Assessment of Pulmonary Tuberculosis Diseases among Human Immunoeficiency Virus Positive Subjects Visiting Antiretroviral Therapy Clinic, Jimma University Specialized Hospital

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Abstract

Back ground: Tuberculosis has been a worldwide health problem mainly affecting developing countries. Dual infection of TB and HIV/AIDS exacerbate the burden of diseases among poor Sub-Saharan African countries, like Ethiopia. The aim of this study is to assess the prevalence of TB-HIV/AIDS co-infection among HIV patients visiting Jimma University Specialized Hospital, ART clinic.

Methods: Facility based cross sectional study design was conducted. Well structural and pre tested questionnaires was used to assess the socio-demographic characteristics. HIV/AIDS patients attending ART clinic treatment and CD4+ counts follow up was requested to bring sputum three times (spot-morning-spot). The sputum part smeared on slide and the rest added to sodium hypochlorite (NaClO) for concentration. Both direct and concentrated sample stained by acid fast staining and examined 100X objectives (oil immersion).

Results: Among 193 HIV patients signed consent form of participation only 157 were obtained morning sputum specimen. The prevalence of Pulmonary Tuberculosis (PTB) among HIV/AIDS patient in our study area were 9.6%. There is statistical significant associations between patients started ART treatments 3/156 (1.92%) and not started treatments 12/156 (7.7%) (Chi-square=3.88, p.value 0.049): besides, CD4 count above 200 cell/µl (0%) and less than 200 cells/µl 15/156 (9.6%) (Chi-square=4.59, p-value=0.000). There were no statistical clinical differences observed between direct smear and concentration techniques in our findings.

Conclusion*: In current study the prevalence of PTB among HIV/AIDS patients are high. The prevalence of PTB was observed among pre-ART patients. CD4+ below 200/µl was showed positive effects to be infected with PTB. Early detection of PTB among HIV patients will help to minimize the complication to be raised in association with immunodeficiency.

Keywords: PTB, HIV, ART, AIDS

1. Back ground

Tuberculosis (TB) has been a worldwide emergency posing a significant health problem to human kind of all nations. Despite the control activities under taking, Directly Observed Therapy Short courses (DOTS) program globally; it is still one of the leading problem of mortality, especially in developing countries [1-3]. Severity of TB infection has becoming serious on peoples living with HIV, because of the fact that HIV virus's cause's immune suppression of infected peoples. The dual epidemicity of TB-HIV/AIDS problem is a major concern in worldwide, specifically for developing countries. World health organization (WHO), has estimated peoples having both TB-HIV/AIDS are 4.4 million [4-6], of which 80% of them are living in Africa [2].

Peoples living with HIV are 10 times more likely to develop TB than peoples without HIV, this could because of profound immunodeficiency among HIV positive peoples[7] . Early treatment of TB patients in peoples living with HIV is crucial step in delaying the morbidity and mortality due to HIV/AIDS[8, 9].

The burdens of TB have been significant in Ethiopia and one of most affected countries at 7th in a world and 3rd from Africa [10] . Beside, the prevalence of HIV in Ethiopia is currently estimated to be 2.1% [11] According to WHO report the prevalence of TB infection in Ethiopia has been 546 per 100,000 peoples, of which 41% of them are co-infected with HIV [10, 11] Thus, the aim of current study is to assess the prevalence of TB among HIV/AIDS infected subjects and to compare the sensitivity of concentration techniques and direct smear techniques.

2. Methods

2.1 Study area

The study was conducted in Jimma University Specialized Hospital (JUSH) from March 25-April 25/2012. JUSH is one of the oldest public hospitals in the country. It was established in 1930 E.C by Italia invader's for the services of their soldiers. Geographically, it is located in Jimma City 352 km south west of Addis Ababa. Currently it became the only teaching and referral hospital in South Western part of the country. It provides services for approximately 9,000 inpatient and 80,000 out patient's attendances a year coming to the hospital from the catchment population of 15,000.000 people.

Study design: Institutional based study cross sectional study design was employed.

2.2 Sample size and sampling techniques
Sample size was estimated using single population proportion formula, considering prevalence of TB around the study area (17%) from previous study[12], 95% CI and 5% margin error. Then the sample size becomes 217.

2.3 Sampling techniques
: A convenient sampling technique was employed, that all HIV/AIDS patients come to Jimma University specialized hospital, ART clinic during study period for the sake of ART drug treatment and CD4 level monitoring/check up.

2.4 Data collection and laboratory processing
Socio-demographic data and risk factor associated with PTB on HIV/AIDS patients were collected during sputum collection by using pre-tested questionnaire.   The patients were interviewed by their own language (Afan Oromo or Amharic).

After briefly explained the objective and benefit of the study, patients were given sputum plastic caps labeled with code of the patients, types of test and date to bring sputum to laboratory. Then 3 times sputum was collected (spot-morning-spot) and prepared for direct smear examination and concentration techniques (sodium hypochlorite). Both smear prepared from direct sputum and concentrated stained by Ziehl-Neelsen (ZN) for identification of acid fast bacilli.

2.5 Data analysis
All Data concerning risk factors and laboratory finding were entered, cleaned and analyzed using SPSS version 20 software package. Descriptive statistics analysis was used to summarize demographic profile of the study subjects. The magnitude of the association between risk factors and TB on HIV patients were measured by chi-square and 95% confidence interval (CI). A P-value < 0.05 was considered as significant.

2.6 Ethical considerations
The ethical clearance for the study was obtained from Jimma University student research program. Formal letter was written to Jimma University ART clinics from the department of medical laboratory for the formality of the study. Informed consent was sought from each of the adult study participants and guardians/parents in case of children aged less than 18 years, prior to data collection. Information collected from the study participants was kept confidential. During the survey, individuals found to be positive for TB, were treated according to the national guideline by doctors.

3.   Results:
3.1 Socio-demographic characteristics and prevalence of PTB-among HIV patients
Among 193 HIV/AIDS patient on ART filled consent form on the first day, only 156 were participated to study by bringing sputum on the next morning. It was on (table 1), that 15 (9.6%) HIV-TB co-infected patients. As age is one of risk factor that 74 (47.4%) were in age groups of 30-44, followed by 44(28.2%) age group of 15-29 yrs old, and 24 (15.4%) were in age groups of 44-59.   The mean age of participant was 33.2± 2.9 years. Whereby males 66(42.3%) and female were 90(57.7%).   There were no statistical significance association observed among TB-HIV/AIDS patients in association with gender, age, occupational status, education, family size and monthly income that p-value in all case (>0.05). But Chi-square results showed higher in age, occupation and education of the patients that may showed biological association (Table 1).

Table 1. Socio demographic characteristic of the HIV-TB patients at JUSH, 2012

Socio-demographic characteristics		N	+Ve (%)	Chi-square (P-valeu) 95% CI
Gender	Male	66	6 (3.85%)	0.036 (0.850)
	Female	90	9 (5.77%	
Age	0-14	14	2 (1.28%)	4.595 (0.204)
	15-29	44	3 (1.92%)	
	30-44	74	10 (6.41%)	
	45-59	24	0 (0.00%)	
	60^+	0	0 (0.00%)	
Occupational status	Employee	26	2 (1.28%)	4.257 (0.513)
	Merchant	18	0 (0.00%)	
	Student	7	0 (0.00%)	
	Farmer	19	2 (1.28%)	
	House wife	54	6 (3.85%)	
	Daily laborer	32	5 (3.21%)	
Educational status	No formal education	68	9 (5.77%)	2.944 (0.889)
	1-6	36	2(1.28%)	
	7-8	15	1(0.64%)	
	9-12	14	2 (1.28%)	
	12^+	23	1 (0.64%)	
Family size	Above 4	89	8 (5.13%)	0.235 (0.889)
	1-4	54	6 (3.85%)	
	Less than 4	13	1 (0.64%)	
Family income (monthly)	Above (500birr)	43	3	0.476 (0.490)
	Below (500 birr)	113	12	

In the study, female patients 9/156(5.77%) were more infected than male 6/156 (3.85%). Infection rate were higher in age group 30-44 yrs, (6.41%), followed by 15-29 (1.92%). Occupational status of study subject also assessed that showed, housewife and daily laborer were more infected 6(3.85%) and 5 (3.21%), respectively. In association with education back ground, people with no formal education take higher 9(5.77%), grade 1-6 and 9-12 were 2(2.18%) equal findings. The very important thing also family size of the patients; people living in the same house above 4 family sizes, 1-4 and below 4; the infection rate were showed 8(5.13%), 6 (3.85) and 1 (0.64%), respectively. Monthly income of the patients were also assessed that, monthly income above 500 birr 3 (1.92%), and less than 500 birr per month 12(7.7%) (Table1).

(In the table 2) possible risk factors, which enhance PTB among HIV patient was determined. But majority of the risk factors didn't show any significant association between PTB-HIV and risk factors. But, there were statistically significant association observed in patients with CD4+ count less than 200/ μl; similarly, higher prevalence of TB was observed among pre-ART HIV patients than on ART (Table 2).

Table 2. Association of possible risk factors on smear positivity of HIV-TB patients at JUSH 2012 Jimma zone, south west Ethiopia from March 25-April 25,2012.

Possible risk factors		n (%)	PTB smear result +Ve	PTB smear result -ve	*Chi-square(p-value)*
Contact history with TB patient	Yes	6 (3.8)	1	5	$X^2=0.357$ (P=0.550)
	No	150 (96.2)	14	136	
Past history of TB infection	Yes	31(19.9)	3	28	$X^2=0.00(P=0.990)$
	No	12580.1)	12	113	
Smoking habit	Yes	16 (10.3)	2	14	$X^2=0.171(P=0.679)$
	No	140 (89.7)	13	127	
HAART began	Yes	109(69.9)	3	106	$X^2=3.88(P=0.049)$
	No	47(30.1)	12	35	
CD4 cell count	>200 CD4 cells/ μl	73(46.8)	0	73	$X^2=4.59 (P=0.000)$
	<200 CD4 cells/ μl	83(53.2)	15	68	

3.2 Comparison of direct microscopy and sodium hypochlorite concentration techniques

The comparison between direct microscopy and sodium hypochlorite (NaOcl) concentration technique was also done, but none of samples negative for direct microscopy was positive for concentration technique. But the concentration technique was more concentrate the number of bacilli and clarifies the field of slide which is

positive in direct microscopy.

4. Discussion

This study investigates the distribution rate of PTB among subjects with HIV/AIDS in Jimma university specialized hospital (JUSH) attending ART clinic during study period. Out of 156 HIV/AIDS positive subjects sputum samples examined microscopically with Ziehl-Neelsen (ZN) staining, 15 were positive for AFB showing a distribution rate of 9.6%. This high prevalence rate suggests strong association between TB and HIV infection in this environment.

The finding of current study was agreed with other studies, Felege Hiwot Hospital, Bahir dar, Ethiopia 10.1%[13], and North Tanzania 8.6%[14]. But, it is much lower when compared with finding from Amhara regional state, Ethiopia 29.2%[15], and Iran 24% [4] and Obafemi Awolowo University teaching hospital, Nigeria 13.9%[16]

In contrast, our finding showed higher when compared with study from Gondar University Hospital, Northwest Ethiopia, 7.5% [17]. The difference between these two studies can be explained by the fact that in Iran and Nigeria purified protein derivative (PPD) skin test was done and the other were methodology and sample size differences.

The PPD skin test may gave elevated result since it lacks specificity due to cross-reactivity with proteins present in other mycobacterium and non mycobacterium. Several factors have been suggested to contribute to the variation in the prevalence of TB among HIV/AIDS positive subjects. Among the factors sex and low CD4 count [18] and history of smoking, history of contact with TB patient in their family, not taking ART and illiteracy as independent risk factors [19]. The fact that the endogenous reactivation of TB occur most commonly among subjects with HIV/AIDS[14], also accounts for the high prevalence rate of TB as indicated in this study (20%).

Among the 15 HIV/AIDS subjects having PTB in this study, 9(60%) were females and 6(40%) were males and these agree with the previous reports indicating higher distribution in females than males [18]. This may be due to high burden occupational status and progressive immunodeficiency.

The age distribution reveals highest prevalence to be in the age group 30-44 years (6.41%), it is due to immune suppression and near half of study subjects lie under this age group, followed by 15-29 (1.92%), which includes the most sexually active age group and correlates with the work done in Nigeria obafemi [4]. This can have a serious negative effect on socio-economic status of the country being the reproductive and economically productive age group.

In the comparison between direct microscopy and sodium hypochlorite (NaOCl) concentration technique, the concentration technique concentrates the number of bacilli seen in direct microscopy and clarifies the field of the slide. This study seems the work done in Dil Chora regional hospital that noted sodium hypochlorite does not significantly increase the sensitivity of the sets, but reduces the risk of contamination during smearing[20, 21]

The immune status of the host have been said to play a vital role in the reactivation of TB, even after initiation of ART. In this study (73.3%) of TB/HIV Co-infected subjects had CD4 cell counts <200 cells/ μl indicating a progressive immunodeficiency, of which 20% of them had a history of TB in the past 10 years which is greater than the study done in Tanzania [14]. The prevalence rate of TB on those subjects who were on ART was 5.77%, while intake of ART and CD4 cell count/μl were significantly associated in the prevalence of PTB in this study (p<0.05).

5. Conclusion

Prevalence of TB in current study was higher than expected (9.6%), even though many studies conducted on risk factor assessment among HIV patients in the study area [19]. The co-infection was higher and statistical significant on Pre-ART HIV patients. A CD4+ count below 200cell/μl was associated with the prevalence of TB among HIV/AIDS patients. Thus, detection of co-infection at early stage is very important to protect the patient and strengthen the immune status of the patients by starting ART as early as possible. CD4+ counts follow up should be maintained for HIV/AIDS patients on ART and Pre-ART.

Competing interests
We declare that we have no competing interests.

Authors' contributions
AG: participated from the very beginning study design, data collection and analysis of the data. DE: Designing of the study, interpretation of the finding, reviewing the manuscript and draft write up.

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