Tuberculosis among HIV-positive patients at Butajira Hospital, South-Central Ethiopia

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Abstract

Background: Tuberculosis (TB) is the leading cause of morbidity and mortality among people living with Human Immunodeficiency Virus (HIV). This study was carried out to determine the prevalence of tuberculosis and its associated factors among HIV-positive patients at Butajira Hospital, South-Central Ethiopia. **Methods:** A retrospective review of standardized 222 HIV-positive patient records between July 2011 and June 2012 was conducted. A data sheet was used to collect relevant variables. Data were entered, organized and analysed using SPSS Version 16.0 Software. A p-value <0.05 was considered statistically significant. **Findings:** Out of 222 HIV-positive patients attended the HIV care clinic, 20.3% had concomitant TB with higher prevalence among females (22.8%), in the sexually active age group >15 years (18.95%). Among 45 TB/HIV cases, 26.7% had smear-positive pulmonary TB; 62.2% had smear-negative pulmonary TB; and 11.1% had extra-pulmonary TB. Malnutrition (OR= 45.7), $CD4^+$ T-cell count <200/µl (OR= 5.4) and WHO clinical stage III or IV (OR= 4.12) were associated with tuberculosis in HIV-positive patients. **Conclusion:** In conclusion, the prevalence of TB/HIV co-infection at Butajira Zonal Hospital, South-Central Ethiopia was high. The co-infection was associated with malnutrition, low CD_4^+ T-cell count and WHO clinical stage III or IV. Therefore, compulsory TB screening among HIV-positive patients is mandatory. Besides, public awareness, community mobilization should be encouraged. Moreover, large scale studies on the trends in TB/HIV co-infection and associated factors should also be implemented across the country.

Keywords: TB/HIV Co-infection, Butajira, Ethiopia

Introduction

Tuberculosis (TB) is the leading cause of morbidity and mortality among people living with Human Immunodeficiency Virus (HIV) worldwide, particularly in developing countries [1-3]. In Ethiopia, TB remains one of the leading causes of mortality and its prevalence is 211 per 100,000 of the population. Moreover, Ethiopia is one of the high TB/HIV and multidrug resistant TB (MDR-TB) burden countries. It has been estimated that about 13% of all new TB cases are HIV co-infected [4]. HIV co-infection increases the risk of developing TB, but also modifies the clinical presentation of the disease [5,6]. Studies conducted in high burden TB countries have reported several socio-demographic and clinical features significantly associated with TB-HIV co-infection [7-9]. Moreover, HIV-infected patients are more likely to experience sputum smear-negative pulmonary TB (PTB) than HIV-uninfected patients and up to one-third may demonstrate unremarkable chest radiographs. Extra-pulmonary TB (EPTB) is also more common in HIV-positive patients [10,11].

Understanding the prevalence and risk factors of TB in patients with HIV is crucial for the design of effective preventive strategies [11]. However, data on the prevalence and risk factors of TB-HIV co-infection in Ethiopia is limited. Hence, this study was conducted to determine the prevalence and associated factors of TB among HIV patients at Butajira Hospital, South-Central Ethiopia.

Methods

Study design and setting

This retrospective study was conducted at Butajira Zonal Hospital; South-Central Ethiopia involves the review of hospital records of 222 HIV-positive patients admitted over a one year period from July 2011- June 2012. The hospital serves the entire Guraghe zone catchment with a total population of 1.3 million. It has 110 beds with 4 wards (gynaecology & obstetrics, paediatrics, surgery and internal medicine). The hospital's anti-retroviral treatment (ART) clinic was established in 2001 and provides monthly clinical follow up for patients for free.

Participants, data variables and data collection

HIV-positive patients who had been screened for TB and followed up at Butajira hospital ART clinic were included in the study. Whereas, patients whose documents were inconsistent, incomplete, lost, or those who were dead, lost to follow up, drop out or transferred out were excluded from the study. The socio-demographic and clinical variables were collected by reviewing participants' documents using a checklist.

The following operational definitions were used:

- WHO clinical stage of HIV patients classifies into 4 stages. Namely, stage 1 (clinically asymptomatic patient, and persistent generalized lymphadenopathy), stage 2 (minor mucocutaneous manifestations, weight loss, 10% of the body weight, Herpes zoster, and recurrent upper respiratory tract infection), Stage 3 (oral candidiasis, oral hairy leukoplakia, unexplained chronic diarrhea for 1 month, unexplained chronic fever for 1 month, weight loss 10% body weight, bacterial pneumonia, and PTB), stage 4 (EPTB, HIV encephalopathy, lymphoma, Herpes simplex, atypical mycobacteriosis, cryptococosis, extra pulmonary, HIV wasting syndrome, Kaposi's sarcoma, pneumocystis carinii pneumonia, toxoplasmosis of the central nervous system, candidiasis of esophagus, trachea, and/or bronchi, cryptosporidiosis with diarrhea, and mycosis disseminated with histoplasma or coccidiosis),
- ART adherence was labelled into good, fair, and poor depending up on the percent of missed doses >95%, 85-94%, and <85% respectively,
- For children under 5 years, mid-upper arm circumference (MUAC) was used to label nutritional status as 'normal' if >13.5cm, 'moderate' if between 11.5 and 13.5cm, and 'severe' if <11.5cm, while for patients above 5 years, body mass index (BMI) was used to label as 'normal' for those > 18.5kg/m^2, 'moderate' for those between 16 and 18.5kg/m^2, and 'severe' for <16kg/m^2.

The national guideline recommends routine TB screening for all HIV-positive clients [12]. The most commonly used diagnostic methods in the hospital were radiological tests and sputum smear for PTB and ELISA (Reagen LLC, USA) for HIV. In children, sputum induction with hypertonic saline was used for microbiological evaluation of PTB. The clinical case definitions of PTB and EPTB were as WHO recommendations [13].

In Ethiopia, the eligibility criteria for ART initiation in HIV-positive patients is WHO stage IV disease irrespective of CD4+ T-cell count or WHO stage III disease with CD_4+ T-cell counts <350/mm^3 if CD4 testing is available and WHO stage III and IV disease irrespective of total lymphocyte count or WHO stage II diseases with a total lymphocyte count <1200/mm^3 if CD4 testing unavailable [14].

According to the standard treatment guideline of Ethiopia, the first line ARV regimen includes a triple therapy, two Nucleoside Reverse Transcriptase Inhibitors (NRTIs) and one Protease Inhibitor (PI), if this is not possible, a Non-Nucleoside Reverse Transcriptase Inhibitor (NNRTI) or as a triple therapy of three NRTIs. Based on the guideline, common ART regimens in Ethiopia are; TDF/FTC/EFV, AZT/3TC/EFV, AZT/3TC/NVP, D4T/3TC/NVP or D4T/3TC/EFV [14,15].

The treatment of TB in HIV-positive patients is essentially the same as in HIV-negative patients. In Ethiopia, the drugs used as first line treatment for TB are Rifampicin(R), Ethambutol (E), Isoniazid (H), Pyrazinamide (Z), and Streptomycin (S). The drugs available either in fixed dose combination, FDC (Rifampicin, Isoniazid, Pyrazinamide and Ethambutol RHZE 150/75/400/275 mg), Rifampicin and Isoniazid RH 150/75 mg, Ethambutol and Isoniazid EH 400/150 mg) or as single drugs (Ethambutol 400 mg, Isoniazid 150 mg and 300 mg, Streptomycin sulphate vials, 1 g) [12].

Ethics statement

Ethical clearance was obtained from the Research and Community Service Council, College of Medicine and Health Sciences, Hawassa University, Hawassa, Ethiopia.

Statistical analysis

The data was entered onto software Epi-data version 13.1. Moreover, cross-checking and data cleaning was done. Then, the data was transferred to Statistical Package for Social Sciences (SPSS) program version 16.0 for analysis. Chi-square ($\chi 2$) test was used to determine the association between variables and logistic regression analysis was carried out to identify risk factors for being TB/HIV-co-infected. Odds ratio (OR) and 95% confidence intervals (95% CI) were calculated for each predictor variable. The P-value of <0.05 was considered statistically significant.

Results and Discussion

The socio-demographic characteristic of the study participants is depicted in table 1. Two hundred and twenty two HIV-positive patients were included in this study. Of these the majority were above 15 years of age (210; 94.6%), rural residents (167; 75.2%), married (130; 61.9%), and females (136, 61.3%).

Table 1: Socio-demographic characteristics of HIV patients attending the HIV care unit at Butajira Hospital, South-Central Ethiopia (N= 222)

Socio-demographic characteristics	Number	Percent
Age (years)		
<15	12	5.4
≥15	210	94.6
Sex		
Male	86	38.7
Female	136	61.3
Marital status (N=210)		
Unmarried	45	21.4
Married	130	61.9
Separated	19	9
Divorced	11	5.2
Widowed/widower	5	2.4
Occupation (N=220)		
Government employee	51	23.2
Merchant	30	13.6
Farmer	29	13.2
Student	15	6.8
House wife	69	31.4
Driver	1	1
Unemployed	25	11.4
Educational status (N=220)		
No formal education	34	15.5
Primary	72	32.7
Secondary	64	29.1
Tertiary	50	22.7
Religion		
Muslim	110	49.5
Orthodox	76	34.2
Protestant	31	14
Catholic	3	
Others	2	
Residence		
Rural	169	75.2
Urban	55	24.8
TB category (N= 45)		
Smear positive	12	26.7
Smear negative	28	62.2
Extra-pulmonary	5	11.1

Out of 222 HIV-positive patients, 20.3% were co-infected with TB. This finding is higher when compared to findings in India [5] and Brazil [7]. Conversely, it is lower than similar study in Tanzania [16] where the prevalence was reported 32%.

Of the 45 TB/HIV cases, 12 (26.7%) had smear-positive PTB; 28(62.2%) had smear-negative PTB; and 5(11.1%) had EPTB (table 1). The proportion of PTB in this study is higher when compared to findings in Tanzania [16], India [5], and Oromia [17]. On the other hand, studies from Tanzania [16] and India [5] reported higher proportion EPTB.

The socio-demographic and clinical determinants of TB/HIV co-infection is shown in table 2. The rate of co-infection was found to be higher among females (68.9%) in the sexually active age group of above 15 years which accounts for 93.3% of the cases. This finding is supported by a similar study conducted in Bahir Dar [18] and Nigeria [19], but this contradicts with studies conducted in Southwest Ethiopia [20], India [5], and Brazil [7] where males were predominantly affected.

Table 2: Socio-demographic and clinical determinants of TB/HIV co-infection in Butajira Hospital, South-Central Ethiopia (N= 222)

Variables	TB status			
	Positive	Negative	Odds ratio (OR)	(95%, CI)
	n (%)	n (%)		
Age				
<15	3 (6.7)	9 (5.1)	1	1
≥15	42 (93.3)	168 (94.9)	2.25	0.28; 48.71
Sex				
Male	14 (31.1)	72 (4.1)	1	0.31; 1.39
Female	31(68.9)	105 (59.3)	0.66	
CD_4+ T cell count				
<200/µl	26 (57.8)	6 (3.4)	5.38	2.18; 13.27
200-500/µl	18 (40.)	164 (92.7)	0.83	7.9-43.1
>500/µl	1 (2.2)	7 (4.0)	1	1
WHO clinical stage				
I or II	5 (11.1)	112 (63.3)	1	1
III or IV	40 (88.9)	65 (36.7)	4.12	8.21; 35.32
ART status				
Pre-ART	33 (73.3)	132 (74.6)	0.94	0.42; 2.11
ART	12 (26.7)	45 (25.4)	1	1
Adherence to ART				
Good	2 (4.4)	16 (9)	1	1
Fair	8 (17.8)	22 (12.4)	2.91	0.46; 23.03
Poor	2 (4.4)	6 (3.4)	0.92	0.10; 6.95
Nutritional status				
Normal	1 (2.2)	99 (55.9)	1	1
Moderate	36 (80)	78 (44.1)	45.69	6.49; 915.9
Severe	8 (17.8)	0	Undefined	
Total	45 (20.3)	177 (79.7)		

Considering the nutritional status of adults in terms of body mass index (BMI) and under-five children in terms of mid-upper arm circumference (MUAC) measurements, 80% of co-infected patients were in a moderate malnutrition state, 17.8% were in a severe malnutritional state and 2.2% were in a good nutritional state. The

nutritional status of patient, however, had strong association that is being moderately malnourished been 46 times more likely to develop TB than those with normal nutritional status, OR= 45.69 (95% CI: 6.49; 915.9).

The majority (182; 82.0%) of HIV-positive patients had a CD_4^+ T cell count between 200 and 500 cells/µL. Nevertheless, most TB infections had occurred in those whose CD_4^+ cell count was <200 cell/µL (26; 57.8%). Our findings revealed an increase in the prevalence of TB as CD_4^+ cell count decreases. Furthermore, HIV-positive patients with CD_4^+ T cell count <200/µL was five times more likely to develop TB compared to those who had a CD_4+ T cell count 200-500/µL (95% CI 2.18; 13.27). Co-infection is associated with lower CD_4+ T count than those with HIV alone, which could translate into an increased morbidity and progression of HIV to AIDS. Several other studies [5,18,20-22] have also pointed to the fact that CD_4+ T cell count is lower among co-infected patients as compared to HIV infected alone and severe immune suppression is seen in those with CD_4+ T cell count below 200 cells/µL.

Using WHO clinical staging of HIV/AIDS, we observed 40(88.9%) of TB/HIV co-infected patients in WHO stage III or IV. Moreover, those in stage III or IV were about four times more likely to develop TB compared with those in stage I or II. This finding is in line with similar studies conducted in Ambo [8] and Tanzania [23].

As a limitation, we did not abstract whether or not HIV-positive individuals were on INH prophylaxis prior to being diagnosed with active TB. Moreover, the study would have been stronger if it only focuses on Adults or children.

Conclusion

The prevalence of TB/HIV co-infection in this study was high. Moreover, the most important determinants of TB/HIV co-infection identified were malnutrition, low CD_4+ T cell count and WHO clinical staging (stage III or IV). Therefore, compulsory TB screening among HIV-positive patients is mandatory for early detection and treatment, and thus reduces morbidity and mortality. Besides, creating grass root level public awareness and community mobilization coupled with an aggressive case finding in suspected high-risk population may be key in preventing and early detection of the dual infections. Moreover, large scale studies on the trends in TB/HIV co-infection should also be implemented across the country.

Abbreviations

TB: Tuberculosis; HIV: Human Immunodeficiency virus; MDR-TB: Multidrug resistant TB SPSS: Statistical Package for the Social Sciences; PTB: Pulmonary Tuberculosis; EPTB: Extra-pulmonary Tuberculosis; AFB: Acid Fast Bacilli; ART: Antiretroviral Treatment; OR: Odds Ratio; CI: Confidence Intervals; BMI: Body Mass Index; MUAC: Mid-upper Arm Circumference; CD_4+: Cluster of Differentiation 4 positive; WHO: World Health Organization; INH: Isoniazid; NRTIs: Nucleoside Reverse Transcriptase Inhibitors; PI: Protease Inhibitor; NNRTI: Non-Nucleoside Reverse Transcriptase Inhibitor.

Competing interests

The authors declare that they have no competing of interests.

Authors' contributions

SM conceived the study and supervised field data collection. TTG interpreted the data and drafted the manuscript. Both authors have read and approved the final version.

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