients with active or latent TB in needed. Characteristically, the older age group, unemployed and no salary earners or less paid patients and hausa tribes was more among this 14.2% co-infection prevalence for this study. Also prompt commencement and regular administration of highly active antiretroviral treatment (HAART), DOTS and BCG.

Age, less paid jobs, unemployemet and ethnicity were identified as preditors of treatment success and antituberculosis global treatment outcomes, this calls for actions in the as regard the collaboartive activities in TB/HIV programms to provide food packages for the patients on treatment and other social support such as traspotation fares and also ensure programmes and campaigns aimed at reducing the HIV/TB co-infection rate in the society as well as the illiterate and semi-literate groups

Provision of National guildeline on TB/HIV co-infection and capacity strengthening of the private owned facilities, Strick monitoring and follow up of patients will an added advantage to examine the progress of co-infected paticnts on treatment which as well as surpportive supervision.

LIMITATIONS

An important limitation of this study is that factors predicting anti tuberculosis treatment outcomes were assessed through cross sectional study. And this study could not destermine the time of onset of tuberculosis infection and TB/HIV co-infection.

Further studies will be necessary to address to provide more valid results.

5.7 Recommendations

As a follow up to the findings of this study;

Urgent strategies that lead to routine screening, rapid diagnosis (Gene Xpert machine) and prompt treatment of co-infected patients with active or latent TB in needed. Characteristically, the older age group, unemployed and no salary earners or less paid patients and hausa tribes was more among this 14.2% co-infection prevalence for this study. Also prompt commencement and regular administration of highly active antiretroviral treatment (HAART), DOTS and BCG.

Age, less paid jobs, unemployemet and ethnicity were identified as preditors of treatment success and antituberculosis global treatment outcomes, this calls for actions in the as regard the collaboartive activities in TB/HIV programms to provide food packages for the patients on treatment and other social support such as traspotation fares and also ensure programmes and campaigns aimed at reducing the HIV/TB co-infection rate in the society as well as the illiterate and semi-literate groups

Provision of National guildeline on TB/HIV co-infection and capacity strengthening of the private owned facilities, Strick monitoring and follow up of patients will an added advantage to examine the progress of co-infected patients on treatment which as well as surpportive supervision.

LIMITATIONS

An important limitation of this study is that factors predicting anti tuberculosis treatment outcomes were assessed through cross sectional study. And this study could not destermine the time of onset of tuberculosis infection and TB/HIV co-infection.

Further studies will be necessary to address to provide more valid results.

REFERENCES

Akinola A.Fatiregun., Abimbola S. Ojo., Afolabi E. Bamigboye., 2009. Treatment outcome among pulmonary tuberculosis patients at treatment centers in Ibadan, Nigeria ,Annal of African Medicine 8: 100 -104

Amoran O.E., Osiyale O.O., and Lawal K.M., 2011.Pattern of default among tuberculosis patients on directly observed therapy in rural primary health care centres in ogun state, Nigeria.Journal of Infectious Diseases and Immunity 3: 90 -95

Anne-christine D. June 9, 2002. WHO spares down HIV treatment guidelines for poor countries. Retrieved Nov. 20, 2010 from *http://www.acais.Cornlvubslarnfari2002* /AM020701.html

Aggleton P, Rivers K. Gender. 2007. Inequalities in Health and Diseases. *International Gender Issue*

Bal, A.M., Lakhashe, S.K., Thakar, M.R., Tripathy, S.P.and Paranjape, R.S., 2004. Deregulation of pro-inflammatory and regulatory cytokine in HIV infected person with active tuberculosis. *Cytokine* 30: 275-281.

Bass, J.R, Farer, L.S. and Hopewel, P.C., 1990. Diagnostic standards and classification of TB. *American Review of Respiratory Diseases* 142: 725-735.

Blumberg, H.M., Bunnan, W.J. and Chassoq, R.E., 2003. Treatment of Tuberculosis. *America Journal of Respiratory Critical Care Medicine* 167: 603-662.

British HIV Association. Oct. 6, 2004, BHIVA treatment guidelines for TB/HIV infection. Retrieved on Dec. 15, 2010 from http://bhiva.org.

Brooks, G.F., Butel, J.S. and Morse S.A., 2004. Medical microbiology. 23rd ed. New York McGraw-Hill 75-100

Centers for Disease Control and Prevention, 1998. Prevention and treatment of TB among patients infected with human immunodeficiency virus: principles of therapy and revised recommendations. *Morbidity and Mortality Weekly Report* 47: 1 – 25.

Centers for Disease Control and Prevention, 2002. Acquired rifamycin resistance in persons with advanced HIV disease being treted for active TB with intermittent rifamycin-based regimes. *Morbidity and Mortality Weekly report* 47: 1-25

Centers for Disease Control and Prevention May, 2004. Treating opportunistic Infection Among HIV-infected Adults and adolescents. Retieved on Jan. 6, 2011 from http://www.cdc.gov/mmwr/preview/mmwrhtml;mm5315al.htm

Cichocki P. June 7, 2007. The history of HIV. Retrieved on Ja. 8, 2011 from http://aids.about.com on January, 2011.

Corbett, E.L., Watt, C.J., Walker, N., Matthew, D. and Williams, C., 2003. the growing burden of tuberculosis: global trends and interactions with the HIV Epidemic, *Archaeology of Internal Medicine* 163: 1009-1021.

Dagnra A.Y., et al., 2011. Prevalence of HIV-TB co-infection and impact of HIV infection on Pulmonary tuberculosis outcome in Togo. *Bullutin de la Societe de Pathologie* Dec;104(5):342-6.

Daniel OJ, Salako AA. Oluwole FA, Alausa OK, Oladapo OT. HIV seroprevalence among newly diagnosed adult PTB patients in Sagamu. Niger Journal of Medicine 2004 Oct-Dec;13(4):393-7 .

Daniel OJ, Oladapo O. T., Alausa O. K., 2006. Default from Tuberculosis treatment programme in Sagamu, Nigeria. *Niger Journal of Medicine* 15(1): 63-67

Datiko, Q.G., Yassin M.A., Chekol L.T., Kabeto L.E. and Lindtjan, B., 2008. The rate of TB-HIV co-infection depends on the prevalence of HIV infection in a community, *Biomed Central Public Health* 8.266: 1471-1488. Retrieved on. Dec 12, 2010 from http://www.biomedcentral.can/1471-2458/8/266.

Dauda, M.M. 2010. Evaluation of the efficacy of directly observed treatment shortcause in patients with HIV/TB coinfection in Kano. *Reviews in Infections* 1.5:218-223.

Deriemer, K., Kawamura, L.M., Hopewelly, P.C. and Daley, C.L., 2007. Quantitative impact of human immunodeficiency virus infection on Tuberculosis dynamics. *Journal of Respiratory Critical Care Medicine* 176: 936-943.

El-Sadr, W.M., Perlman, D.C., Denning, P., 2001. A review of efficacy studies of 6-month short course therapy for TB among patients infected with human immunodeficiency virus; differences in study outcomes. *Clinical Infectious Diseases* 32: 623-631.

Eliner. J.J., 2007. The interaction between HIV and Mycobacterium tuberculosis. *Opportunistic infections* 197:216-218.

Eno P. E., Edem A. A., 2008. Assessment of Directly observed chemotherapy short – course on Tuberculosis prevalence in Calabar Cross River State, Nigeria. Ham Med 51 (2): 18 – 23.

Enwuru Chika Paulinus, Emeh Madubuike Samuel, Izuehie Ifeanyi Samson, Enwuru Christian Azubuike, Umeh Sarah I., Agbasi Uchenna Marcel, 2009. Broncho pulmonary tuberculosis- laboratory diagnosis and dots strategy outcome in a rural community: a retrospective study. *African Journal of Clinical and Experimental Microbiology* 10(3): 175-184.

Fauci, A., 1998. Principles of International medicine. 14th ed. New York: McGraw-Hill:78-81.

Federal Ministry of Health, 2010. Tuberculosis and Leprosy control efforts in Nigeria, National Tuberculosis and Leprosy Control Program report. Pp150.

Federal Ministry of Health, 2005. 2006-2010 national strategic framework for implementing TB/HIV collaborative activities in Nigeria: 7-20

Federal Ministry of Health, Nigeria. *National Tuberculosis and Leprosy Control Programme. Annual report*, 2007.

Federal Ministry of Health, 2008. Tuberculosis care with TB/HIV co-management for General health care workers in primary and secondary health facilities: 10-16.

Fiske, C.T., Hamitton, C.D and Stout J.E. 2008. Alcohol use and clinical manifestations of tuberculosis. *Journal of Infection* 57.5: 385-391.

Fitzgerald, D.W. Desvarieux, M. and Severa, P., 2000. Effect of post-treatment isoniazid on prevention of recurrent TB in HIV-1 infected individuals: a randomized trial, *Lancet* 356: 1470-1474.

Goldfield, A. and Eller, J.J. 2007. Pathogenesis and Management of HIV/TB confection in Asia. *Tuberculosis* 87:526-530

Grace Pennap, Stephen Makpa, Sam Ogbu. Sero-prevalence of HIV infection among tuberculosis patients in a rural tuberculosis referral clinic in northern Nigeria. *The Pan African Medical Journal*. 2010;5:22

Harries AD, Hargreaves NJ, Kemp J (2001). Deaths from tuberculosis in sub-Saharan Africa countries with a high prevalence of HIV-1. *Lancet*, 357: 1519-1523.

Herold, C.D., Fitzgerald, R.L. and Herold, D.A. 1996. Current techniques in microbacterial detection and speci fication. Critical Reviews in Clinical and Laboratory Sciences 33:83-138.

Htay, Z. Aug.10, 1999. Management of TB in HIV infected patients, retrieved on Dec. 15, 2010, from http://www.dcmsonlinc.org/jax medicine/1999journals/august99/tb.htm.

Hudson, C.P., Wood, R, Martens, G. 2003. Diagnosing HIV-associated TB associated wth a

draining abscess, *Journal of Infectious Diseases* 161: 286-295.

Hutton, M.D., Stread, W.W., Cauthean , G.M, 1990. Nosocomial transmission of TB associated with a draining abscess, *Journal of Infectious Disease* 161:286-295 http://www.ghf12.org/?p=2986

Idemyor, V. 2007. HIV and Tuberculosis confection: inextricably linked Liason. *Journal of the Nigerian Medical Association* 99.12:1415-1419.

Ige O. M., Akindele M.O., 2011. Five year review of treatment outcome of directly observed therapy (DOT) for re-treatment pulmonary tuberculosis patients in UCH, Ibadan, Nigeria. *African Journal of Medical Science* 40(1):15-21.

Ige Olusoji M., and Regina E. Oladokun, 2011. Treatment outcome of newly diagnosed sputum positive adult tuberculosis cases in the context of HIV infection. *Journal of Infectious Diseases and Immunity* Vol. 3(10), pp. 210-217.

Iliyasu Z, Babashani M. Prevalence and Predictors of TB coinfection Among HIV seropositive patients attending Aminu Kano Teaching Hospital, Northern Nigeria. *Journal of Epidemiology* 2009;19(2):81-7

International Union Against Tuberculosis and Lung Diseases, 2005.Tuberculosis- a global emergency, Retrieved on Jun. 20, 2009 from http://www.tbalert .org/worldwide.

Korenromp, E.L., Scano, F., Williams, B.G. 2003. Effects of human immunodeficiency virys infection on recurrence of TB after rifampicin-based treatment: an analytical review *Clinical Infection Disease* 37:101-12

Lucas A.O. and Gills M.H., 2003. Short textbook of public health medicine for the tropics. 4th ed. London: Edward Arnol: 405-412.

Mallory K. F., Churchyard G. J., and Kleinschnidt I., 2000. The impact of HIV infection on recurrence of tuberculosis in South Africa gold miners. *International Journal of Tuberculosis and Lung Disease* 4(5): 455-462.

Marshall, B.G and Shaw, R.J., 1996. New technology in the diagnosis of TB. *British Journal of Hospital Medicine* 55:491-494.

Mcnerney, R., 1996. TB Diagnosis: present difficulties and prospects for the future. *African Health* 19:22-23.

Mukhtar M. Dauda, 2010. Evaluation of the efficacy of directly observed treatment short course (DOTS) in patients with tuberculosis and HIV Co-infection in Kano, Nigeria. *Reviews in Infections* 1(5):218-223.

Njepuome N. and Odume B., 2009. The impact of HIV syndromes on the treatment of TB cases in Gombe State, Nigeria. *African Journal of Respiratory Medicine* September

2009.

Nahid P, Gonzalez LC, Rudoy I, de Jong BC, Unger A, Kawamura LM, Osmond DH, Hopewell PC, Daley CL (2007). Treatment outcomes of patients with HIV and tuberculosis. *America Journal of Respiratory Critical Care Medicine* 175: 1199-1206

Narita, M., Ashkin, D., Hollender, E.S. Pithenik, A.E., 2008.paradoxical worsening of TB following antiretroviral therapy in patients with AIDs. *American Journal of Respiratory Critical Care Medicine*. 158:157-161.

Navas, E., Martin-Davila P., Moreno, L., 2002. Paradoxical reactions of TB in patients with the acquired immunodeficiency syndrome who are treated with highly active antiretroviral therapy. *Archives of Internal Medicine* 162:97-99.

Nigeria Tuberculosis Fact Sheet United States Embassy in Nigeria. January 2012. www.nigeria.usembassy.gov

Odaibo GN, Gboun MF, Ekanem EE, Gwarzo SN, Saliu I, Egbewunmi SA, Abebe EA, Olaleye DO. HIV infection among patients with PTB in Nigeria. *African Journal of Medicine and Medical Sciences*. 2006; 35:93-98.

Olise, P. 2004.Primary healthcare for sustainable development. Abuja: *Ozege Publications*: 98-100.

Olugbue, Victor U. and Onuoha, Stanley C. 2012. Prevalence of HIV infection among tuberculosis (TB) patients in a TB/HAART-HAART referral centre in Nigeria. *International Journal of Science and Nature*, *Vol.* 3(1:) 88-92

Onipede AO, Idigbe O, Ako-Nai AK, Omojola O, Oyelese AO, Aboderin AO, Komolafe AO, Wemambu SNC. Seroprevalence of HIV antibodies in TB patients in Ile-Ife. *East African Medical Journal*. 1999; 76(3): 127-132.

Orlovic, D., Kularatne, R., Ferraz, V. 2001. Dual pulmonary infection with MTB and Pneumocytisi carinii inpatients infect with human immunodeficiency virus. *Clinical Infectious Diseases*: 32:289-294

Parks K., 2009. Textbook of preventive and social medicine 20th ed. India: M/S *Banarsidas Bhand*: 780-790.

Quraishi, S.Y. Jun 5, 2005. The HIV/TB co-infection. Retrieved Dec. 10, 2010 from http://www.nacoonline.gov/HIV/TB guideline.pdf.

Salami, A.K., 2006. HIV-TB co-infection: Pathogenesis, Diagnosis and management in adults. *African Journal of clinical and Experimental microbiology* 7.3:158-171.

Sweet H, Denison S. Gender inequalities in health and diseases. *International Gender Issue* 2008.

The World Gazetteer.Feb.2, 2010. Current population for cities and towns of Nigeria. Retrieved on April 14, 2011 from http://www.gazetteer.de/c/c_ng.htm.

United States Agency for International Development Feb.19, 2010. Global AIDS report 2009. Retrieved from Dec. 26, 2010 www.usaid.org

Westley A.V., 1978. Essentials of medical microbiology.new York. Limppincort:344-345.

World Health Organization report 2010. Global TB control report retrieve on January 6, 2011 from www.who.int//tb/data.

World Health Organization report, 2009. Global TB control: epidemiology, strategy, financing. No. WHO/HTM/TB/2009.411. Retrieved on Dec.4, 2010 from www.who.int//publications

World Health Organization, 2008. WHO three I's meeting: Intensified case finding (ICF), isoniazid preventive therapy (IPT),and TB infection control (IC) for people living with HIV Geneva, WHO, 2008 (HTM/HIV/12/2008).

World Health Organization, 2007. Antiretroviral newsletter issue No. 4. Clinical and laboratory monitoring of antiretroviral therapy in resource-limited and unlimited settings. Retrieved on Nov. 10, 2010 from http://www.wpro.who.int/NR.rdonlyres.DFC88S4E-IEA8-41306-BO4A 4EO5799F17EEO/ART/Newsletter issue 4.pdf

World Health Organization, 2005. Global TB control surveillance, planning, financing. Retrieved on May 5, 2010 from http://www.who.int/entity/tb/publications/global report/en/

World Health Organization, 2003. Scaling up of antiretroviral therapy in resource-limited settings: Treatment guidelines for a public health approach. WHO Geneva.

Wood, R., Middlekoop., K., Myer, L., Grant, A.D., While law, A., Lawn. S.D., 2007. Undiagnosed tuberculosis in a community with high HIV prevalence: implications for tuberculosis control. *American Journal of Respiratory and Critical Care Medicine* 175:810-824.

Van SD, Hermans PW. 1995. Epidemiology of TB by DNA fingerprinting. *European Respiratory Journal* 20: 5498-6563

Data extraction form

Outcome of Daily Directly Observed Therapy Short-course among co-infected Pulmonary Tuberculosis and Human Immunodeficiency Virus patients in Oyo state, Nigeria.

SOCIODEMOGRAPHIC CHARACTERISTICS

1. Serial number:
2. Patients name:
3. Sex: (1) Male [ ] (2) Female[ ]
4. Age group: (1) 15-24[ ] (2) 25-34 [ ] (3) 35-44[ ] (4) 45-54 [ ] (5) 55-64[ ] (6) 64+[ ]
5. Marital status: (1)Single [ ] (2) Married[ ]
6. Educational status: (1)None [ ] (2) Primary[ ] (3) Secondary [ ] (4)Tertiary [ ]
7. Ethnicity group: (1) Yoruba [ ] (2)Hausa [ ] (3) Ibo [ ] (4) Others [ ]
8. Religious group: (1)Christian [ ] (2) Islam[ ] (3) Others [ ]
9. Occupation: (1)Employed [ ] (2) Unemployed[ ]
10. Income per month: (1)No earner [ ] (2) 18,000[ ] (3) N18,000+ [ ]
11. Distance to health facilities : (1) Less than 5km [ ] (2) 5km or more than[ ]
12. Address of patient:

DIAGNOSIS AND FOLLOW UP :

14. Smear result before treatment: (1)'SC'[ ](2) '+'[ ](3)'2+'[ ](4) '3+'[ ](5)'0' [ ] (6) 'Not done'[ ]
15. Chest radiograph before treatment: (1) Suggestive [ ](2)Non-suggestive[ ] (3)Not done[ ]
16. Smear follow up 2/3 months: (1)'SC'[ ](2) '+'[ ](3)'2+'[ ](4) '3+'[ ](5)'0' [ ] (6)'Not done'[ ]
17. Smear follow up 5 months: (1)'SC'[ ](2) '+'[ ](3)'2+'[ ](4) '3+'[ ](5)'0' [ ] (6) 'Not done'[ ]
18. Smear follow up 7 months: (1)'SC'[ ](2) '+'[ ](3)'2+'[ ](4) '3+'[ ](5)'0' [ ] (6) 'Not done'[ ]

19. Treatment outcome: (1)Cure[ ](2) Treatment completed[ ](3) Treatment failure[ ] (4) Died[ ](5) Default [ ](6) transfer out[ ]

20. Hiv counselling and testing (HCT) (1)Yes [ ] (2) No [ ]

21. HIV screening result: (1) Reactive [ ] (2) Non reactive

TREATMENT :

22. Date of registration:

21. Type of patient: (1)New, "N"[ ] (2) Relapse, "R"[ ] (3) Treatment after failure, "F"[ ] 4) Treatment after default, "RAD"[ ] (5) Transfer in, "T"[ ] (6) Other Previously treated, "O"[ ]

23. Site of disease: (1)Pulmonary [ ] (2) Extra-pulmonary[ ]

24. Health facility:

25. Year of treatment:

26. Treatment Unit:

27. The person supporting the patient:

28. Date treatment started for the patient:

29. Quarter of commencing treatment: (1) Quarter 1[ ](2) Quarter 2[ ](3) Quarter 3 [ ] (4) Quarter 4[ ]

30. Treatment regimen for the patient: (1) CAT 1 [ ] (2) Cat 2 [ ]

31. Date treatment completed:

32. TB/HIV co-infection: (1)Yes[ ](2) No [ ]

33. Commenced on Anti retroviral therapy: (1)Yes [ ](2) No [ ]

34. Commenced on Cotrimozaxole prophylaxis: (1)Yes [ ](2) No [ ]

OUTCOME VARIABLES

35. Cured (1)Yes[ ](2) No [ ]

36. Treatment completed (1)Yes[ ](2) No [ ]

37. Treatment failure (1)Yes[ ](2) No [ ]

38. Default (1)Yes[ ](2) No [ ]

39. Died (1)Yes[.](2) No [ ]

40. Transfer out (1)Yes[ ](2) No [ ]

DEPARTMENT OF EPIDEMIOLOGY, MEDICAL STATISTICS & ENVIRONMENTAL HEALTH

FACULTY OF PUBLIC HEALTH

COLLEGE OF MEDICINE

UNIVERSITY OF IBADAN, NIGERIA.

elephone: (234)-2-2413906, 8103168
irect Lines)
34)-2-2410088 Ext. 2661
AX: (234)-2-2413545, 2413906
mail: emseh@skannet.com

Ag Head: Dr. Ikeoluwapo O. Ajayi

20th March, 2012.

The Program Manager
TB & Control, Ministry of Health
Oyo State.

Dear Sir,

LETTER OF INTRODUCTION

Dr. Oladimeji, Olanrewaju is a post graduate student of the Department of Epidemiology and Medical Statistics, Faculty of Public Health, University of Ibadan.

He is currently doing his research work on ***"Outcome of daily directly observed therapy short-course among pulmonary tuberculosis and human immunodeficiency virus co-infected patients in Oyo state, Nigeria."***
He requires your ethical approval in carrying out his research using tuberculosis patients' records in tuberculosis clinics and treatment centres in Oyo state.

Kindly give him necessary assistance within your jurisdiction.

Thank you in anticipation of your favourable response.

Yours sincerely,

Dr. Babatunde, Adedokun

DEPARTMENT OF EPIDEMIOLOGY, MEDICAL STATISTICS & ENVIRONMENTAL HEALTH
FACULTY OF PUBLIC HEALTH
COLLEGE OF MEDICINE
UNIVERSITY OF IBADAN, NIGERIA.

elephone: (234)-2-2413906, 8103168
Direct Lines)
(34)-2-2410088 Ext. 2661
AX: (234)-2-2413545, 2413906
mail: emseh@skannet.com

Ag Head: Dr. Ikeoluwapo O. Ajayi

20th March, 2012.

The Program Manager
TB Control, Ministry of Health
Oyo State.

Dear Sir,

LETTER OF INTRODUCTION

Dr. Oladimeji, Olanrewaju is a post graduate student of the Department of Epidemiology and Medical Statistics, Faculty of Public Health, University of Ibadan.

He is currently doing his research work on *"Outcome of daily directly observed therapy short-course among pulmonary tuberculosis and human immunodeficiency virus co-infected patients in Oyo state, Nigeria."*
He requires your ethical approval in carrying out his research using tuberculosis patients' records in tuberculosis clinics and treatment centres in Oyo state.

Kindly give him necessary assistance within your jurisdiction.

Thank you in anticipation of your favourable response.

Yours sincerely,

Dr. Babatunde, Adedokun

DEPARTMENT OF EPIDEMIOLOGY, MEDICAL STATISTICS & ENVIRONMENTAL HEALTH

FACULTY OF PUBLIC HEALTH

COLLEGE OF MEDICINE

UNIVERSITY OF IBADAN, NIGERIA.

elephone: (234)-2-2413906, 8103168
irect Lines)
34)-2-2410088 Ext. 2661
AX: (234)-2-2413545, 2413906
nail: emseh@skannet.com

Ag Head: Dr. Ikeoluwapo O. Ajayi

20th March, 2012.

The Medical Adviser
Damien Foundation
Lyoganku Ibadan, Nigeria

Dear Sir,

LETTER OF INTRODUCTION

Dr. Oladimeji, Olanrewaju is a post graduate student of the Department of Epidemiology and Medical Statistics, Faculty of Public Health, University of Ibadan.

He is currently doing his research work on *"Outcome of daily directly observed therapy short-course among pulmonary tuberculosis and human immunodeficiency virus co-infected patients in Oyo state, Nigeria."*
He requires your ethical approval in carrying out his research using tuberculosis patients' records in tuberculosis clinics and treatment centres in Oyo state.

Kindly give him necessary assistance within your jurisdiction.

Thank you in anticipation of your favourable response.

Yours sincerely,

Dr. Babatunde, Adedokun

foundation damien

April 2nd, 2012

Dr. Oladimeji, Olanrewaju
Dept. of Epidemiology and Medical statistics,
Faculty of Public Health,
University of Ibadan,
Nigeria.

RE: APPROVAL IN USING TB PATIENTS' RECORDS FOR YOUR STUDY

Sequel to your request which we subsequently made contact with the Headquarter in Belgium following review of your study proposal by the team in Field and Clinical-Monitoring & Evaluation Unit.

I wish to convey Damien foundation Belgium – Nigerian TB project's approval for data collection in all the Tuberculosis clinics and treatment centres in both Government and Private Health Facilities supported by our organization on ***"Outcome of daily directly observed therapy short-course among pulmonary tuberculosis and human immunodeficiency virus co-infected patients in Oyo state, Nigeria."***

The TBL Supervisors in the Clinics and treatment centres will provide you with the reporting and recording forms you need to collect you data following the presentation of this letter.

The Country office is expected to be fully acknowledged and given a copy of your findings to be sent to the headquarter in Brussels.

Wishing you best of luck.

Yours sincerely,

Dr. Osman Eltayeb
DFB Country Representative & Medical Advisor
Ibadan- Nigeria

Damien Foundation Belgium -18 Adekoyejo Majekounmi Avenue- Iyaganku GRA, Ibadan – Nigeria
Tel: (234)-2-7517499, dfbng@yahoo.com

MINISTRY OF HEALTH

TBL .....DIVISION.....

.....

PRIVATE MAIL BAG NO. 5027, IBADAN, OYO STATE OF NIGERIA.

Your Ref No.....

Our Ref No....ADH/H248/VOL VI/108 Date; 10/04/2012

The Investigator,
Department of Epidemiology & Medical statistics,
Faculty of Public Health,
University of Ibadan,
Nigeria.

APPROVAL FOR THE USE OF TB PATIENTS' RECORDS FOR YOUR RESEARCH

Having gone through your request and study protocol titled ***"Outcome of daily directly observed therapy short-course among pulmonary tuberculosis and human immunodeficiency virus co-infected patients in Oyo state, Nigeria."***

I wish to inform you that the state team in Tuberculosis and Leprosy unit has given you approval to use the tuberculosis patients records from 2009 - 2010 in all the Tuberculosis clinics and treatment centers in Oyo state.

In case you meet any challenges the state team will provide necessary assistance.

We will be looking forward to receive copy of you research findings.

10/4/12

Dr. O. M. Lawal
State TBL Programme Officer
For Director PHC and Disease Control

" We can't fight AIDS unless we do much more to fight TB as well."

Nelson Mandela

Bangkok, July 15, 2004

Source: From the CREATE project

Nelson Mandela, Former President of South Africa and Nobel peace prize winner 1993