CURRENT PREVALENCE AND TRENDS OF MYCOBACTERIUM TUBERCULOSIS AND HIV INFECTIONS AND CO-INFECTIONS AMONG PATIENTS VISITING KUYU HOSPITAL, GARBA GURACHA TOWN, NORTH SHOA, OROMIA, ETHIOPIA

MSc. THESIS

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Current Prevalence and Trends of *Mycobacterium Tuberculosis* and HIV Infections and Co- infections among Patients Visiting Kuyu Hospital, Garba Guracha Town, North Shoa, Oromia, Ethiopia

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By

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We hereby certify that we have read and evaluated this MSc Thesis entitled "Current Prevalence and Trends of *Mycobacterium tuberculosis* and HIV Infections and Co-Infections among Patients Visiting Kuyu Hospital, Garba Guracha Town, North Shoa, Oromia, Ethiopia.'' prepared under our guidance by Dereje Seyoum Weyessa.We recommend that it be submit as fulfilling the Thesis requirements.

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As a member of Board of Examiners the Final MSc Open Defense, we certify that we have read and evaluated the thesis prepared by Dereje Seyoum Weyessa and examined the candidate we recommend that the Thesis be accepted as fulfilling the Thesis requirement for the degree of MASTER OF SCIENCE in Biology.

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Final approval and acceptance of the Thesis is contingent upon the submission of the final copy of the Thesis to the Council of Post Graduate Directorate (CPGD) through the Departmental Graduate Committee (DGC) of the candidate's major department.

DEDICATION

This thesis is dedicated to my late mother Kefene Bechew who planted in me the desire of self reliance and hope; she passed away without seeing the fruitful success of my life. Without her help I wouldn't have the opportunity to reach the level I have reached now.

STATEMENT OF THE AUTHOR

I declare that this thesis is my bonafide work and all sources of materials used in this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for M.Sc. degree at Haramaya University and is deposited at the University Library to be made available to borrowers under rules of the Library. I also declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma or certificate. Brief quotations from this thesis are

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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Acid Fast Bacilli
ART	Anti Retroviral treatment
DHSS	Department of Health and Social Sciences
DOTS	Directly Observed Treatments
EPTB	Extra pulmonary Tuberculosis
FMHO	Federal Ministry of Health Organization
HAART	Highly Active Antiretroviral Therapy

HIV	Human Immunodeficiency Virus
IEC	Information Education communication
LTBI	Latent Tuberculosis Infection
MDR	Multi Drug Resistant
MOH	Ministry of Health
MTB	*Mycobacterium tuberculosis*
OI	Opportunistic Infection
PPD	Purified Protein Derivatives
PTB	Pulmonary Tuberculosis
RR	Relative Risk
TB	Tuberculosis
UNAIDS	United Nations and programme on HIV/AIDS
WHO	World Health organization

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Current prevalence and trends of mycobacterium tuberculosis and HIV infection and co-infection among patients visiting Kuyu Hospital, Garba Guracha Town, North Shoa, Oromia, Ethiopia

ABSTRACT

HIV greatly increase the number of TB patients, which in turn increases TB transmission from family member and community members.

The study was conducted in Kuyu Hospital from February-May 2017 with the objectives of determining the prevalence and trends of HIV, TB and their co-infections and associated risk factor among patients visiting Kuyu Hospital. A total of 384 patients of all age were enrolled in the study and out of this, the number of males and females were 196 and 188, respectively. Sputum and blood sample were collected by using coded clean, applicator stick and finger puncture or lancet respectively. D*escriptive statistics were computed to describe the data obtained both from survey and laboratory analysis. The data was analyzed by SPSS version 20. The overall HIV sero prevalence rate was 6.50%. The highest rate of HIV prevalence was observed in the age group of >35 years old which accounts 16 (8.60%). The highest HIV infection was observed in females 14(7.40 %) than males 11 (5.61%). The lowest mean value of CD_4T-cell /mm^3 266.64±51.3 was observed in males where as the highest 474±78.5 was observed in females. 8 patients with CD_4 <300 T-cell/mm^3 of HIV patients were started ART service where as 4 and 13 patients with CD_4 300-500Tcell/mm^3 and CD_4 >500Tcell/mm^3 were not started ART service respectively. The overall prevalence of TB was 39(10.20%) and from this, the sex distribution was 25(12.75%) for males and 14(7.44%) was for females. The highest (12.75%) prevalence of TB was seen in males*

than in females (7.44%). The highest 24(12.90%) frequency of TB infection was found in the age group of >35years old and the lowest 1(6.66%) was observed in the age group of <15 years old. The overall TB-HIV co-infection was Eight (2.08%) and out of this, the highest 6(3.19%) percentage of TB-HIV co-infection was registered in males and females were taken less number 2(1.06%) as compared to males. The result of this study showed that TB and HIV were the major public health problem, so health education should be given for the community on mode of transmission of TB, prevention of HIV infections and co-infections.

Keywords. *CD_4T-cell, HIV/AIDS, Co-infection, Risk factors, Tuberculosis*

1. INRODUCTION

Tuberculosis (TB) has existed in human since antiquity and has been reported as the most common expressive and infective respiratory diseases that results from the inhalation of air droplets laden with tubercle *Mycobacterium tuberculosis* (Pennap *et al*., 2011). In addition, the disease may be occasionally caused by other organisms of *Mycobacterium tuberculosis* complex which causes tuberculosis in humans. *Mycobacterium* includes *M. tuberculosis*, *M. africanum*, *M. bovis*, *M. canetti* and the rare, *M. microti*. The most important sources of infection are a person with smear-positive pulmonary tuberculosis (SPPTB) (Shargie, 2006).

The M .tuberculosis infection occurs through inhaling an aerosol droplet that is generated when patient with PTB coughs, talks, sneezes and spits. For *M*. bovis, it can be transmitted through drinking of raw milk that may infect the tonsil presenting as scrofula (cervical lymphadenitis), or the intestinal tract, causing abdominal tuberculosis (WHO, 2004). When a healthy individual inhale bacilli, the first implant is done in the lungs at bronchiole or alveolar level. The bacilli multiply and produce the primary lesion there (Bass, *et al*., 1990). Some bacilli pass into the hilary lymph nodes causing lymph node enlargement. Once a person develops the diseases, PTB, there will be several suggestive clinical features, especially two weeks or above duration of cough with sputum production and weight loss are important for the diagnosis of PTB. Others respiratory symptoms like chest pain, haemoplysis, breathlessness and/or constitutional symptoms like fever, night sweats, tiredness, loss of appetite can also occur (WHO, 2004)

Acquired Immuno-deficiency syndrome (AIDS) is caused by human immune deficiency virus (HIV). There are two types of HIV, HIV-1 and HIV-2. Both types of HIV are transmitted through unprotected sexual intercourse, transfusion of contaminated blood, sharing of contaminated needles and from infected mother to her infant during pregnancy, childbirth and breastfeeding (Seoane *et al*., 2008).

The unique feature in the pathogenesis of HIV/AIDS is that the primary target cell for HIV is immune cells bearing CD_4^+ marker at their surface. With the infection of HIV,

there will be gradual decrease of human immune cells bearing CD_4^+ antigen receptor, the most important being T helper cells (CD_4^+ T- Cells), B lymphocytes, macrophage and natural killer cells leading to development of wide varieties of opportunistic infections (OIs) i.e, severe infections induced by agents that rarely cause serious diseases in immune competent individuals. In this way, AIDS related mortality and morbidity, which is significantly higher in number as compared to other diseases, is actually due to OIs rather than HIV itself (FMOH, 2008).

As more and more CD_4^+ T-lymphocytes become damaged the immune system becomes more and more weakened (Madigan *et al*., 2005). It is strongly believed that the higher the number of CD_4^+ T- lymphocytes in the system, the active and more robust is the immunological responses of the system (Mermine *et al*., 2006). However, as the HIV infection progressively weakens the person's immune system, the person becomes more susceptible to opportunistic infections and the individual can develop clinical signs and symptoms such as oral thrush, cough and diarrhea (Reynold, 2006). Although HIV is the causative agent in AIDS, most of the morbidity and mortality seen in AIDS patient's results from opportunistic infections, which take advantage of declined cell- mediated and humoral defense mechanisms (Smith, 2006).

The HIV infection has globally claimed over 20 million lives; and currently over 40 million people carry the infection leading to AIDS has now emerged as a major public health problem. The major cause of morbidity and mortality in HIV infected persons are due to different opportunistic bacterial infections. Opportunistic bacterial infections pose one of the most important public health problems in HIV sero-positive individual because of decreased immune status (Wimantikit, 2001). Almost one third of HIV infected patients have tuberculosis. The rate of infection differs among the population residing in different geographical regions. The HIV/ADS pandemic has substantially altered the epidemiology of tuberculosis. The results of various studies have documented that persons co-infected with *Mycobacterium tuberculosis* and HIV have a 5-8% annual risk of developing active TB (WHO, 2006).

TB-HIV co-infections has fatal consequences as TB becomes the leading cause of death in HIV infected individual and patients with acquired immunodeficiency syndrome (AIDS). HIV lowers the host's immune responses to *Mycobacterium tuberculosis*. The life time risk of developing active TB in HIV infected individual is 10% per year compared with the life time risk of 5-10% in individual without HIV. As a result, the TB case notification rate (CNR) has increased four to six fold in sub-Saharan Africa (Kassu *et al*., 2007).

In Ethiopia, efforts of controlling tuberculosis began in the early 1960s with the establishment of TB centers and sanatorium in three major urban areas of the country (FMOH, 2008). A nation-wide survey conducted in Ethiopia between 1987 & 1990 showed that the annual risk of TB infection was 1.4% which was lower than the 3.0% reported in 1953-1955 (Munche, 2003). In 1992, a standardized TB prevention and control program, incorporating the short course directly observed therapy (DOTs) was started as a pilot program in Arsi and Bale Zones of Oromia Region (MOH, 2008).

Ethiopia is one of 22 high burden countries (HBCs) and TB remains one of the leading causes of mortality. According to the (WHO, 2014) report, the prevalence and incidence of all forms of TB are 211 and 224 per 100,000 of the population, respectively. Excluding HIV related deaths; in 2013 TB mortality was estimated to be 32 per 100,000 of the population. About 13% of all new TB cases are also HIV co-infected. Moreover, Ethiopia is also one of the high TB/HIV and multidrug resistant TB (MDR TB) burden countries. Among TB patients about 11% were HIV co-infected. In the present study area there is no research done on the tuberculosis and HIV infections and co-infections among patients and therefore, the study was initiated with the following objectives.

General objectives of the study

To assess the prevalence of *Mycobacterium tuberculosis* and HIV infection and co-infections among patients visiting Kuyu Hospital,GarbaGuracha town, North shoa,Oromia,Ethiopia

Specific objectives of the study were:

1. To determine prevalence and trends of *Mycobacterium tuberculosis* infection among patients visiting Kuyu Hospital, Garba Guracha Town, North Shoa, Oromia, Ethiopia.
2. To determine prevalence and trends of HIV infection among patients visiting Kuyu Hospital.
3. To determine the association between risk factors and the prevalence of HIV/AIDS and infections among patients visiting Kuyu Hospital.

2. LITERATURE REVIEW

2.1. Etiology and Mode of Transmission of Tuberculosis

Tuberculosis is a bacterial disease and often deadly infectious disease caused by micro bacterium tuberculosis in humans. The mode of transmission of mycobacterium species from person to person is well established. Virtually new infections with mycobacterium Tuberculosis are acquired via airborne transmissions. The sources of infections are

persons with Tuberculosis of the lung who have coughing and sneezing. Coughing and sneezing produce air droplets containing bacilli. Persons in the same household, or who are in frequent contact with an infections patient have the greatest risk of being exposed to the bacilli (Murray and Lopez, 1996).

It is thought that the rates of new Tuberculosis infections and deaths per capita have probably been falling globally for several years now. However, the total number of new Tuberculosis cases is still rising. The majority of the morbidity and deaths occurred due to TB in the world is in Africa of which the share of Ethiopia is really quite big. However, recent evidence demonstrates that TB prevalence (distribution) and TB death rates are globally decreasing after having reached a peak. Since 2005, the TB incidence rate is in decline in all six WHO regions (FMOH, 2008).

In Ethiopia, TB had been identified as one of the major public health problems in the last five decades. And it is also a well known disease that is spatially distributed in different regions of our country. The 2007 WHO report indicates that the number of TB cases largely increased in Ethiopia with many clinical episodes and deaths occurring annually. Ethiopia is ranking 4^{th} among 22 high TB burdened countries and is leading in Africa. Ethiopia had an estimate of 314,267 TB cases, with incidence rate of 378 cases per 100,000 populations in the year 2007 (WHO-2007).

According to the 2008 WHO estimate, the incidence of TB in Ethiopia was 541 per 100,000 populations, and the Federal Ministry of Health (FMOH, 2007) hospital statistical data reports that TB is the leading cause of morbidity, the second cause of death and the third cause of hospital admission in Ethiopia. These estimates are not sufficient because of inadequate TB cases reporting in most endemic countries and lack of national wide TB distribution pattern. Therefore, accurate estimates of TB distribution are needed for further planning, implementation and evaluation of TB control program. Hence, there is need for knowing the distribution of TB to optimize the use of limited resources in high risk areas. HIV infection has been identified as a major risk factor in developing TB. This is because infection with HIV destroys the immune defense mechanisms of the body and is, therefore, an important risk factor for

the development of TB. It is estimated that 50-60% of HIV infected people will develop TB disease in their life time in contrast with HIV negative persons, whose life time risk is only 10% (FMOH, 2008).

HIV pandemic presents a massive challenge to the control of TB. The synergy between TB and HIV/AIDS is strong in high HIV prevalence populations. Tuberculosis is a leading cause of morbidity and mortality, and HIV is fuelling the Tuberculosis epidemic in Ethiopia. This unprecedented scale of the epidemic of HIV related TB demands concerted and urgent action. HIV increases susceptibility to infection with micro-bacterium TB, the risk of progression to TB disease, and the incidence and prevalence of TB. It also increases the likelihood of re-infections and relapses of TB and in general TB transmission intensity and temporal variation in Ethiopia is mainly determined by population density, prevalence of HIV diseases and not proportionally allocated of health facilities. Based on these variables variation used to further clarify TB distribution pattern (FMOH, 2008).

The risks of morbidity and mortality associated with TB particularly in semi-arid and high-land regions vary spatially and temporally. In addition to this, the levels of TB risk and its transmission intensity vary from region to region. For instance, Oromia region is one of the affected regions as compared to other regions in our country. According to FMOH report in 2007 more than one-third (36.82%) of the TB patients in Ethiopia is in Oromia region. The eradication of TB is the greatest public health challenge for this region. Knowledge about the distribution and clustering of the disease is the way to reduce its prevalence. The basic problem in geographical distribution of TB disease for North Shoa Zone, Oromia region, is identification of areas with exceptionally high prevalence to test and to identify the reasons behind high prevalence of the disease. In other words, the problem is to identify hotspot areas or an elevated cluster for events in each woreda (Aragaw Melesachew, 2014).

Disease cluster investigation in space and or time provides information to public health policy makers. The identification of geographical areas with ongoing disease transmission, using spatio-temporal statistical analysis, has become indispensible. Spatio-temporal clustering methods are concerned with the identification of greater

density of occurrences of a phenomenon in certain places and at certain times. Identification of disease clustering is a major interest of epidemiologists; for an effective disease management it is essential to know when, where and to what degree a disease is present. TB is the leading cause of morbidity and mortality in Ethiopia, accounting for more than thousands of cases and thousands of deaths occurring annually. The risks of morbidity and below 5 years children mortality associated with TB are characterized by spatial variation across the country. Consequently, we recognize the spatial variation of TB by means of spatial autocorrelation (FMOH, 2008).

2. 2. Global Epidemiology of Tuberculosis

According to WHO estimation, nearly one third of the world's population is infected with Tuberculosis bacteria which are at risk of developing active disease, 8.4 million people develop active tuberculosis disease every year and 2.3 million die of the disease (MOH, 2002) TB accounts for 2.5% of the global burden of diseases, for 26% of preventable death and leading infections cause of death among young women (WHO, 2000) and among the top ten causes of global mortality (Jans, 1998).

As revealed in WHO monitoring and surveillance project record, 68 million tuberculosis cases since 1980 and 10 million new smear positive cases since 1997 were reported. Approximately 80% of tuberculosis cases are from 22 countries the highest incidence rate found in Africa &East Asia (kruner, 1998). In Ethiopia, according to the Ministry of health report, there were 94,954 of all forms of tuberculosis cases, and 33,028 of new smear-positive pulmonary cases from directly observed short course chemotherapy (DOTS) implementing areas by the end of 2001. TB affects individuals of all ages and both sexes with in every socio-economic group in the population. There is however groups, which are more vulnerable to develop tuberculosis disease in a given community (MOH, 2002).

2.3. TB in Ethiopia

In Ethiopia, TB had been identified as one of the major public health problems. And it is also a well known disease that is spatially distributed in different regions of our country. The 2007 WHO report indicates that the number of TB cases largely increased in Ethiopia with many clinical episodes and deaths occurring annually. Ethiopia is ranking 4 th among 22 high TB burdened countries and is leading in Africa. Ethiopia had an estimate of 314,267 TB cases, with incidence rate of 378 cases per 100,000 populations in the year 2007 (WHO, 2007). According to the 2008 WHO estimate, the incidence of TB in Ethiopia was 541 per 100,000 populations, and the Federal Ministry of Health (FMOH, 2007) hospital statistical data reports that TB is the leading cause of morbidity, the second cause of death and the third cause of hospital admission in Ethiopia. These estimates are not sufficient because of inadequate TB cases reporting in most endemic countries and lack of national wide TB distribution pattern. Therefore, accurate estimates of TB distribution are needed for further planning, implementation and evaluation of TB control program. Hence, there is need for knowing the distribution of TB to optimize the use of limited resources in high risk areas (FMOH, 2007).

2.4. TB Diagnosis

TB diagnosis Presumptive diagnosis of TB is commonly based on the finding of acid fast bacillus (AFB) on microscopic examination of a diagnostic specimen such as a smear of expectorated sputum or of tissue (for example, a lymph node biopsy or fine needle aspiration) (Hudson *et al*.,2000; Johnson and Ellner ,2006). Definitive diagnosis depends on the isolation and identification of MTB from a diagnostic specimen (in most cases a sputum) using Mycobacterium Culture on Lowenstein-Jensen or Middle brook 7H10 media by incubating at 370 C under 5% CO2. In today's laboratories, the uses of liquid media with radiometric growth detection and mycobacterium growth indicator tubes (MGIT) have replaced the traditional methods of isolation on solid media. These new methods have decreased the time required for isolation to 2 to 3 weeks compared to the 8 weeks required for the traditional culture methods. Advances in knowledge about genetic structure of tubercle bacillus helped develop gene probes and gene

amplification methods for identification and detection of tubercle bacillus, from culture or directly from clinical specimens and molecular detection of drug resistance. While the gene probes can help in rapid identification of isolates, gene amplification methods (eg.PCR) developed for diagnosis of TB is demonstrably highly sensitive and detection can be done within hours (Katoch, 2004).

Alternative specimens for diagnosis of TB can be aspirated effusions, blood for cultures, early morning urine for TB culture and bone marrow biopsy (Hudson *et al*., 2000; Johnson and Ellner, 2006). Skin testing with PPD is most widely used in screening for MTB infection. The test is of limited value in the diagnosis of active TB because of its low sensitivity and specificity (Johnson and Ellner, 2006). False-negative reactions are common in immune suppressed patients. Positive reactions are obtained when patients have been infected with MTB but do not have active disease and when persons have been sensitized by non-tuberculosis mycobacterium or Bacilli Chalmette-Guerin (BCG) vaccination. In the past years, new diagnostic methods like Enzyme-linked immunospot (ELISPOT) and Enzyme-linked immune sorbent assay (ELISA) for the diagnosis of infection with MTB have been developed. The ELISPOT and ELISA detect the secretion of γ-interferon by mononuclear cells in venous blood, specific for MTB peptides, ESAT-6 and CFP-10. These tests are more sensitive and specific for the diagnosis of MTB infection and are superior to the tuberculin skin test (TST) in patients with immune suppression (Ferrara et al., 2006). ESAT-6 and CFP-10 are peptides that mediate MTB virulence (Brodin *et al*., 2005).

Radiographic Procedures and clinical sign and symptoms can also be used in the process of diagnosing TB. The initial suspicion of pulmonary TB is often based on abnormal chest radiographic findings in a patient with respiratory symptoms (Johnson and Ellner, 2006). Of the clinical features, cough is reported less frequently in HIV patients, probably because of weak cough reflex due to debilitated condition of the patients in advanced disease, absence of cavitations, and less end bronchial irritation (MOH, 2005b). The following are the criteria to diagnose the various clinical forms of TB: 1. Pulmonary smear positive (PTB+): at least 2 sputum smear examinations positive for AFB, or one sputum positive for AFB and radiographic abnormalities consistent with

active pulmonary TB, or one sputum specimen positive for AFB and culture positive for M tuberculosis. 2. Pulmonary smear negative (PTB-): at least three sputum examinations negative for AFB, radiographic abnormalities consistent with active pulmonary TB and not responding to a course of general antibiotics, or diagnosis based on positive culture but negative AFB sputum examinations. Others consider the patient is PTB- when three sputum smear examination is negative and bronchoscopes samples (BAL) show 'scanty' to 1+ positivity or if two of any samples were positive after concentration (Harries *et al*., 2001).

Extra-pulmonary tuberculosis (EPTB): one culture-positive specimen from an extra pulmonary site, or histological evidence, or strong clinical evidence consistent with active extra-pulmonary TB (MOH, 2005b). Tuberculosis may affect any organ system. Extra pulmonary TB results from hematogenous dissemination of tubercle bacilli with incomplete immunologic control of the disease, either during primary infection or because of reactivation from a site of latent infection. In order of frequency, extra pulmonary tuberculosis involves the lymph nodes (40% of all EPTB), the pleura, the genitourinary tract, bone and joints, the meninges and the peritoneum (Johnson and Ellner, 2006).

2.5. Human Immunodeficiency Virus (HIV) Infection attacks Immune System via the CD_4 T-Cell

Human immunodeficiency virus (HIV), the agent that cases acquired immunodeficiency syndrome (AIDS), is classified as members of the *Lent virus* sub family of *Retroviruses. It is* isolated in 1983. There are two main types HIV. HIV type one (HIV-I): the most prevalent though out the world. HIV type two (HIV-II) is prevalent in West Africa. Both cause AIDS and the routes of transmission are the same. However, HIV –2 causes AIDS much more slowly than HIV-1(Seoane *et al*., 2008) it is a disease that reduces progressively the effectiveness of the immune system and leaves the patient susceptible to opportunistic diseases. As HIV infection progresses, CD_4 lymphocytes decline by about 50–80 cells/mm3/year, and the immune system becomes less able to prevent the growth and local spread of *M. tuberculosis*. Pulmonary TB (PTB) remains, especially in adults, the commonest form of TB, but its presentation depends on the

degree of immunosuppressant. The clinical pictures, sputum-smear results and chest X-rays are often different in the early stage of HIV infection (CD_4>350 cells/mm3) and the late stage (CD4<200cells/mm3) (CDC, 2012).

The clinical presentation of TB cases in early HIV infection is similar to that of individuals without HIV infection, resembling post-primary PTB, that is, with positive sputum smears (defined as two or more initial smear examinations that are positive for acid-fast bacilli (AFB), or one plus consistent radiographic abnormalities) and often with cavities in the chest X-ray. In contrast, the clinical presentation in late HIV cases resembles primary (PTB): the sputum smear is often negative and radiological infiltrates are present instead of cavities (Elliott A *et al*, 1995).

2.6. Global Epidemiology of HIV/AIDS

It has been estimated that at list 10.7 million persons were co-infected with HIV and *M. tuberculoses* 1997, and those HIV -1 infected patients represent 8% of the world wide total of TB causes. More than 30% of TB causes in Africa are also co-infected with HIV. During HIV infection, mal nutrition and increased risk of developing TB has been found in males, in those living in areas such as Sub-Saharan countries, social deprivation are factors (Selwyn *et a*l.,1992). The number of people living with HIV /AIDS has risen from around 8 million in 1990 to nearly 40 million in 2006, is still growing. Around 63% of people living with HIV are in Sub Saharan Africa. During 2006, around 4 million adults and children became infected with HIV, the virus that causes AIDS (WHO, 2006).

The 2006 also shows around 3 million deaths from aids, despites recent improvements in access to antiretroviral treatment. The incidence of TB does not vary according to the route of HIV transmissions, but the risk of developing TB after exposure to an infectious contact has been estimated to be 515% per year in HIV- infected patients as compared with 510% during the live time of HIV- negative patients (Raviglione *et al* .,1997) The TB mortality rate also increased at the beginning of the HIV pandemic in areas hyper-endemic for both HIV and TB, particularly in Africa and Asia, Where TB can develop early after exposure to an infectious contact even in non-severely immune compromised patients (WHO, 2006).

2.7. HIV/AIDS in Ethiopia

Ethiopia is the most seriously affected by HIV/AIDS in the world. The earliest evidence of HIV infection in Ethiopia was found in 1984, with the first case reported in1986. Since 1984, accumulative total of 107,575 AIDS cases were reported to the Ministry of Health. There were approximately 45,200 (36,500-55,200) AIDS related deaths in 2013 and about 898,400 (770,700-1,048,500) AIDS orphans in the same year. HIV adult prevalence is estimated at 1.5% in 2011, the year in which the last Ethiopian Demographic Health Survey (DHS) was conducted (DHS, 2011).

However prevalence varies according to age, sex, gender and geographical location. According to the 2011 DHS adult prevalence was almost twice as high among females compared to males at 1.9% versus 1.0% respectively. The distribution of HIV prevalence also varies by age, peaking earlier in females in the 30-34 years age group compared to 35-39 years in males (CSA, 2012). Looking at the younger age groups it can be seen that young women have a two to six fold higher HIV prevalence than young men (ranging from 15-17 years: 0% males vs. 0.2% females to 20-22 years: 0.1% males vs. 0.6% female) (FHAPCO,2014).

The major avenue of transmission of HIV infection in Ethiopia is heterosexual intercourse. The practice of multiple sexual partnerships, particularly in urban areas is a major contributory factor to the rise in HIV prevalence. Illegal medical practices and harmful traditional practices are also potential routs of transmission. It is believed that 30- 40% of the babies born to HIV positive mothers are likely to contract the virus (Raviglione *et al*., 1997).

2.8. HIV Diagnosis

For HIV diagnosis currently, different testing methods can be used. These methods detect the presence of infection by detecting one of the following: HIV antibody, HIV antigen, combined HIV Ab/Ag, HIV viral nucleic acid and HIV virus by viral culture method. HIV antibody detection can be done using ELISA methods, rapid tests and western blot assay methods (CDC, 2012). For surveillance as well as diagnostic purpose in developing countries, WHO recommends alternative testing strategies using combination of ELISA or rapid tests (WHO, 2001).

As stated above, HIV infection may also be diagnosed through the direct detection of virus. Because of its cost, virus detection is only necessary in certain situations. Alternatively, assays for the detection of HIV p24 antigen are available. Although the p24 antigen ELISA has generally been replaced by the more sensitive nucleic acid detection assays, fourth generation antibody screening tests incorporate p24 antigen detection in addition to HIV antibody detection, to shorten the "diagnostic window" period (CDC,2012). The detection of viral nucleic acid (i.e. of virus genome) may be achieved by different laboratory techniques. These methods may be used to detect either proviral cDNA in leucocytes or viral RNA in the cell-free compartment (Preiser and Korsman, 2006). The close relationship between clinical manifestations of HIV infection and CD_4+ T cell count has made measurement of the latter a routine part of the evaluation of HIV-infected individuals. The CD4+ T cell count provides information on the current immunologic status of the patient (Fauci *et al*., 2001). Patients with HIV infection should have CD_4+ T cell measurements performed at the time of diagnosis and every 3 to 6 months thereafter (DHSS Panel, 2005). CD_4+ T cell count is stated in treatment guidelines for determining when to start or change ART and for deciding when to initiate prophylaxis for opportunistic infections (MOH, 2005c).

According to most guidelines, a CD_4+ T cell count 25% is an indication for considering a change in therapy (Fauci *e t al.,* 2001). In the Ethiopian setting currently clinical symptoms and CD_4+ T-cell count of >200 cells/mm^3 are in use for initiating anti retroviral treatments (MOH, 2005C).In untreated HIV patients or in patients in whom therapy has not adequately controlled virus replications ,CD_4+Tcells count falls below a critical level after a variable period and patients become highly susceptible to opportunistic disease (Fauci *et al*.,2001).Different opportunistic infections occur at different CD_4+Tcells levels in HIV/AIDS patients. Unlike most other opportunistic infections (OIS) associated with AIDS, TB can occur at relatively high CD_4+ counts (Lynn *et al.*, 2003).

2.9. TB-HIV Co-Pathogenesis

TB-HIV co-pathogenesis Infection with HIV constitutes the strongest risk factor for development of TB in subjects with latent MTB infection. Due to the high incidence of both HIV and MTB infection in the developing countries, TB has emerged as the most common opportunistic infection (OI) in HIV-infected patients worldwide (WHO, 2006a). Thus, the interaction of these two pathogens currently and in the future will potentiate morbidity and mortality associated with either. Globally, more than one-third of HIV positive individuals are co infected with MTB and 12% of AIDS deaths are attributed to TB (Raviglione, 2003; Corbett *et al*., 2003).

In Africa, HIV is the single most important factor determining the increased incidence of TB in the past 10 years (WHO, 2006b). HIV/AIDS accounted for 32% of the estimated 141,000 cases of tuberculosis in Ethiopia in 2005 (MOH, 2005a). The co pathogen city between MTB and HIV is best illustrated by the high susceptibility of the HIV-infected persons for reactivation of a remote TB infection or early progression of a newly acquired disease. This dual interaction is also demonstrated by the negative impact of TB on the natural history of HIV, which is characterized by increased incidence of clinical progression and increased mortality rates (WHO, 2006b; Gerard, 2000). An HIV-positive person infected with MTB has a 50 - 60% life time risk of developing TB disease as compared to HIV-negative person who has only 5-10% risk. HIV-infected persons who become newly infected with MTB rapidly progress to active TB disease. Clinical presentation of TB is also atypical and severe when immune suppression is advanced in TB-HIV co infected patients (Gerard, 2000).

The progressive loss of CD_4+ T cells in HIV-infected patients is the basis of increased TB incidence since CD_4+ T cells are considered to be the primary cellular component involved in immune protection against TB via their ability to produce IFN γ, activate macrophages, and kill infected cells (Flynn and Chan , 2001a; Ottenhoff *et al*., 2003). Furthermore, CD_4+ T cells are believed to be required either for primary activation of CD_8+ T cells or for the maintenance of immune protective CD_8+ T cells (Janssen *et al*., 2003; Shedlock and Shen , 2003; Sun and Bevan, 2003; Badri *et al*., 2001). Since,

MTB can spread through the air, the increase in active tuberculosis cases among dually infected people means more transmission of the TB germ, meaning more TB infections and disease in the whole population. Consequently, the HIV/AIDS epidemic is reviving an old problem in developed countries and exacerbating an existing one in the developing countries (Fauci *et al.,* 2001). For these reasons, it is believed that HIV increases the spread of TB. Active TB is most common in patients aged 25 to 44 years in developing countries. In these demographic groups, 20 to 70% of the new cases of active TB are in patients with HIV infection. This active TB often develops relatively early in the course of HIV infection and may be an early clinical sign of HIV disease (Fauci *et a*l., 2001). Clinical TB accelerates the progression of underlying HIV disease by stimulating HIV infected macrophages and CD_4+ lymphocytes to produce more viruses. A cohort study undertaken to assess the effect of TB on the natural history of HIV infection in patients from a high TB prevalence setting (Badri *et al*., 2001), demonstrated a significantly reduced survival and an increased frequency of AIDS-defining illness in HIV-infected patients with TB. The median time of progression to AIDS according to this study, in patients free of AIDS at baseline, was 6 months for tuberculosis cases compared to 14.5 months for patients with HIV but no TB (comparison group). Mortality rate was significantly higher in TB cases compared to the comparison group (Badri *et al*., 2001).

Furthermore, TB has been shown as one of the leading opportunistic diseases diagnosed in patients with AIDS as well as the most common cause of death in autopsied African patients with AIDS (Lynn *et al*., 2003). In one observational cohort study of HIV infected adults in South Africa (Day *et al*., 2004), viral load was compared between patients experiencing episode of TB and those non-TB control group. The result revealed that the mean HIV viral load was higher in the TB group than in the non-TB control group showing that an episode of TB could have some effect on HIV disease progression or HIV transmission at the population level (Day *et al*., 2004).

On the other hand, HIV positive patients with active TB, who receive anti-TB therapy and HAART, are just as likely as HAART-treated HIV-positive patients without TB to benefit from antiretroviral therapy (Hung, 2003). Although a causal link cannot be

established in an observational study, the above findings support the view that prolonged immune activation induced by tuberculosis leads to increased HIV replication and consequent accelerated disease progression (Badri *et al*, 2001).

2.10. Tuberculosis and HIV Co-Infection in Ethiopian

Varying HIV sero positivity rates among tuberculosis patients have been reported in different parts of the world and even within a country. Several studies done elsewhere globally have reported TB-HIV co-infection rates ranging from <1% up to as high as 65% (Kumari, 2005). Similarly, studies from Central, North and Southern part of Ethiopia revealed varying rates of HIV sero positivity in active TB patients ranging from 6.6% to 52.1% (Kefene *et a1*., 1990). On the other hand, very limited studies in Ethiopia tried to assess the immune status of patients when they develop active TB. Tuberculosis (TB) remains a major public health problem in Ethiopia (MOH, 2002).

This is exemplified by the statistics for 1994 where the number of patients notified under DOTS increased from 10,000 to about 100,000 in 2001, which has been a nearly 10 folds increment (MOH, 2002). More over nearly 4000 excess cases were detected in 2001 compared to 2000 of which 2500 were smear positive and the proportion of notified pulmonary cases that are smear positive has increased steadily from 27% in 1997 to 36% in 2001(WHO,2001). According to 2003 WHO monitoring and surveillance report, Ethiopia ranks 10th the globally, and estimated incidences of all forms of TB cases were 282. These Excess numbers of cases reported were probably reflects an increase in the underlying incidence of tuberculoses associated with the spread of HIV. However the most reliable way to determine the prevalence of tuberculosis infections in Ethiopia is by tuberculin testing with purified protein derivative (PPD) of the non-BCG vaccinated population. According to the tuberculin survey conducted from 1953 – 1955 by WHO, UNICEF and MOH in Ethiopia, among 609,321 people, tested net positive rate was 35.9% (Richard and Mogues, 1993).

Undeniably, HIV is the most powerful risk factor known for activation of latent Mycobacterium tuberculosis infection. For HIV infected person co-infected with *M tuberculosis,* the risk of developing active TB reaches 5–10% annually instead of the 5–10% life time risk for an individual not infected with HIV. This discrepancy is clearly

linked to the immunodeficiency caused TB, which can be due to either endogenous reactivation or exogenous reinjection (Hopewell and Chaisson , 2000).

HIV greatly increases the number of TB patients, which in turn increases TB transmission from family members (the highest TB transmission risk is from household contacts, such as children and HIV-positive partners) and community members (through contact in work-places, schools and hospitals) where there is a risk of nosocomial infections from both patients (whether HIV positive or negative) and health care workers. Moreover, the risk of MDR-TB transmission may be increased if effective and uninterrupted TB treatment is not ensured (Girde *et al*, 2000).

As HIV infection progresses, CD_4 lymphocytes decline by about 50–80 cells /mm3/ year, and the immune system becomes less able to prevent the growth and local spread of M. tuberculosis. Pulmonary TB (PTB) remains, especially in adults, the commonest form of TB, but its presentation depends on the degree of immune suppressant. The clinical pictures, sputum smear results and chest X-rays are often different in the early stage of HIV infection (CD_4>350 T-cells/mm3) and the late stage (CD_4<200 cells /mm3). The clinical presentation of TB cases in early HIV infection is similar to that of individuals without HIV infection, resembling post primary TB, that is, with positive sputum smears (defined as two or more initial smear examinations that are positive for acid fast bacilli (AFB),or one plus consistent radiographic abnormalities) and often with cavities in the chest X-ray. In contrast, the clinical presentation in late HIV cases resembles primary PTB: the sputum smear is often negative and radiological infiltrates are present instead of cavities (Elliott *et al.,* 1995).

In case of severe immune deficiency, the rate of extra pulmonary TB (EPTB) increases in both adults and children. Because of difficulties in diagnosis, disseminated TB may account for a high proportion of misattributed hospital deaths. Active TB itself is responsible for a mild immunodeficiency. In countries with independent epidemics of TB and HIV/AIDS, TB does not always indicate severe deterioration of the immune system in HIV infected people because it may occur before HIV infection or in its early stages, before the immune system has deteriorated. Any of these opportunistic

infections may be lethal. If so, TB is indirectly responsible for the death (Badri *et al.,* 2001). In addition, TB has been found directly responsible for an average mortality rate of 30% among HIV/AIDS cases in many reports (Drobniewski *et a.,l* 2005).

The HIV/AIDS epidemic in Ethiopia probably began in the late 1970s or early 1980s, with the first hospitalized AIDS patients reported in 1986,(Lester *et al.,* 1988) and the first sero survey at a national scale conducted among military recruits in 1984-85 (showing a prevalence of 0.07% among 5,565 people tested) (Hailu *et al.,* 1989). Initially, the epidemic was localized in urban areas, along the major commercial routes and among certain occupational groups. By 1988, high rates of HIV prevalence (17%) were detected among commercial sex workers residing along the main trading roads and long distance truck drivers (13%).(Mehret *et al.,* 1990) In some urban areas, prevalence rates as high as 38% were recorded among sex workers. In Addis Ababa, HIV prevalence rates in female commercial sex workers rose rapidly, from 24.7% in 1988 to 54.3% in 1990. (Mehret, 1990) Since then the epidemic has expanded throughout the country into rural areas, especially in areas along road sides. (Zewde *et al* 2002).

HIV-positive person infected with MTB has a 50 - 60% life time risk of developing TB disease as compared to HIV-negative person who has only 5-10% risk of the co pathogencity between MTB and HIV is best illustrated by the high susceptibility of the HIV-infected persons for reactivation of a remote TB infection or early progression of a newly acquired disease. This dual interaction is also demonstrated by the negative impact of TB on the natural history of HIV, which is characterized by increased incidence of clinical progression and increased mortality rates (WHO, 2006b; Gerard, 2000). HIV-positive person infected with MTB has a 50 - 60% lifetime risk of developing TB disease as compared to HIV-negative person who has only 5-10% risk mated 141,000 cases of tuberculosis in Ethiopia in 2005 (MOH, 2005a).to active TB disease. Clinical presentation of TB is also atypical and severe when immune suppression is advanced in TB-HIV co infected patients (Gerard, 2000).

3. MATERIALS AND METHOD

3.1. Description of Study Area

The study was conducted in Kuyu Hospital found in Gerba Guracha town. The town is located about 155 Km from Addis Abeba to the Northern part of Shoa, Oromia Region, Ethiopia. The town is divided in to 2 Kebeles and its population is estimated to be 27424, of which 13762 were males and 13662 were females (2007censu, Kuyu Health Department).The town contains one governmental health station, five private clinics and one governmental hospital which is known as Kuyu Hospital.The Kuyu Hospital is a district hospital with 10 physicians, 8 pharmacist and pharmacy technicians, 45 nurses, 7 medical laboratory and laboratory technicians, and 4 patient registration clerks and others like anesthetists, physical therapists.

3.2. Study Design

The design of the study was Hospital-based analytical cross sectional survey to determine the prevalence of HIV, Tuberculosis and co-infections among patients who visited Kuyu Hospital. Accordingly, TB and HIV diagnosis has been done by skilled laboratory technicians and the results were tabulated. In addition, structured questionnaire was used to assess the major associated socio- demographic risk factors to HIV and Mycobacterium *tuberculosis* infections and co-infections among the selected study participants who have been visiting Kuyu Hospital. Before starting collection of data from the selected study participants, they were first briefed about the

purpose of the study in the Volunteer Counseling and Testing (VCT) Center of the hospital. Those individuals who were volunteer to participate were enrolled in the study. All relevant data were collected from the Hospital by the principal investigator with the help of physicians, nurses and laboratory technicians

3.3. Study Population

People who came to Kuyu Hospital of both sexes and all age groups to monitor their health status and volunteer to take part in this study were enrolled. In addition, people who referred from other health institutions for clinical and laboratory investigations to monitor their health status were also enrolled.

3.4. Sample Size Determination

Usually in determining sample size, there is tradeoff between the desirability of a large sample and the feasibility of a small one (Hassan, 1991). The ideal sample is large enough to serve as an adequate representation of the population about which the researcher wishes to generalize, and a small enough to be selected economically in terms of subject availability, expense in both time and money, and the complexity of data analysis, Hence, there is no fixed number or percentage subjects that determines the size of an adequate sample (Hassan, 1991).

Since there was no or investigation conducted on the same title in the study area, p value of 0.5 was taken to ensure the sample size large enough to satisfy the precision and confidence constraints. By taking this in to consideration, the sample size for single population was calculated based on the 95% confidence limits and 5% sampling error by using a formula described in Hassan (1991)

$$n = \frac{Z\alpha^2 (P)(1-P)}{d^2}$$

Where:

n= required sample size=384

Z=standard deviation which is= 1.96

P=prevalence of the issue under study= 0.5

D= confidence limit of prevalence which =0.05.

Therefore the calculated sample size for this study will be 384.

3.5. Sampling Procedure

Sputum and blood samples were collected, accordingly, from the study participants who came to Kuyu Hospital, from those who have fulfilled the criteria until the sample size was reached. The inclusion criteria were willingness of the participants to participate in the study and willingness to be examined for both TB and HIV infection. Using these criteria, a total of 384 respondents were included in the study. The data collection was carried out during the period between February-May, 2017.

3.6. Inclusion and Exclusion Criteria

The inclusion criteria were willingness of the participant to participate in the study and willingness' to be examined for both TB and HIV. Whereas the exclusion criteria were those study participants who were not volunteer to participate and who were not voluntary to be examined for both TB and HIV.

3.6. Method of Data Collection

3.6.1. Questionnaires survey

For the collection socio-demographic data, structured questionnaire was used. The questionnaire was prepared in local languages, Amharic and in Afan Oromo which were later translated in to English. Training was given for data collectors regarding the purpose of the study and the procedures to be followed for data collection. The questionnaire was pre- tested using few respondents who were not included in the present study.

3.6.2 Collection of Sputum Samples

The sputum samples were collected from all the study participants .During collection three consecutive sputum samples were collected using coded clean, sterile, leak-proof, screw capped, wide-mouth, disposable containers. Before collection of the samples the participants were oriented on how to handle sputum specimens by laboratory technicians. Sputum (spot, early morning, spot) was collected from each study participant. Then certified medical laboratory technicians performed the laboratory diagnosis.

3.6.3 Collection of Blood Samples

After ensuring the willingness of the respondents to participate in the study,4micro litter of blood sample was collected by finger puncture from each study subject for the detection of HIV on the same day of enrolment using sterile and disposable material by experienced laboratory technicians and the test ' Determine' was done according to the manufacturer's instruction .After detection from the HIV infected group, the blood sample was collected for CD_4^+T cell count from the arm vein to K3EDTA vacationer tub after appropriate disinfection of vein puncture site by 70% alcohol.

3.7. Laboratory Examination Procedures for TB and HIV /AIDS

3.7.1. Sputum Smear Microscopy

TB diagnosis was made by identification of acid- fast *Mycobacterium tuberculosis* from sputum and/or aspirate after staining with Ziehl –Neelsen statin. Direct microscopic

examination for acid fast bacilli (AFB) was done on three consecutive sputum samples (spot, morning, spot) after staining with the ziehl-Neelsen technique. Smear was prepared, stained and examined by the modified Zeihl-Neelsen, method to which, 0.1% auromine solution and a 0.3% phenol solution was added. Positive and negative control slides were included with each run of the staining procedure to verify the correct performance of the procedure as well as the staining intensity of the acid-fast bacilli (FMOH, TB and Leprosy Control manual FDRE, MOH, 2008).

To declare a slide negative in grading a scale under a fluorescence microscope ,no AFB have seen in at least 30 fields or 40 fields depending up on the scale 20 x objectives and 40 x objectives respectively .In case of positive ,slides examination ,even less number of fields are sufficient and the number of organisms present was classified using guidelines .1 to 29 AFB per 30 fields, actual number ; 30 to 299 AFB per 30 fields in at least 15 fields recorded as (1+);10 to 99 AFB per fields in at least 15 fields recorded as (2+); and more than 100 AFB per field in at least 6 fields recorded as(3+) (WHO, 2008).

3.7.2. HIV Serological Test

World health organization (WHO) approved kit manufactured about Laboratory called 'Determine' was used for the HIV detection. It was an in-vitro visually quantitative immune assay for the detection of antibodies to HIV-1 and /orHIV-2 in human plasma, serum or whole blood. It is made up of a strip impregnated selenium colloid HIV antigen conjugate at one and two reaction windows at the other end. The kits were stored at 4 ^{o} C until ready for use and screening of the spacemen was carried out as recommended by the manufacturer. The kits are named as: - KHB, STAT, PAK and UNI-GOLD. Determine HIV-1/2 is an immuno chromatographic test for the qualitative detection of antibodies to HIV-1 and/or HIV-2 .Test serum sample was added to the sample pad (impregnated strip) and as the test serum migrates through the conjugate pad it reconstitutes and mixes with the selenium collide-antigen conjugate . The mixture continuous to migrate through the solid phase to the immobilized recombinant antigens and synthetic peptides at the patient window site. If antibodies to HIV-1and/ or HIV-2 are present in the sample the antibodies

bind to the antigen –selenium colloid and to the antigen at the patient window forming a red line at the patient window site. When a red bar appeared in both the control and the patient windows of the test strip, the result was interpreted as positive. Where, the appearance of a red bar only in the control windows of the strip was interpreted as negative.

3.7.3. CD_4 + T- cell count

Lymphocyte subset, CD_4^+ T-cell was analyzed by a well trained laboratory technicians using FACS can flow cytometry (Becton Dickinson Immunocytometry system, and Jose, CA., USA). Briefly 100mm^3 of whole blood was mixed with 10mm^3 of each monoclonal combination in separate tube and incubated at room temperature for 20 minutes. Red blood cells then lysed by adding 2ml of fluorescence activated cell sorter lysing solution (Becton Dickinson) After overtaxing ,tubes incubated in the dark at room temperature for 10 minutes and centrifuged at 300xg for 5 minutes. Then cell pellet washed once with 2ml of Isoton, resuspended in 500mm3 of Isoton, and analyzed with simulset software (Becton Dickison) of the FACS can. The cell is acquired on FACS or / and analyzed in simulset soft ware (BD). Getting for lymphocytes was carried out by leucogate reagent (CD_{45} CD_{14} antibody BD, USA).

3.8. Data Analysis

Data was primarily entered into Microsoft excel 2007. The data was then edited, coded, and transferred to SPSS version 20 (SPSS inc, Chicago, IL) for analysis. Descriptive statistics were computed to describe the data obtained both from survey and laboratory analysis. Chi-square, odds ratio possible association between and HIV and their associated risk factors with socio-demographic factors .The significance level was set at $p < 0.05$.

3.9. Ethical Consideration

The study was carried out after obtaining ethical clearance from ethical committee of Kuyu Hospital. Before conducting the investigation, the researcher was discussed with concerned bodies in the study area and their agreement was obtained after the objective and purpose of the study was explained to Hospital Medical Director and the participants. All the study participants were clearly be informed about the purpose of the study and kindly asked to participate and permission was obtained before the actual investigation as well as seeking verbal information from the participants. They were insured that any information concerning them was never be used by anybody or institution.

4. RESULT AND DISCUSSION

3.1. Demographic Characteristics and Description of Study Participants

The socio-demographic characteristics of the study area included 384 patients. As summarized in Table1, of the total 384 participants in the study who visited Kuyu Hospital during February-May 2017 indicated 196 (51%) males and 188 (49%) were females .The study participants were divided in to four age groups. The number and respective percentage of age groups included less than 15 years old 40 (10.42%), 15-25 years old 88 (22.91%), 26 -35 years old 70(18.23%) and greater than 35 years

old 186 (48.44%).The mean age and range of the participants were 38.08 and 86 years old respectively. Concerning their educational status, 42(10.94%) of the patients were illiterate, 211(54.95 %) were primary school, 112(29.17%) were secondary school and the remaining 19(4.95%) were Diploma and above. In the case of marital status, the majority of the participants 200(52.08%) were married and 156(40.63%) were unmarried whereas 23(5.99%) were divorced and 5(1.30%) were widowed. Occupation of patients revealed that 148(38.49%) were farmers, 109(28.38%) were students, 33(8.59%) were daily labours, 71(18.48%) were merchants and 23(5.98%) governmental employees.

According to this study Socio demographic characters showed that some patients 20(5.21%) were adapted to smoking cigarette and the majority of the patients 364 (94.79%) were not smoking cigarette. Concerning sexual partner 271(70.57%) of the patients had only one sexual partner, 17(4.42%) had more than one sexual partner the remaining 96(25%) of the patients responded as they were not exprienced sex with any sexual partner. In case of patients knowledge and attitude about TB, 314(81.77%) had good knowledge and attitude and 70(18.22%) had poor knowledge and attitude about TB. In the same way concerning knowledge and attitude about HIV/AIDS 344 (89.58%), and 24(6.25%) had good and poor knowledge and attitude about HIV/AIDS respectively, whereas 16 (4.16%) patients had no knowledge and attitude about HIV/AIDS.

As to patients residence 219(57.03%) were coming from rural area and the rest 165(42.96%) were from urban area. In case of monthly income, 218(56.77%) were earned below 1600 Birr per month and they were Categorized as poor, 83(21.61%) of the participants were earned between 1600-3500 which were grouped as Medium and the rest 83(21.61%) of patients were rich with monthly income of greater than 3500 Birr per month.

Table 1. Socio-demographic characteristics of the study patients' visiting Kuyu Hospital of Oromia Regional State from February – May 2017

Character	Categories	No of examined (%)
Sex	Male	196(51.04)
	Female	188(48.95)
Age	<15	40(10.42)
	15-25	88(22.92)
	26-35	70(18.23)
	>35	186(48.44)
Education	Illiterate	42(40.2)
	Primary	211(54.94)
	Secondary	112(29.16.)
	Diploma and above	19(4.94)
Marital status	Married	200(52.08)
	Unmarried	156(40.62)
	Divorced	23(5.9)
	Partner died	5(1.3)
Occupation	Merchant	71(18.48)
	Government employee	23(5.98)
	Students	109(28.38)
	Daily labour	33(8.59)
	Farmer	148(38.54)
Sexual partner	Only one	271(70.57)
	More than one	17(4.42)
	Do not experienced	96(25)
Awareness onTB	Good	314(81.77)
	Poor	70(18.22)

Awarness on HIV	Good	344(89.58)
	Poor	24(6.25)
	Do not have	16(4.16)
Recidence	Rural	219(57)
	Urban	165(43)
Monthly income	Poor	218(56.77)
	Medium	83(21.61)
	Rich	83(21.61)

4.2. Prevalence of Mycobacterium tuberculosis

The present result was included a total of 384 patients as the sample population and the overall prevalence of TB among the total examined patients were 39(10.2%) in numbers. The prevalence of TB in case of Male was 25(12.75%) where as the prevalence of TB in females was 14(7.44%). Distributions of TB with age group were categorized as <15 years old, 15-25, 26-35 and >35 were 1(2.5%), 11(12.5%), 3(4.28%) and 24(12.90%) years respectively. As indicated in Table 2, the prevalence rate of TB infection was higher in the age group of >35 years old with prevalence rate of 24(12.9%) as to compared with the other age group in both sexes but the lowest prevalence was obtained in the age group of <15 years old. The present study showed the distributions of *Myco-bacterium tuberculosis* increased in the age group of >35 years old. Most of this age group were smokers, illiterate and had low immunity and they were easily susceptible for TB infection than other age groups.

There was significant difference in the prevalence of *Myco-bacterium tuberculosis* between male and female in all age groups of<15, 15-25, 26-35 and>35. When all TB infected patients (39) were observed and compared with their age references the frequency of patients of age group >35 years old and 15-25 years old consists the highest 24(12.90%) and 11(12.5%) respectively frequency and the rest age groups non significant to each other.

Factors that drive TB transmission are the rate of exposure or susceptible to infectious persons, the efficiency of transmission per exposure, and the average duration of infectiousness once infection has occurred (Dye c, and wiliam BG, 200).

The present finding was contradicted with the finding of Tadesse 2008 and Teshome 2013 on TB prevalence patients in Adama Hospital who reported Prevalence of 6%, 33.3% respectively out of examined patients.

Table :2 . Prevalence of Tuberculosis among the study patients in Kuyu Hospital of Oromia regional State during February-May 2017

Age	Sex	No Examined	No. TB positives (%)	Chi-square	P-value
<15	Male	25	0.00		
	Female	15	1 (6.66)	1.23	0.021
15-25	Male	36	3 (8.33)	.023	.723
	Female	52	8 (15.38)		
26-35	Male	31	3 (9.70)	2.053	.141
	Female	39	0.00		
>35	Male	104	19 (18.26)	0.431	0.842
	Female	82	5 (6.09)		
All age group	Male	196	25 (12.75)	.432	0.521
	Female	188	14(7.44)	0.431	0.621
Total	Total	384	39(10.2)	4.657	.391

The study showed that from the total 39(10.2%) of TB positive patients, the prevalence of smear negative pulmonary TB was the highest 18(4.68%) followed by smear positive 16(4.16%) where as lowest 5(1.30%) prevalence was observed in extra pulmonary TB type (Table 2).

The present study showed less in number as compared to previous study of Assefa (2011) who reported 32% SPPTB and 44.1% SNPTB of prevalence rates from the total examined patients. The study also in consistence with report of Mohamed (2004) where SNPPTB was 50% and PPTB was 31.2% in prevalence rates.

It has been suggested that the high number of SNPPTB- and SPPTB+ cases could be partly due to the referral system adopted in the country, where health centers are allowed to treat only SPPTB patients and must refer other suspected TB patients to hospitals and this led to be highest prevalence of SNPPTB in particular study hospital (Kassu *et al.,* 2007).

The situation was not restricted to Kuyu Hospital in particular case but it was practiced as general throughout the country. On the other hand, other non-adherence to diagnostic algorithm, poor quality of sputum processing and microscopy, lack of culture facility as well as high HIV co- infection might contribute to such high sputum smear negative rates (Kassu *et al*., 2007; Burchfeld *et al*., 2002; Lambert *et al*., 2003).

Table: 3. Types of TB identified among the study participants in Kuyu Hospital, Oromia Region during February to June 2017

Age	Sex	N o examined	TB positive	SPPTB	SNPTB	EPTB
			No. (%)	No. (%)	No. (%)	No.(%)
<15	Male	25	0.00	0.00	0.00	0.00
	Female	15	1(6.66)	0.00	1 (6.66)	0.00
15-25	Male	36	3(8.33)	2(5.55)	1(2.77)	0.00
	Female	52	8(15.38)	4(7.69)	3(5.76)	1(1.92)
26-35	Male	31	3(9.67)	1(3.22)	1(3.22)	1(3.22)
	Female	39	0.00	0.00	0.00	0.00
>35	Male	104	19(18.26)	7(6.73)	9(8.65)	3(2.88)
	Female	82	5(6.09)	2(2.43)	3(3.65)	0.00
All age groups	Male	196	25(12.75)	10(5.10)	11(5.61)	4(2.04)
	Female	188	14(7.44)	6(3.16)	7 (3.72)	1(0.53)
	Total	384	39(10.2)	16(4.16)	18(4.68)	5(1.29)

SPPTB=Smear positive pulmonary tuberculosis

SNPTB=Smear negative pulmonary tuberculosis

EPTB=Extra pulmonary tuberculosis

4.3. Prevalence of HIV Infections

The result in Table 4 implied that 384 patients were examined for HIV infection and the prevalence rate was 25(6.5%). The distribution of HIV in this study was inconsistent with the report of Jabi (2011),Teshome (2013) and Tadesse (2008) with prevalence rates of 22.4% 17.5% and 26.4% respectively.

Based on sex, the prevalence rate of male was 11(5.61%) whereas the prevalence rate of female was14 (7.44%). Higher 16(8.60%) HIV positivity rate was observed in the age group of >35 years old followed by the age group 26-35 years old 5(7.14%). The prevalence of the HIV is not the same in different age groups. Some groups are more vulnerable to the HIV than others. In the context of this study for female HIV prevalence peaks 9 (10.97%) at age group of >35 years and followed by the age group 4(10.25%) of 26-35 years old. Male HIV prevalence reached peak point at 7(6.73%) at age group of >35 years old. Total HIV infected women was greater (14) than men (11) and from this study it was concluded that women were more vulnerable than men. This is because of women are biologically more susceptible to infection due to larger genital tract surface area, which may be also torn during sexual activity, which leads to higher risk of HIV transmission. They also exposed to the disease through traditional practices such as husband sharing, early marriage and female genital mutilation (Sileshi, 2013).This study indicated that HIV prevalence was closely related to marital status.

The study revealed that divorced and partner died 7(25%) individuals have higher HIV prevalence compared with married and unmarried individual. The result of this study showed that higher prevalence rate of HIV/AIDS is observed in Urban 14(56%) areas compared to rural 11(44%) areas. This is because in urban areas there is a high prevalence of sexual networking and its related factors are highly manifested (Sileshi, 2013).

Table: 4. Prevalence of HIV infection among the study patients in Kuyu Hospital,Oromia Region during February-May 2017

Age	Sex	No. of Exmined	HIVpositive No.(%)	Chi-square	P-value
<15	Male	25	2(8)	1.312	0.215
	Female	15	0 (0.00)		
15-25	Male	36	1(2.77)	1.413	.122
	Female	52	1(1.92)		
26-35	Male	31	1(3.22)	0.731	.821
	Female	39	4 (10.26)		
>35	Male	104	7 (6.73)	3.032	0.761
	Female	82	9 (10.97)		
All age group	Male	196	11 (5.61)		
	Female	188	14 (7.44)	1.326	0.213
	Total	384	25(6.51)	2.431	0.643

4.4. Prevalence of Tuberculosis and HIV Co-Infections

A total of 384 patients were randomly selected and examined for TB HIV co-infection in Kuyu Hospital of study area, of these patients, 7(1.82%) were TB-HIV co-infected. The prevalence of males 6 (3.06%) was greater than females 1(0.53%) in numbers in this finding. The highest TB-HIV co-infected patients were in the age groups of >35 years old which accounts 6(3.06%) in numbers. This indicated that the immune system

of elder people is not strong as immune system of young people. That means patients whose age is >35 are grouped in adolescence and old age as age increase the immunity become less and less the reason why the immune system decreased is due to different disease. When the result was computed in terms of sex the prevalence of TB-HIV co-infection in males was 6(3.06%) which higher, than that of females 1(0.53%).This result indicated there was significant different in the prevalence of TB–HIV co-infection among male and females of each age group. The result of this study showed 7(1.82%) was much less than that of 97(11.45%) reported by Tadese (2013), 44.8% Esmael *et al.,* (2013) and 8% WHO (2013).

Tuberculosis is the leading cause of death for HIV-infected patients, and HIV is the most important risk factor for developing active TB. The risk of death from TB is significantly higher in the HIV-infected population. The interaction between TB - HIV co-infected person is bidirectional and synergistic: HIV-1 infection predisposes to the development of active TB, and the course of HIV-related immunodeficiency is worsened by active TB infection. Generally, the severity of the co-infected patients was more serious and the chance of morbidity and mortality were high unless they follow treatment seriously (WHO, 2006).

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Table: 5. Prevalence of Tuberculosis and HIV co-infections among the study patients

Age	Sex	N o Examined	TB and HIV co-infection	Chi-square	p-value
			Positive No.(%)		
<15	Male	25	0.00		
	Female	15	0.00	0.00	0.00
15-25	Male	36	0.00		
	Female	52	1(1.92)	1.121	0.242

26-35	Male	31	0.00		
	Female	39	0.00		
>35	Male	104	6(5.76)	0.431	0.032
	Female	82	0.00		
All age	Male	196	6(3.06)	0.332	0.431
	Female	188	1(0.53)		
Total		384	7(1.82)	1.221	0.435

4.5. CD_4+ T-cell counts of HIV Seropositive Patients

The CD_4^+T-cell count is used to guide decisions regarding when to initiate prophylaxis against opportunistic infections and when to start ART. The CD_4^+ T- cell count exhibits significant variability and hence the reasonable test is reproducible and repeated to confirm the result prior to making decision if resources are permitted since the variability depends on immune system of the patients. The immune system of HIV seropositive patients of study area was summarized in Table 7. The overall mean of CD_4+ T cell counts for all HIV sero positive patients in this study was 438.72±266.0 cells/mm^3.

The mean CD_4^+T-cells count of the age group <15 years was 585±91.9 cell/mm3.From this age category 2(8%) were males with the mean value of 585±91.9 $CD4^+$T-Cells/mm^3 and the females were not included in this age category. From this age category of 15-25 years the mean standard devotion value of CD_4^+Tcells/mm^3 counts males and females were 417±00 and 251±00 respectively. The mean value of males and females in the age groups of 26 - 35 years old were 390±00 and 353.75±42.5 CD_4^+T-cells/mm^3 respectively. Similarly the mean value of males and females within age group of >35 years was 197.14±108.3 and 660.56±285.6 CD_4^+T-cells/mm^3, respectively. The result of this study indicated that the lowest CD_4^+ T-cell was observed in males 197.14 ±108.3 than that of females 660.56±285.6 in HIV sero positive individuals in the present study. This could be due to early detection of females for HIV sero positivity than male counterparts or husband whereas males were detected during secondary infection and at this time CD_4^+ T-cell count was very less as compared to females (Aragaw, 2014).

The study was in line with the study done by Tadese (2008), Aragaw, (2014) who reported male patients were low mean CD_4^+ T-cells/mm^3 counts than females.

Table: 6.Mean standard deviation of CD_4+ T-cell counts of HIV seropositivity patients

Age	Sex	N o examined	TB positive	HIV Positive	CD4+T-cell counts
			No.(%)	No.(%)	Mean ±SD
<15	Male	25	0	2(8)	585±91.9
	Female	15	1(6.66)	0.00	0.00

15-25	Male	36	3(8.33)	1(1.77)	417±00
	Female	52	8(15.38)	1(1.92)	251±00
26-35	Male	31	3(9.67)	1(3.22)	390±00
	Female	39	0	4(10.25)	353.75±42.5
>35	Male	104	19(18.3)	7(6.73)	197.14±108.3
	Female	82	5(6.09)	9(10.76)	660.56±285.6
All age	Male	196	25(12.8)	11(5.61)	305.18±183.5
	Female	188	14(7.44)	14(7.45)	543.64±278.8
Total		384	39(10.16)	25(6.51)	438.72±266.0

4.6. ART Status of HIV Seropositive Patients

CD_4^+T-cell of HIV seropositive study individuals in Kuyu Hospital were summarized in Table 7. Accordingly, 8(2.08%) of HIV infected participant had CD_4^+T-cell counts<300 cell/mm^3, which is considered as a criterion for eligibility to start Anti Retroviral Therapy (ART) and 4(1.04%) infected patients had CD_4^+ T-cell counts of 300-500 cell/mm^3 and the other 13(3.38%) of the patients had $CD4^+$ T-cell counts of above 500 cells/mm^3. 8(2.08%) patients whose age was found in the age group of greater than 35 years had got CD_4^+T-cell count less than 300 CD_4^+ T- cells/mm^3. Meanwhile, ART usage of HIV infected patients 8(2.08%) of the study subjects were

started ART services. From the total 25 HIV infected patients 6(24%) which were started ART were males and their numbers were higher 2(8%) than females

The result of the study revealed that the rest 17(68%) HIV infected patients out of 25 HIV peoples did not start ART service in the present study. Based on information obtained from the respondent this is due to some patients were not know as they were infected. The CD_4+ T cell count provides information on the current immunologic status of the patient (Fauci *et a*l., 2001). According to Badri *et al* (2002) most of the HIV-TB co-infected patients (67%) had CD_4+T-cell count of more than 200 cells/mm^3. Low CD_4^+ T-cell increases susceptibility to opportunistic infections (Hunter and Nicholis, 2002). Disease progression is associated with immune activation and vice versa (Vajpayee *et al.*, 2005).WHO recommends Anti Retroviral Therapy in all adolescents, adults and pregnant women with a CD_4^+ T-cell count less than 350 cells/mm^3 or those with clinical sign and symptoms regardless of CD_4 T-cell count improves physical and mental health, a decreased risk of transmissions of the disease to sexual partners and a decrease in mother to child transmission (WHO, 2010). The decreased morbidity and mortality rate of AIDS-defining illnesses over the last HAART period was most probability attributed to the improved availability of antiretroviral therapy (ART). Improvements in general patient care, as well as better diagnostic and therapeutic management of AIDS related diseases (Francisco *et al,* 2003; John *etal*, 2009).

Table :7. ART status of HIV seropositive of study patients in kuyu Hospital

Age	Sex	NO examined	HIV Positive	ARTS started CD_4^+T-cell/mm^3	ART not started CD_4 T-Cells /mm^3	
				<300	300-500	>500
			No. (%)	No. (%)	No. (%)	No. (%)
<15	Male	25	2(10.5)	0.00	0.00	2(5.25)
	Female	15	0 (0.00)	0.00	0.00	0.00

15-25	Male	36	1(2.77)	0.00	1(2.77)	0.00
	Female	52	1(1.92)	1(1.92)	0.00	0.00
26-35	Male	31	1(3.22)	0.00	1(3.22)	0.00
	Female	39	4(10.25)	0.00	0.00	4(10.25)
>35	Male	104	7(6.73)	6(5.76)	1(0.96)	0.00
	Female	82	9(10.97)	1(1.21)	1(1.21)	7(8.53)
All age	Male	196	11(5.61)	6(3.06)	3(1.53)	2(1.02)
	Female	188	14(7.40)	2(0.53)	1(0.53)	11(5.85)
Total		384	25(6.5)	8(2.08)	4(1.04)	13(1.82)

4.7. Risk Factors Associated with TB Infection

The necessary information about the socio-demographic characteristics of all study individuals were collected and discussed. The chi- square test was used as statistical tool to determine the relationship between educational level, marital status, occupation, smoking habit, sexual partner, awareness about TB, awareness about HIV, monthly income. P-value of <0.05 were considered to be statistically significant subsequently the analysis revealed that smoking habit, Awareness about TB, TB type, Educational level and Occupation, were statistically significant in study.

The socio-demographic characteristics of the study showed that, among all patient, 11(9.82%) of them were secondary school, 19(9.04%) of the patients were primary school while 7(16.7%) of patients were illiterate, and 2(10.5%) of them were Diploma and above. Similarly, results of occupational status of patients indicated that, 7(9.9%) of patients were merchant, 2(8.7%) were governmental employee, 8(7.3%) were students, 3(9.09%) were daily labour and 19 (12.8%) of the patients were farmers. As to cigarette smoking, 14(70%) of the patients were continuously smoking cigarette, and 25(6.86%) of the patients were free from smoking cigarette. Many of the respondents 21(9.63%) were poor (their monthly income was less than1600), 13(15%) and 5(6.02%) of the patients were found in rich and medium catagory in their monthly income respectively. The review paper organized by Cegielski *et al*., (2004) showed that the risk of TB was higher in people with malnutrition and the effect was higher in severely malnourished group compared to the mild to moderately malnourished groups. Concerning patients knowledge and attitude about TB 2(0.63%) had good knowledge and attitude and 37(52.85%) had poor knowledge and attitude about TB.In the case of marital status 21(10.5%) were married and 12(7.7%) were unmarried whereas 1(20%) and 5(21.7%) were divorced.

Table; 8. Association of socio-demographic characteristics with TB (+) concerning risk factors

Character	Variable	No. examined	TB positive No. (%)	TB negative No. (%)	OR	95%CI	P-V
Education	Illitrate	42	7(16.7)	35(83)			
	Primary	211	19(9.04)	192(90.99)			
	Secondary	112	11(9.82)	101(90.2)			
	Diplomaand above	19	2(10.5)	17(89.47)	4.310	1.435-2.124	.016
Marital status	Married	200	21(10.5)	179(89.5)			
	Unmarried	156	12(7.7)	144(92.3)			
	Divorced	23	5(21.7)	18(78.26)			
	Partner died	5	1(20)	4(80)	3.480	1.335-8.074	.062
Occupation	Merchant	71	7(9.85)	63(88.7)			
	Government	23	2(8.69)	20(87)	.502	.174-1.090	0.13

	employee						
	Students	109	8(7.33)	101(92.7)			
	Daily labor	33	3(9.09)	30(90.9)			
	Farmers	148	19(12.83)	129(66.5)			
Cigarette smoking	Not smoking	364	25(6.86)	339(86.53)	.042	.1641.070	.011
	Smoking	20	14(70)	6(30)			
Sexual partner	Only one	271	20(7.4)	251(92.6)	.786	.232-2.360	.511
	More than one	17	10(58.8)	7(58.8)			
	Not experienced	96	9(9.37)	87(90.6)			
Awareness on TB	Good	314	2(0.63)	312(99.4)			
	Poor	70	37(52.85)	33(47.1)	669.97	99.632-563.02	.000
Monthly income	Poor	218	21(9.63)	197(90.4)			
	Medium	83	13(15.66)	70(84.3)			
	Rich	83	5(6.02)	78(93.97)	.687	.281-1.681	.411
TB types	SPPTB		16 (4.16)	345 (89)			
	SNPTB		18(4.680)	0.00	3.840		000
	EPTB		5(1.30)	0.00			

4.8. Risk Factors Associated with HIV Infection

Necessary information related to the socio-demographic characteristics of all study patients was organized in table 10. The chi-square soft ware was used as statistical instrument revealed that ART status CD_4^+ T-cell count, awareness about HIV were important in this study. The result showed that demographic variables like monthly in come, awareness, ART status, residence and marital status were highly significant effect in the prevalence of HIV/AIDS.

Females are at much greater risk at early ages because of both biological and cultural factors. Females in Ethiopia are more vulnerable to HIV than Males because of early age at sexual debut, early marriage, sexual abuse and violence such as rap and

abduction. Sexual mixing patterns are more important than the age at sexual debut in putting Women at higher risk of HIV than Males. Many studies have showed that woman in Ethiopia often form sexual relationship with men who are on average ten years older. As well, adolescent woman are at risk because they are unlikely to have had any training or experience in sexual negotiation skills, and are especially vulnerable in situations with older men where age, wealth, physical strength and other power dynamics put them at a disadvantage average ten years older.

Poverty is another risk factor that enhances the vulnerability of contracting HIV. In the present study 15(3.90%) who were HIV positive belong to the poor monthly income category. The relationship between HIV/AIDS and poverty is complicated (Collins and Rau, 2000). Poverty exposes people to food insecurity and fails to fulfill other basic needs. This problem facilitates sexual risk behaviors by forcing them to engage in commercial sex practices. Women's economic dependence on their partner may also expose them to their partner insisting on unsafe sex. Poverty is also related to the biological problems of human beings through food insecurity and malnourishment. Malnutrition will expose individuals to the disease through weakening of their immune system.

Education is other risk factors, individuals who are less educated experience a higher rate of HIV infection due to their low income, decreased autonomy and limited access to information concerning the way the disease is transmitted and its prevention method.

Occupation is one risk factor of HIV prevalence, individuals mainly depends on the profession in which they are engaged. Since most migrant workers are forced to stay in their work places for extended periods separated from their families and marriage partners, there will be a tendency of having new sexual partners during their migration period. Hence, they will have a wider range of sexual networking than non migrant workers. Thus, this will in turn accelerate the transmission of the HIV/AIDS epidemic.

Similarly Place of residence of individuals may affect the prevalence rate of HIV through socio-cultural and socio-economic variation. According to the present study out of 25 HIV infected patients 44% were from urban whereas 56% were from rural area. This indicates that rural people were more infected than urban people. For

example, rate of STD tends to be higher in rural areas due to unstandardized access to STD treatment. In addition to this the level of knowledge about HIV/AIDS is also lower in these areas. Employment status is also linked to the prevalence of the epidemic through generating income and migration to other places in order to look for jobs. This income difference and migration will affect the likelihood of individuals affected by the epidemic. Cultural practices, values and traditions have strong influences on the visible aspects of individual behaviors which in turn influence their vulnerability to disease. Additionally women are exposed to the disease through traditional practices such as husband sharing, early marriage, female genital mutilation and condoning of gender based violence (Sileshi, 2013).

Other risk factors for the infection of HIV/AIDS were sharing HIV transmission materials in common and through blood transfusion from mother to child as well as through blood contact of infected person to uninfected person in many ways. Low living standard, irresponsible sexual behavior, lack of being faithfulness, transmission from mother to child during pregnancy, delivery and breast feeding, busing alcohol or illicit substances are the main known risk factors for HIV /AIDS transmissions.

Table : 9. Association of socio-demographic Characteristics of the study individuals with HIV patients in Kuyu Hospital, Oromia Region during February to May 2017.

Character	Variable	No. examined	HIV positive No. (%)	HIV negative No. (%)	OR	95 %CI	P-V
Education	Illiterate	42	4(9.52)	38(90.47)			
	Primary	211	15(7.1)	196(92.89)			
	Secondary	112	5(4.50)	107(95.53)	.625	.353-1.652	.570
	Diploma and above	19	1(5.26)	18(94.73)			
Marital status	Married	200	9(4.5)	191(95.5)			
	Unmarried	156	9(5.8)	147(94.2)	1.467	.435-.390	.205
	Divorced	23	5(21.7)	18(78.3)			
	Widowed	5	2(40)	3(60)			
Occupation	Merchant	71	5(7.04)	66(92.95)			
	Government employee	23	1(4.34)	20(86.95)			
	Students	109	6(5.50)	103(94.49)	.576	.237-1.352	.306

	Daily labour	33	3(8.8)	30(91.2)			
	Farmers	148	10(6.80)	138(93.24)			
Sexual partner	Only one	271	2(0.75)	269(99.26)			
	More than one	17	16(94.11)	1(5.88)	.345	.242-1.607	.074
	Do not experience	96	7(7.29)	89(92.70)			
Awareness on HIV	Good	344	9(2.61)	342(99.41)			
	Poor	24	16(66.66)	8(33.33)	41.635	21.104-83.04	.000
	Do not have	16	0.00	16(100)			
Monthly income	Poor	218	15(3.90)	203(93.11)			
	Medium	83	6(7.22)	77(92.77)	4.231	1.555-16.821	.007
	Rich	83	4(4.81)	79(95.18)			
ART	Started	8	8 (100)	(0.0)			
	Not started	376	17(4.52)	359(97.03)	3.749	2.579-7.926	.000
Residence	Rular	213	14(56)	199(93.42)			
	Urban	171	11(44%)	160(93.56)	3.780	2.589-7.826	0.054

4.9. Trend of Tuberculosis Cases over the Last Five Years from 2005-2009

The previous data of TB distribution were taken and summarized in Figure 2. The distribution of TB in 2013 was observed in 68(13%) patients. In 2014, 2015, 2016 and 2017 the distributions of TB were 77(12.6%), 74(10.4), 43(6.6%) and 39 (10.2%) respectively. The highest percentage of TB patients were registered in 2013 (13%) and the prevalence rate was high when compared to the other years. The lowest prevalence of TB was observed in 2016 (6.6%) patients were treated in specified Hospital. The data of 2017 was taken from February to May.

Figure 1. Trends of TB infections over the last five years

(Source: Kuyu Hospital Planning Team Department)

4.10. Distribution of Previous TB cases by type of Tuberculosis

In 2013 68 TB patients were registered, and attended their treatment in Kuyu Hospital and all of them were found to have symptom complexes or signs of tuberculosis. Among these cases: 21 patients had smear-positive pulmonary tuberculosis (PTB+), 33 of them had smear-negative pulmonary tuberculosis (PTB-) and 14 patients had extra-pulmonary tuberculosis (EPTB).

In 2014, similar condition was happened, from the total 77 TB patients, 42 of the patients had smear positive pulmonary TB,18 of the infected patients had smear negative pulmonary TB, and the remained 17 patients had extra pulmonary TB.

In 2015 out of 74 total TB infected patients,19 patients had smear positive pulmonary TB, 22 patients had smear negative pulmonary TB, and the remained 17 TB infected patients had extra pulmonary TB type and in 2015 another 6 relapsed TB type was registered. From the total 43 TB infected patients which registered in 2016, 12 patients had smear positive pulmonary TB type, 15 patients had smear negative pulmonary TB type, 10 patients had extra pulmonary TB type and the remained 6 patients had relapse pulmonary TB type. Finally, in 2017 39 patients were registered, out of this patients,16 patients had smear positive pulmonary TB type, 18 patients had smear negative pulmonary TB and 5 infected patients had extra pulmonary TB type.

4.11. Trends of Previous HIV Infections over the last Five Years

According to this study the general trend of the prevalence rate of HIV was varies across in each year. This finding showed that there was a gradual decrease of HIV/AIDS prevalence, in 2013, 115(12%) patients were registered. According to 2014 data the prevalence rate showed very slight increase prevalence from 115(12%) to 154(14%) and then showed decreasing in prevalence rate. Starting from 2015 there was a continuous decreasing of HIV prevalence 88(10%). In 2015, 88(10%) HIV infected patients were registered and followed their treatment and when this data was compared with 2016 there was a slightly decrease in HIV/AIDS infection. In 2016 there were 68(7%) HIV infected patients which were in number 88(10%) as compared to 2015. In 2017, 25(6.51%) HIV infected patients were registered and attended their treatment at Kuyu Hospital. The data of 2017 was taken From Fbruary to May 2017.

Figure 2. Trends of HIV infections over the last five years

(Source; Kuyu Hospital Planning Peam Department)

5. SUMMARY, CONCLUSION AND RECOMANDATION

5.1. Summary

Both tuberculosis and human immunodeficiency virus infection are among the major public health problems worldwide, particularly in undeveloped countries. TB is a common life threatening opportunistic infectious disease in HIV infected patients. HIV is also a known risk factor for TB acquisition and puts the patients with latent infection at increased risk for progressing to active TB disease. The present study aimed to determine the prevalence of HIV, TB infection and their co- infection as well as their associated risk factors among patients with socio-demographic factors. The design of the study was descriptive cross-sectional survey done from February-May 2017 at Kuyu Hospital

The study comprised of 196 males and 188 females as study population. The data was analyzed by using software SPSS version 20. According to the study the overall prevalence of TB and HIV were 16.77% and out of this the total prevalence of TB was 10.20%. The distribution of TB in male and female was 12.75% and 7.44% respectively and the distribution was higher in males than females. The present finding showed that the total prevalence of HIV was 6.5%. The prevalence of HIV in male was 5.61% where as in female it was 7.4% from the total patients and the distribution was highest in females than males. Eight patients were HIV-TB co infected and from these 6 patients were males and the rest 2 patients were females. Patients bellow 300 CD_4^+ T-cell/mm^3 associated with the highest risk of TB and HIV co infected and majority of co- infected patients were found in the age group of greater than 35 years old. Many socio-demographic characters like having low level of education, having more than one sexual partner, level of income, smoking cigarette and lack of awareness on TB and HIV were some of the associated risk factors for TB, HIV infection and co-infection. 8 patients were started ART out of 25 HIV patients.

5.2. Conclusion

The result of the study showed TB and HIV were the major public health problems. TB represents a public health threat because its transmissions dependent on the way of life of the society. Accurate information about the extent and trends of the dual infection is important for effective prevention and control programs. There for, with high burden of tuberculosis infection, poor living condition, and HIV epidemic in the country like ours, the risk of developing active tuberculosis will be much higher and eventually over load the health services in the near future. This shows tuberculosis and HIV co-infection has synergistic effect to one another that would adversely affecting health services and economic productivity of the country, unless control measure is taken. The distribution of TB and HIV is aggravated by socio-demographic character. A real progress in controlling TB and HIV can only be made with dual strategy targeted both epidemic.

Hence, controlling tuberculosis means detecting cases and ensuring that a person gets antibiotic treatment, if he had HIV infection, he can be cured of his active tuberculosis as well as avoiding transmission to others and extends his survival. It cannot prevent him dying from other infection. On the other hand vigorous action to prevent HIV is one of the dual strategies. There for dual strategy in control program deserve a high priority. The HIV prevalence in TB patients is a sensitive indicator of the spread of HIV in to the general population.

The rate of TB-HIV co-infection was high among TB patients in the study area. CD_4 counts less than 300 have shown significant association as a risk factor for the development TB in these groups of study participants. Most of patients with CD_4 T-cell less than 300 were those individual infected by both disease. Provision of ART was found to have very strong significant negative (protective factor) association with development of TB.

5.3. Recommendation

The results of this study demonstrated that in the study area TB and HIV infection loading pattern varies among different age groups and between male and females at

kuyu Hospital. Based on the results obtained from the present study, the following recommendations can be made.

- The national HIV/AIDS secretariat office and the national Tuberculosis control Program should make a dual strategy targeting both epidemics at all levels.
- To reduce HIV spread in the community, IEC activities should be strengthened and so as to create awareness and eventually bring attitudinal change so that individuals will limit partners and avoid unsafe sexual practices.
- Pre-marital HIV-VCT should be encouraged.
- Health education should be given for the community on mode of transmission of TB, prevention of HIV infection impact of TB-HIV co-infection on TB treatment out comes and productivity of population and national country
- Pay special attention in combating HIV/AIDS epidemics.
- Expand and strengthen medical facilities especially in different districts.
- Since the study was conducted within short period of time, further study should be conducted.

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7. APPENDICES

Appendix 1. English Version Questioners for Respondents

Dear respondents ,The main purpose of this study is to find out the prevalence of TBs and HIV infections and their associated risk factors among patients visiting Kuyu hospital ,Ethiopia. Therefore, I kindly request you to give your genuine response to each question

1. Sex A) Male B) Female

2. Age in years A) <15 B) 15-25 C) 26-35 D) >35

3 .Educational status A) Illiterate B) primary school

C) Secondary D) Diploma and above

4. Marital status A) married B Unmarried

C) Divorced D) Widowed

5. Occupation A) Employed B) Farmer

C) Merchant D) Student E) Daily Labor

6. Cigarette Smoking habit A) No B) Yes

7. Sexual partner A) more than one B) Only one C Do not has

8 . Awareness about TB A) Good B) Poor

9. Knowledge about HIV/AIDS A) poor B) Good C) Do not have

10. Residences

A) Urban B) Rural

11. Average monthly income A) Poor (below 1600) B) Medium(1600-3500)

C) Rich (above 3500

Appendix 2.Afan Oromo Version Questioners for Respondents

GAAFANNOO AFAAN OROMOO

Kabajamtoota hirmaattota gaaffii kanaa Kaayyoo gaaffii kanaa waa'ee dhukkuboota Sombaa fi EEDSI Yaada namoota sassaabbachuuf waan ta'eef deebiin isin kennitan qorannoo geggeeffamu kanaa galmaan gahuuf gahee olaanaa waan qabuuf deebii isinitti fakkaate akka deebistan kabajaan isin gaafanna.

1.Saala A) Dhiira B) Durba

2 . Umurii A) <15 gadi B) 15-25

C) 26-35 D)>35

3 Sadarkaa barumsaa A) Kan hin baranne B) Sadarkaa 1ffaa

C) Sadarkaa 2ffaa E) Dippiloomaa fi ol

4. Gaa'ila ilaalchisee A) Kan fuudhe/Heerumte B) k a n h i n fuunne/hin Heerumne C) kan gargar bahe /baate D)Du'aan gargar kan bahan

5.Hojii ilaalchisee A)Hojjeta mootumma B) Qotee bulaa C) Daldalaa D) Barataa/ttuu E) Hojjetaa guyyaa

6. Tamboo ni xuuxxaa? A) Lakkii B) Eeyyee

7. Jaalallee dhiira ykn Durbaa meeqa qabdaa?

A) Tokko B) Tokkoo ol C) Hin qabu

8. Hubannoo dhibee sombaa hagam qabda?

A) Gaarii B) Gadi

9. Hubannoon dhibee AIDS hagam qabda? A)Gaariidha B)Xiiqqaa C) Hoomaa hin qabu.

10. Eessa jiraatta ? A)Magaalaa B) Baadiyyaa

11.Giddu galeessi Galiin kee baatitti qarshii meeqa? A) 1600 gadi B) 1600-3500 C) 3500 ol

Amharic version Questionnaire

□□□□□□□□ □□ □ □ □ □ □□□

1. □□ □. □□□ □. □□
2. □□□ □. ≤15 □. 15-25 □. 26-35 □ .>35
3. □□□ □□□ □□□ □. □□□□ □ □. 1□ □□□ □. 2□ □□□ □ . □□□ □ □ □□□ □□□
4. □□□□ □□ □. □□□□/□ □. □□□/□ □. □□□/□ □ . □□ □□□/□□□
5. □□□ □□□ □. □□ □□□□ □ /□□ □□□ □ □. □□ □□□ □. □□□ □ . □□□
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8. □□HIV □□□ □□□□ □. □ □ □. □ □□ □□ □□ □
9. □□TB □□□ □□□□ □. □ □ □. □ □□ □□ □□ □
10. □□□ □□ □ □□ □. □1600 □□ □ □. □1600-3500 □. □3500 □□□
11. □□□ □□ □□□/□ □. □□ □. □□□□

Appendix 3. Clinical and Laboratory Reporting Format

Cod---------- Age---------- sex----------

1. Type of Infections A) co-infected B) HIV C) TB D) no-infection

2. Type of TB-infection A) EPTB B) PPTB C) NPTB

3. ARTstatus A) ART not started B) ART started C)

4. $CD4^{+}$ T-cell count /mm^3 A) Less than 300 B) 300-500 C) greater than 500

Appendix 4. Laboratory Activities on HIV and TB