

## HIV co-infection among tuberculosis patients on Directly Observed Treatment Short Course in Western Ethiopia

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**Abstract:** A retrospective study was conducted to assess the extent of tuberculosis and Human Immunodeficiency Virus co-infection and associated risk factors among tuberculosis patients enrolled in Directly Observed Treatment Short Course (DOTS) program over the course of five (2009-2013) in six selected institutions providing DOTS program Western Ethiopia from April to August 2014. Bivariate and multivariate logistic regression analyses were used to assess the association between treatment outcomes and predictor variables. The overall prevalence of tuberculosis and Human Immunodeficiency Virus co-infection was 17.9% and the trend was shown steady increasing. Controlling the effect of confounding factors living in urban duller, being 25-34 year old, being 35-44, year old and having smear negative pulmonary TB were found to be 0.238 (AOR), 0.26(AOR), 0.19(AOR), and 0.516 (AOR), times more likely to develop HIV co-infection, respectively but being male sex has 1.535(AOR) less likely to have HIV co-infection comparing with their counterpart. The finding of the study found that HIV co-infection among TB patients was high and the trend was steadily increasing in the present study. Thus, this urgent need for programmatic revision on the ongoing intervention strategies, strengthening the health system infrastructure, and increasing public awareness on targeted interventions for women and reproductive age group.

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**Key words:** HIV, Tuberculosis patients, DOTS, Western Ethiopia

### 1. Introduction

Tuberculosis (TB) and Human immunodeficiency virus (HIV) co-epidemics remain a major public health challenge, particularly in low income countries. In 2011, 1.1 million (13%) of the 8.7 million people who developed TB worldwide were HIV-positive; the highest rates of HIV co-infection were reported for TB patients in the African Region where 46% of those with an HIV test result were HIV-positive (compared with 44% in 2010). The percentage of TB patients found to be HIV-positive in the 28 African countries in the list of 41 priority countries ranged from 8% in Ethiopia to 77% in Swaziland (WHO, 2012). A recent Ethiopia National TB/HIV Sentinel Surveillance showed that the prevalence of HIV among the TB patients registered was 20% (EFMOH, 2013).

In high HIV prevalent countries, the control targets HIV related TB continues to be increasing even in well-established TB program. This implies that asserting a very good TB program with effective implementation of DOTS would not be sufficient to control TB (WHO, 2009). The HIV pandemic is a forceful contributor to the incidence of TB. Globally, from the year 1990 to 2004, TB incidence increased from 125 cases to 142 cases per 100,000 populations, primarily because of the HIV pandemic (Mukadi et al., 2001).

The interaction of TB and HIV are called a “deadly duo” as HIV weakens the immune system and makes them more susceptible for TB infection. On the other hand, TB increases the progression of HIV to AIDS stage (WHO, 2008). In addition, the complex relation between the two diseases may affect TB cases finding due to atypical presentation of TB and the presence of co-infections, which may mimic the presence of TB (Wood et al., 2007). The risk of developing TB among people infected with HIV/AIDS is ten times higher than those without HIV infection, with profound immunodeficiency associated with HIV infection. Although the chance of acquiring TB is progressively increases with the advancement of HIV disease stage, TB tends to occur at any time in the course of HIV disease (WHO, 2004). It is the leading specific diagnosis among patients living with HIV/AIDS (Seifu, 2004).

Ethiopia has started implementing the TB/HIV collaborative activities since 2002 (EFMOH, 2007). However, only few studies state that HIV co-infection has been a major public health challenge among TB patients of the country (Esmael et al, 2013, Sebsibe Tadesse and Takele Tadesse, 2013, Getahun et al, 2014, Wondimeneh et al., 2012, Deribew et al., 2010). Therefore, HIV co-infections among TB patient have not yet exhaustively studied in Ethiopia. Therefore, this study was to assess the extent of HIV co-infection and associated risk factors

among TB patients enrolled in Directly Observed Treatment Short Course (DOTS) program in Western Ethiopia.

## 2. Materials And Methods

**2.1. Study area:** The study was conducted in health institution providing DOTS services in Selected health facilities of Western Ethiopia. The health institutions were Nekemte Referral Hospital, Nekemte health center, Awash higher clinic, National higher clinic, Red Cross clinic and Abdi clinic during the study period.

The patients were diagnosed, registered, treated, and referred to other DOTS clinics in these health institutions following the National Tuberculosis and Leprosy Control Program (NTLCP) guideline which adopted from World Health Organization (WHO) (FMOH, 2008). These health institutions also confirm the HIV status of TB patients and gives ART service.

**2.2. Study design and data collection techniques:** A five year (2009-2013) retrospective study was conducted among 1125 TB patients attending DOTS services in Nekemte Referral Hospital, Nekemte health center, Awash higher clinic, National higher clinic, Red Cross clinic and Abdi clinic which are located in Western Ethiopia from April to August 2014. The socio demographic data such as sex, age, and residence, HIV status, TB form, and patient category were collected from the DOTS registration book. The HIV status were determined in the study health institution following national HIV test algorithm in Ethiopia where KHB (Shangai Kehua Bio-engineering Co, Ltd. China) was used for the first screening and positive samples were re-tested with STAT PAK (Chembio HIV1/2 STAT PAK Assay, USA). Samples giving discordant results in the two tests (KHB and STAT PAK) were re-tested using tie-breaker (Unigold). The study excluded TB patient having incomplete data on registration book of DOTS clinics.

**2.3. Definition of forms of TB** According to the standard definitions of the NLCP (FMOH, 2008), adopted from WHO, there are three type of TB considered in this study and defined for the clinical case as follows: The first is Smear-positive pulmonary TB (SPPTB) and it is was identified if a patient had at least two initial sputum smear examinations positive for AFB by direct microscopy, or one initial smear-positive examination for AFB by direct microscopy and a positive culture, or a patient has one initial smear-positive examination for AFB by direct microscope and radiographic abnormalities consistent with active TB as determined by a clinician. The second type was smear-negative Pulmonary TB (SNPTB) and it was characterized by

a patient having (1) symptoms suggestive of TB with at least three initial smear-negative examinations for AFB by direct microscopy and no response to a course of broad-spectrum antibiotics; (2) three smear-negative examinations by direct microscopy, and radiological abnormalities consistent with pulmonary tuberculosis, and decision by a clinician to treat with a full course of anti-tuberculosis; or (3) a diagnosis based on a positive culture for *Mycobacterium tuberculosis* after three initial smear-negative examinations by direct microscopy. The third type was Extra pulmonary TB (EPTB). In this case TB occurs in organs other than the lungs, proven by one positive-culture from specimens of an extra-pulmonary site or histo-pathological evidence from a biopsy, or TB based on strong clinical evidence consistent with active EPTB and the decision by a physician to treat with a full course of anti-TB therapy.

**2.4. Data quality assurance:** To assure the data quality, the trained data collectors were used and informed on how to maintain the completeness, accuracy and consistency of the collected data as well as pre-developed data collection sheet was used.

**2.5. Data analysis:** The collected data were entered, cleaned and analyzed by using SPSS version 20 statistical software. Descriptive statistics was computed to determine the prevalence of HIV/TB co-infection. To identify associated risk factors, first a bivariate logistic regression was performed for each independent variable with the outcome of interest (HIV/TB co-infection). Finally, multivariable logistic regression was done to determine independent predictors of HIV/TB co-infection. All tests were two-sided and  $p < 0.05$  was considered statistically significant

**2.6. Ethical consideration:** Before any attempt to collect data, the protocol was approved by Institutional Review Board (IRB) of College of Medical and Health Sciences, Wollega University. Official permission was also obtained from respective institutions administration office. The anonymity was warranted for all those records reviewed.

## 3. Results Analysis

**3.1. Socio-demographic characteristics of study participants:** A total of 1125 TB patients were involved in the study. Of whom, 605(53.8%) were male, 618 (54.9) attend DOTS services at Nekemte Health Center and 454(40.4%) had EPTB form. The patients had a mean, standard deviation and median age of 29.81, 13.915 and 26.00 respectively. Major of the study participants were urban (86.3%), new patient category, age between 15-44 year (Table 1). The frequency of all form of TB co-infected with

HIV was steadily increasing in the last five year with peak at 2011 (Figure 1).

Table 1: Socio-demographic characteristics of study participants attending DOTS services in Western Ethiopia from 2009-2013

Character		Frequency	Percentage
Address	Urban	971	86.3
	Rural	154	13.7
Sex	Male	605	53.8
	Female	520	46.2
Age	0-14	79	7.0
	15-24	400	35.6
	25-34	284	25.2
	35-44	179	15.9
	45-54	98	8.7
	55-64	54	4.8
	>=65	31	2.8
TB Patient category	New	1037	92.2
	Relapse	11	1.0
	Treatment failure	1	.1
	Default	5	.4
	Transfer in	24	2.1
	Unknown	47	4.2
Form of TB	SPPTB	228	20.3
	SNPTB	443	39.4
	Extra pulmonary TB	454	40.4
Treatment centers	Nekemte Referral Hospital	304	27.0
	Nekemte Health Center	618	54.9
	National Higher Clinic	87	7.7
	Awash Higher Clinic	81	7.2
	Red Cross Clinic	8	.7
	Abdi Clinic	27	2.4
Total		1125	100%

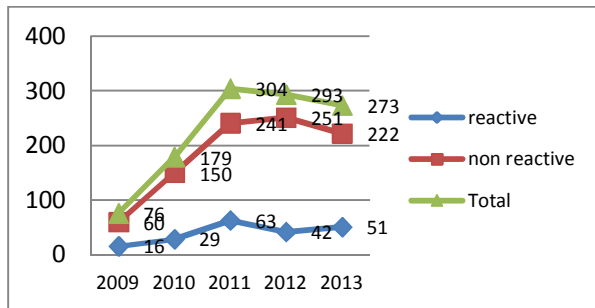


Figure 1: Trend of HIV co infection with TB in Western Ethiopia, 2009- 2013

**3.2. Prevalence and associated predictors of HIV/TB confection:** The overall prevalence of HIV among TB patient was 17.9%. The HIV co- infection among TB patient were higher among the Urban dweller 192(15.7%), Female 106 (20.4%), 25-44 year age 140(62 %), Smear negative pulmonary TB 95(21.4%) and patient attend Nekemte Referral Hospital 87(28.6%) (Table 2).

In bivariate analysis, urban dweller, male sex, 25-44 year age, having smear negative pulmonary TB and attending Nekemte Referral Hospital were

significantly associated with HIV co-infection with TB patients, however, patient category were not significantly associated. Controlling the effect of confounding factors living in urban dweller, being 25-34 year old, being 35-44, year old and having smear negative pulmonary TB were found to be 0.238 (AOR), 0.26(AOR), 0.19(AOR), and 0.516 (AOR), times more likely to develop HIV co-infection, respectively but being male sex has 1.535(AOR) less likely to have HIV co-infection comparing with their counterpart (Table 2).

**4. Discussion**

HIV co-infection among TB patients is well recognized as a major public health problem worldwide and this study was carried out to determine the prevalence and associated risk factors of HIV and TB co-infection among patients in Western Ethiopia from 2009-2013. The overall prevalence of HIV co-infection among TB patient was 17.9% which was consistent with the study done at southern Ethiopia (18.0%). This is higher than the study done in Dabat (11.4%) (Sebsibe Tadesse, Takele Tadesse, 2013) and northwest Ethiopia (7.5%) (Wondimeneh et al., 2012) but lower than study done in Debre Markos Referral Hospital 44.8% (Esmael et al., 2013) and recent national survey 20% (EFMOH, 2013). This high prevalence of HIV co-infection among TB patients in the study area signifies the urgent need for programmatic revision, strengthening the health system infrastructure, staff capacity building, increasing public awareness, decreasing social and perceived stigma associated with TB and HIV (Deribew et al.,2010) and innovating for patient-friendly and cultural sensitive intervention approaches.

In this study the urban dweller had higher HIV co infection with TB. This consistence with other studies conducted in sub-Saharan African countries that showed higher number of HIV infected TB cases in urban than rural areas (Esmael et al., 2013, Datiko et al., 2008, Pefura et al., 2012, Houston et al.,1994, Nwabuko et al., 2012). Possibly this might be due to a presence of high prevalence of HIV infection among urban dweller (Seifu, 2004, EFMOH, 2007).

The prevalence of HIV co-infected TB patients was higher in female in this study. Other studies support this finding (Wondimeneh et al., 2012, CSA, 2012). This is probably related to the high incidence of HIV infection in females which predisposes them to TB as the former is known to activate dormant TB. Women, who have a higher susceptibility to HIV infection, are usually exposed to sexual activities earlier than men mainly for economic reasons. Furthermore, most African women being subservient subordinated to their husbands have little or no say in

issues relating to sexual relationships (Pefura et al., 2012).

The higher prevalence of HIV co-infection among TB patients age between 25-44 years old was statistically significant. This finding was in agreement with studies conducted in Ethiopia (Pefura et al., 2012), Debre Markos Referral Hospital (Esmael et al., 2013), in Cameron (Adjei et al., 2006),

and in Ghana (Houston et al., 1994). This age prevalence of HIV co-infection among TB patients probably reflects the age-specific prevalence of HIV in the community. This may be related to patients' being in a sexually active age group in which both TB and HIV prevail most (Tessema et al., 2009, Berhe et al., 2012)

**Table 2: Socio-demographic characteristics and HIV status of TB patients in Western Ethiopia, 2009 – 2013**

Character		HIV Status Reactive	Non-reactive	Total (%)	COR (95% CI)	AOR(95% CI)
Address	Urban	192(15.7%)	779(84.3%)	971(53.8%)	.252(0.126-0.503)*	<b>.238(0 .116-.49)*</b>
	Rural	106 (5.8%)	414(94.2%)	520(13.7%)	1	<b>1</b>
Sex	Male	95(15.7%)	510(84.3%)	605(53.8%)	1.375(1.012-1.866)*	<b>1.535(01.096-2.151)*</b>
	Female	106 (20.4%)	414(79.6%)	520(46.2%)	1	<b>1</b>
Age	0-14	10 (12.7%)	69(87.3%)	79(7.0%)	.739(0 .189-2.889)	<b>.667(0 .163-2.732)</b>
	15-24	27(6.8%)	373(93.2%)	400(35.6%)	1.48(0 .423-5.182)	<b>1.51(0 .412-5.55)</b>
	25-34	77(27.1%)	207(72.9%)	284(25.2%)	.288(0 .08-0.975)*	<b>.26(0.075-0.947)*</b>
	35-44	63(35.2%)	116(64.8%)	179(15.9%)	.197(0 .058-0.675)*	<b>.19(0.05-0.716)*</b>
	45-54	19(19.4%)	79(80.6%)	98(8.7%)	.445(0 .12-1.62)	<b>.476(0 .125-1.819)</b>
	55-64	2(3.7%)	52(96.3%)	54(4.8%)	2.78(0 .439-17.668)	<b>3.48(0 .527-22.97)</b>
	>=65	3(9.7%)	28(90.3%)	31(2.8%)	1	<b>1</b>
TB Patient category	New	189(18.2%)	848(81.8%)	1037(92.2%)	.534(0 .209-1.368)	
	Relapse	2(18.2%)	9(81.8%)	11(1.0%)	.536(0 .089-3.212)	
	Default	2(40.0%)	3(60.0%)	5(0.4%)	.179(0 .024-1.34)	
	Transfer in	3(12.5%)	21(87.5%)	24(2.1%)	.83(0.18-3.826)	
	Unknown	5(10.6%)	42(89.4%)	47(4.2%)	1	
Form of TB	Smear positive pulmonary TB	43 (18.9%)	185(81.1%)	228(20.3%)	.69(0.453-1.061)	<b>.66(0.415-1.055)</b>
	Smear negative pulmonary TB	95(21.4%)	348(78.6%)	443(39.4%)	.59(0.416-0.837)*	<b>.516(0.35-0.76)*</b>
	Extra pulmonary TB	63(13.9%)	391(86.1%)	454(40.4%)	1	<b>1</b>
Treatment centers	Nekemte Referral Hospital	87(28.6%)	217(71.4%)	304(27.0%)	.20(0.046-0.86)*	<b>.258(0.057-1.178)</b>
	Nekemte Health Center	101(16.3%)	517(83.7%)	618(54.9%)	.41(0.095-1.756)	<b>.513(0.113-2.32)</b>
	National Higher Clinic	3(3.4%)	84(96.6%)	87(7.7%)	2.24(0.35-14.16)	<b>3.03(0.45-20.27)</b>
	Awash Higher Clinic	7(8.6%)	74(91.4%)	81(7.2%)	.846(0.165-4.34)	<b>1.17(0 .215-6.38)</b>
	Red Cross Clinic	1(12.5%)	7(87.5%)	8(0.7%)	.56(0.044-7.119)	<b>.42(0.025-7.127)</b>
	Abdi Clinic	2(7.4%)	25(92.6%)	27(2.4%)	1	<b>1</b>
Total		201(17.9%)	924(82.1%)	1125		

\*=Statistical significance ( $P < 0.05$ ), 1 =Reference group, COR= Crude odd ratio, AOR=Adjusted Odd ratio 95%CI=95% confidence interval

The higher prevalence of HIV in patients with smear negative pulmonary tuberculosis has been described elsewhere (Wondimeneh et al., 2012, Deribew et al., 2010, Pefura et al., 2012). The finding was largely in agreement with published literature. The patients with SNPTB were more likely to be HIV positive than those with SPPTB. Unlike patients with tuberculosis and without HIV, those with HIV are twice as likely to have sputum smear-negative, and culture-positive pulmonary TB which results from their compromised immune response leading to less cavity formation (Nunn et al., 1994, Elliott et al., 1993)

The trend of HIV/TB co-infection was steadily increasing in the last five years in the study area. The finding was in line with the 2012 WHO report on the trend of HIV among TB patients from 2004-14 (WHO, 2012). Thus, this implies that the level of the problem is increase despite the ongoing intervention.

In conclusion the prevalence HIV co-infection among TB patients was high and the trend was steadily increasing in the present study. The co-infection was significantly associated with urban dweller, 25-44 age groups, being male sex and having

smear negative pulmonary TB. Thus, this urgent need for programmatic revision on the ongoing intervention strategies, strengthening the health system infrastructure, and increasing public awareness on targeted interventions for women and reproductive age group.

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