Prevalence of Tuberculosis and Human Immunodeficiency Virus Co-infection and Associated Factors among People Living With Human Immunodeficiency Virus at Burayu and Holeta Districts, Oromia Region, Ethiopia

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Abstract

Tuberculosis (TB) and Human Immunodeficiency Virus (HIV) are the double burden diseases of the world. The African continent takes a great share of TB-HIV cases worldwide. This retrospective study was conducted to assess the prevalence of TB-HIV co-infection and associated factors in Burayu and Holeta health centers. A ten years retrospective study was conducted by reviewing files of HIV/AIDS patients attending HIV clinics in the two health centers (2008-2017). Data were coded, cleaned and analyzed using SPSS version 20 statistical software. A P-value <0.05 was considered statistically significant. Among 2937 people living with HIV/AIDS, 13.3% (95% CI: 12.07-14.53) were TB-HIV co-infected, the majority were males and in the age group of 15-45years. $CD4^+$ cell count <200cells/mm^3 (χ^2 = 58.22 P<0.001), WHO clinical stage III and IV (χ^2 = 119.3; P<0.001), antiretroviral drug adherence (χ^2 = 92.31; P< 0.001) nutritional status (χ^2 = 89.4; P < 0.001) were significantly associated with HIV-TB co-infection. The prevalence of TB among HIV patients at two health centers was moderately high. Therefore, TB screening among HIV-positive patients is mandatory. In addition, community mobilization on early case detection and health education on TB-HIV co-infection should be encouraged.

Keywords: Tuberculosis, HIV/AIDS, People living with HIV/AIDS, TB-HIV Co-infection

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INTRODUCTION

Tuberculosis (TB) is one of the 10 top global health problems which is a cause for the illness of 10 million and the death of 1.6 million people (WHO, 2018). The largest number of new TB cases was from Southeast Asia and Western Pacific regions (62%), followed by Africa (25%) (WHO, 2018). Globally, 36.9 million people were living with human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), out of which 25.7 million were in Africa (UNAIDS, 2018).

Ethiopia is among the 30 countries highly affected by tuberculosis, ranking 10th globally, and 4th in Africa (WHO, 2016). Ethiopia is also heavily affected by TB-HIV co-infection, being the 7th globally and 2nd in Africa (WHO, 2014). Understanding the prevalence and predictors of TB-HIV co-infections in the local context is critical to determine the burden and associated factors of the co-infection and design intervention strategies accordingly. Associated factors that contribute to TB-HIV co-infection are numerous (Mohammed et al., 2011). Therefore, in countries like Ethiopia where TB and HIV are the major public health problems, understanding the associated factors in local settings is vital to assess the status of TB-HIV co-infection and improve the management accordingly. Therefore, this study was designed to assess the prevalence of TB-HIV co-infection and associated factors among people living with HIV/AIDS (PLWHIV) that were attending the HIV clinics in Holeta and Burayu Health Centers.

MATERIALS AND METHODS

Study area

The study was conducted in health centers found in Burayu and Holeta towns located 31 and 15 Km West of Addis Ababa, respectively. According to the 2010 report of the Central Statistical Agency (CSA), the population of Holeta and Burayu towns were 57,621 and 93,437, respectively. There were two public health centers and 11 private clinics in Burayu and two public health centers and 10 private clinics in Holeta (Fig. 1).

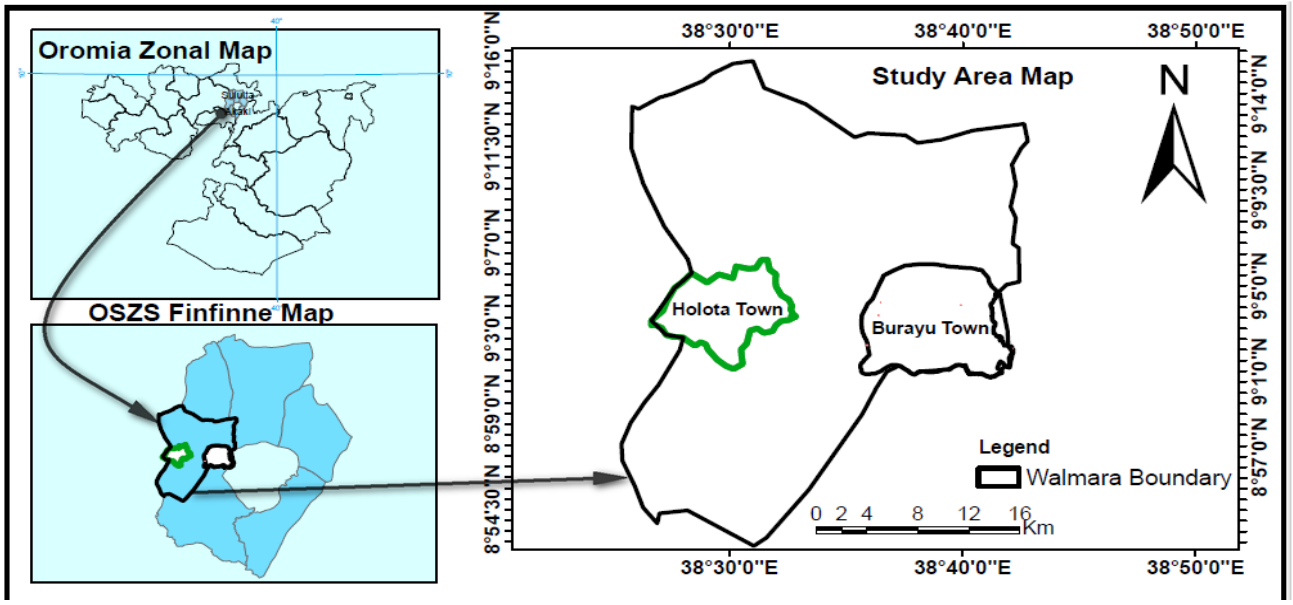

Figure1. Map of the study area.

Study design

A health facility-based retrospective study was conducted by reviewing 10 years (2008-2017) records of PLWHIVA at the directly observed treatment short-course (DOTS) clinic of two health centers. The selection of the two Health Centers was based on their high patient inflow with full information, which let as to get sufficient data within the study period. Records of cases with complete demographic and clinical data were included in the study, while those whose documents were incomplete, inconsistent, lost, or transferred were excluded from the study. The reviewed documents contained basic information such as patient's age, sex, weight address, TB type, and HIV status. About 2941 records from 2008-2017 on logbooks at the DOTS clinic of the two health centers were reviewed and 2937 were included in the study, while four records with incomplete data on logbooks were excluded.

Data collection and analysis

Socio-demographic characteristics (age, sex, marital status, residence, education and occupation) and TB-HIV infection associated factors (nutritional status, WHO clinical stage, CD4 count, adherence status) data of the cases were retrieved from the TB log and recorded in a pre-prepared data collection checklist adopted from an other study (Yeitayih et al., 2012). Data quality was assured by using a pre-tested data collection checklist and trained data collectors. Completeness and consistency of data were checked by data clerks and investigators before and after data entry. Data were entered, cleaned and analyzed using SPSS version 20 statistical software. Data were summarized using frequencies and proportions to describe the study population relevant variables. Chi-square test was used to determine the association between TB-HIV co-infections and relevant variables and P values of less than 0.05 were considered as statistically significant.

Ethics approval

Ethical clearance was obtained from the Institutional Review Board of Hawassa University. A formal letter of permission was obtained from the Heads of Holeta and Burayu District Health Offices. The consent for extracting data from records was obtained from Burayu and Holeta District Health Offices, Health Center heads and the DOTS clinic coordinators. The patients' clinical records were reviewed anonymously, and all information obtained from clinical records was kept confidential.

RESULTS

Totally 2937 records of PLWHIVA were reviewed and the majority (1789, 61%) were females, 2226 (75.8%) urban dwellers and 703 (39.6%) in the age group of 15-30 years. The majority (67.7%) of the cases was unemployed or daily laborers and 37.9% were single. Most (60.1%) of the participants had normal nutritional status and good adherence to antiretroviral therapy (ART) (62.9%). Most (66.7%) of the PLWHIVA were at WHO clinical stages I and II and (63.7%) of the cases had a CD4 count greater than 200 cells/mm^3 (Table1).

Table1. Socio demographic and clinical characteristics of PLWHIVA, Burayu and Holeta Health Centers (2008-2017).

Characteristics		Frequency	Percentage
Sex	Male	1148	39.1
	Female	1789	60.9
Age(years)	≤ 15	310	10.5
	16 – 30	1162	39.6
	31 – 45	1111	37.8
	>45	354	12.0
Residence	Urban	2226	75.8
	Rural	703	23.9
Nutritional status	Normal	1766	60.1
	Moderate malnourished	978	33.3
	Severe malnourished	143	5.0
ART adherence	Good	1848	62.9
	Fair	965	32.9
	Poor	103	3.5
WHO clinical stages	stage1	911	31.0
	stage 2	1050	35.7
	stage 3	929	31.6
	stage 4	47	1.6
CD4 cell count	< 200 cell/mm^3	1067	36.3
	200 – 500 cell/mm^3	1108	37.7
	Above 500 cell/mm^3	762	25.9
Educational status	No formal education	689	23.5
	Primary education completed	1143	38.9
	Secondary education completed	873	29.7
	Tertiary education completed	232	7.9
Marital Status	Single	1112	37.9
	Married	1043	35.5
	Separated/Divorced	325	11.1
	Widowed/widower	457	15.6
Occupation	Government Employee	209	7.1
	Industry workers	957	32.6
	Students	213	7.2
	Unemployed	1031	35.1
	Others	229	7.8

Trends of HIV/TB co-infection

The trend of TB-HIV co-infection showed variations during the study period. From 2008-2010 TB-HIV co-infection was gradually decreased from 12.9 - 9.9% and starting 2011 the co-infection progressively increased and reached 17.1% in 2013. Then, constantly decreased down to 7.7% in 2017 (Fig 2).

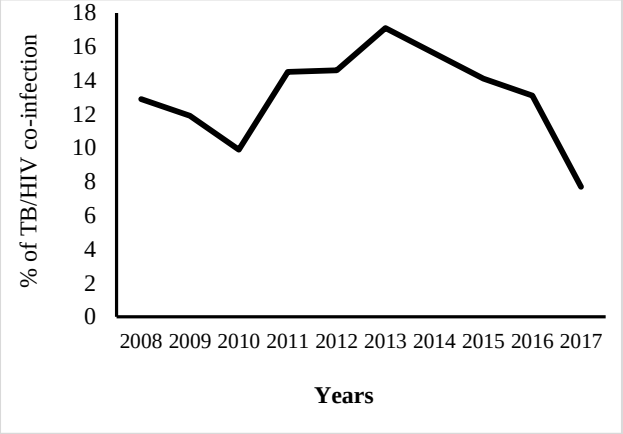

Figure 2. Trend of TB-HIV co-infection among PLWHIVA at Holeta and Burayu Health Center (2008-2017)

Among 2937 PLWHIVA, 391 [13.3%; (95% CI: 12.07-14.53)] were TB-HIV co-infected and the majority were in the age range of 15-45 years. The prevalence of TB-HIV co-infection among males was 210 (18.3%) (Table 2). TB-HIV co-infection was significantly associated with nutritional status, WHO clinical stage, ART drug adherence, CD4 cell count, educational status, and occupation ($P< 0.05$). Individuals in WHO stage III and IV were significantly exposed to the co-infection than stage I and II ($\chi^2 = 119.3$; $P < 0.001$). TB-HIV co-infection was significantly higher in case of $CD4^+$ cell count <200 cells/mm^3 as compared to CD4 cell count above 500 cells/mm^3 ($\chi^2 = 58.22$ $P < 0.001$). More TB-HIV co-infection was recorded in the case of severely and moderately mal-nourished people and the association was statistically significant ($\chi^2 = 89.4$; $P < 0.001$). The majority of co-infection was observed in cases with poor adherence and the association was statistically significant ($\chi^2 = 92.31$; $P< 0.001$).

DISCUSSION

Tuberculosis is a well-recognized opportunistic infection in patients with HIV/AIDS and is the leading cause of morbidity and mortality among people living with HIV/AIDS. Therefore retrospective or prospective assessment of the status of TB among PLWHIVA is very essential for public policy, planning, and development of collaborative activities accordingly. Hence, in this study, the overall prevalence of TB-HIV co-infection was 13.3%, which was in coherence with studies conducted in Southern, Central, North West Ethiopia, and Nigeria 13.9%, 12%, 11.4%, 14.1%, respectively (Asnake et al., 2017, Solomon et al., 2018, Sebsibe and Takele, 2013, Tony et al., 2015). The finding was less than the studies done in Southern, Central, North East, and North West Ethiopia 18.2 %, 36.9%, 20.3%, 24.4% and 44.8%, respectively (Sintayhu et al., 2015; Abel et al., 2018; Seada and Tewelde 2015; Daniel et al., 2015; Ahemed et al., 2013) and in other countries such as Cameroon and India 51.6% and 17% (Pefura et al., 2012; Purushottam et al., 2013), respectively. But, it was higher than investigations conducted in South West, North West Ethiopia, and Tanzania 8.1%, 7.5%, 8.5%, respectively (Kebede and Wabe, 2012; Yeitayih et al., 2012; Ngowi et al., 2008). These variations in the magnitude of TB/HIV co-infection among people living with HIV/AIDs may be associated with differences in coverage level of highly active antiretroviral treatment (HAART), diagnostic procedures used, the difference in TB diagnosis, under-reporting, epidemiology of TB in different countries and study methodology applied.

Residence of the study participants had no association with TB-HIV co-infection. However, reports from North West Ethiopia (Sebsibe and Takele, 2013) Cameroon (Pefura et al., 2012) indicated that TB-HIV co-infection occurs more among urban dwellers. This might be associated with overcrowded settlement and low-quality life status of most of the people in the urban areas of developing countries (Amare et al., 2009). In contrast, in South and North West Ethiopia (Mohammedaman et al., 2018; Sebsibe and Takele, 2013) most of the cases were among rural residents. Males were more exposed to co-infection; this could be usually due to the migration of the adult male population to the study area for a job and enrolled as laborers in private institutions and factories. Moreover, it may be because males are more involved in the consumption of alcohol and smoking and have risky sexual behavior (Aweke et al., 2016). Similar findings were documented in North West and South Ethiopia (Yeitayih et al., 2012; Mohammedaman et al., 2018), Nigeria, India, Brazil and Europe (Babatunde et al., 2016; Magna and Sitikantha, 2016; Bráulio et al., 2008; Pimpin et al., 2011). In contrast, in North West, North East, South Ethiopia (Sebsibe et al., 2013; Daniel et al., 2015; Mohammedaman et al., 2018) and Sub-Sahara Africa countries females are more exposed (Sia et al., 2014). Participants in the age group 15-45 years were more affected with TB-HIV co-infection, similar findings were obtained elsewhere in Ethiopia, Malawi and Cameroon (Yeitayih et al., 2012; Tweya et al., 2013; Sume et al., 2008). This might be because this age group was sexually active and involved in various superfluous

daily activities, which increase the frequency of the exposure.

Table 2.Chi-square analysis of factors associated with TB-HIV co-infection among PLWHIVA at Holeta and Burayu Health Centers (2008-2017)

Characteristics		Total	HIV-TB co-infection		χ^2	P-value
			Yes	No		
Sex	Male	1148	210	938	40.49	<0.001
	Female	1789	181	1608		
Age(years)	≤ 15	310	35	275	2.47	0.47
	16 – 30	1162	166	996		
	31 – 45	1111	147	964		
	>45	354	43	311		
Residence	Urban	2226	305	1921	1.20	0.54
	Rural	703	85	618		
Nutritional status	Normal	1766	162	1604	89.4	<0.001
	Moderate	978	187	791		
	Severe	143	41	102		
ART adherence	Good	1848	176	1672	92.31	<0.001
	Fair	965	175	790		
	Poor	103	38	65		
WHO clinical stage	Stage 1	911	43	868	119.3	<0.001
	Stage 2	1050	101	949		
	Stage 3	929	216	713		
	Stage 4	47	31	9		
CD4cell count	< 200 cell/mm^3	1067	200	867	58.22	<0.001
	200 – 500 cell/ mm^3	1108	142	966		
	Above 500 cell/ mm^3	762	49	712		
Educational status	Illiterate	689	122	567	20.22	0.062
	Primary education	1143	155	988		
	Secondary education	873	91	782		
	Tertiary	232	23	209		
Marital Status	Single	1112	211	901	74.8	0.10
	Married	1043	85	958		
	Separated/Divorced	325	37	288		
	Widowed/widower	457	58	399		
Occupation	Government Employee	209	13	196	54.10	0.35
	Farm and Industry	957	139	818		
	Students	213	12	201		
	Unemployed	1031	201	830		
	Others	229	18	211		

*Others (Wife, farmer, merchant, driver)

TB-HIV co-infection was significantly associated with $CD4^+$ cell count <200 cells/mm^3, studies conducted in other places also obtained similar results (Bekele et al., 2018). The association between TB/HIV co-infection and WHO clinical stages of HIV patients was statistically significant, studies in

other place in Ethiopia, and Gambia (Aweke et al., 2016;Hill et al., 2006) also documented congruent findings. The nutritional status of PLWHIVA was also significantly associated with TB-HIV co-infection, the finding was in line with that of (Aweke et al., 2016; Sudre et al., 1996). Cases with poor adherence were more affected and the association was statistically significant, which is in agreement with other findings (Sudre et al., 1996).

The finding of this study was able to determine the prevalence of TB-HIV co-infection and identified the possible TB- HIV associated factors in the study areas. The finding could be used as baseline data for professionals that involved in the prevention and control of TB and HIV and policymakers to design strategies that improve referral pathways between the TB and HIV clinics and improve TB screening among HIV patients and allocate resource accordingly. Further investigation should be carried on the incidence of TB-HIV co-infection and the trend and level of interaction of TB infection in HIV patients.

CONCLUSION

In the present study, the prevalence of TB-HIV co-infection was moderately high. The co-infection was associated with $CD4^+$ cell count less than 200/µl, WHO clinical stage III, poor nutritional status and antiretroviral drug adherence. Therefore, compulsory TB screening among HIV-positive patients is required for early detection and treatment, and thus reduces associated morbidity and mortality. Moreover, intervention strategies on the reduction of TB-HIV co-infection should focus on improving the $CD4^+$ cell count, nutritional status and antiretroviral drug adherence of the clients.

LIMITATION OF THE STUDY

The study was on the prevalence and associated risk factors of TB-HIV co-infection among PLWHIV in Burayu and Holletea, Ethiopia. It was facility-based study and therefore difficult to make generalizations. Community-based studies are required to fully understand the extent of the problem and identify feasible intervention measures. Moreover, since the study design was retrospective, the data source relies on records where some of the case records are incomplete or absent and consequently have a negative impact on the final finding.

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