Magnitude and correlates of tuberculosis among HIV patients at Felege Hiwot Referral Hospital, Bahir Dar city, northwest Ethiopia

Alemayehu Belay[1], Zelalem Alamrew[2], Yibeltal Berie[3], Bisratewongel Tegegne[4], Gebeyaw Tiruneh[5], Amsalu Feleke[6]

[1]Department of Health Education and Promotion, Felege Hiwot Referral Hospital, Bahir Dar City, Ethiopia

[2]Department of Public Health, College of Medicine and Health Sciences, Bahir Dar University, Bahir Dar City, Ethiopia

[3]Department of Health and Health Related Service Product Regulation Core Process, Amhara National Regional Health Bureau, Bahir Dar City, Ethiopia

[4]Department of Chemistry, College of Sciences, Bahir Dar University, Bahir Dar City, Ethiopia

[5]Department of Public Health, GAMBY College of Medical Sciences, Bahir Dar City, Ethiopia

[6]School of Public Health, College of Medicine and Health Sciences, Gondar University, Gondar City, Ethiopia

Email address:
balemayehu95@yahoo.com(A. Belay), kzolam@gmail.com(Z. Alamrew), yiberie@gmail.com (Y. Berie),
bsratchem03@gmail.com(B. Tegegne), gebeyawt@yahoo.com(G. Tiruneh), felekeam@yahoo.com (A. Feleke)

Abstract: Background: Tuberculosis and HIV have been closely linked since the emergence of AIDS. The aim of this study is to assess magnitude of Tuberculosis and its associated factors among HIV patients at Felege Hiwot Referral Hospital in Bahir Dar city. Methods: Institutional based Cross-sectional study was conducted in September 2012 in Bahir Dar city. Systematic sampling technique was employed to collect the data; both primary and secondary data were collected by interviewing HIV cases and reviewing their cards. The data were analyzed in bivariate and multivariate analysis using SPSS version 20. Result: The study was conducted among a total of 385 HIV cases. The prevalence of Tuberculosis was 10.1%. This study declared that body mass index (BMI), CD4 count and functional status were significant predictors of tuberculosis (TB). Besides, HIV cases whose BMI less than 18.5 were more than five times more likely to develop TB compared to those with BMI greater than 24.5 (AOR= 5.24, 95%CI:1.01-27.13), individual HIV cases whose CD4 count less than 200 were more than seven times likely to develop Tuberculosis compared to those whose CD4 count greater than 500 (AOR= 7.33, 95%CI:1.57-34.28), besides, the study explored that respondents who were bed redden and ambulatory were more than eight and six times more likely to develop Tuberculosis compared to those respondents who were able to work respectively (AOR=8.61, 95%CI: 1.83-40.40 and AOR=6.22, 95%CI: 1.40-7.65). Conclusion: This study showed that magnitude of TB among HIV cases was 10.1%. HIV patients, whose BMI less than 18.5, CD4 count <200/μL, ambulatory and bedridden patients should be closely supervised by increasing patient round frequency and providing special nutritious food. TB/HIV co-infected patients should get all services in TB clinic. The Hospital should provide fast triaging systems for coughing patients and reducing their waiting time for services.

Keywords: Tuberculosis, HIV cases, Felegehiwot Referral Hospital, Bahir Dar city, Ethiopia

1. Background

Tuberculosis is the most common presenting opportunistic infection among HIV-infected patients, who remain at high risk for TB throughout the course of their disease. Tuberculosis and HIV have been closely linked since the emergence of AIDS. HIV infection has contributed to a significant increase in the worldwide incidence of tuberculosis. By producing a progressive decline in cell-mediated immunity, HIV alters the pathogenesis of tuberculosis, greatly increasing the risk of developing disease and leads to more frequent extra pulmonary involvement and atypical radiographic

manifestations. Although HIV-related tuberculosis is both treatable and preventable, incidence rates continue to climb in developing nations where HIV infection and tuberculosis are endemic and resources are limited (1, 2)

Human immunodeficiency virus (HIV) is one of the greatest challenges facing mankind. People with advanced stage of HIV infection are vulnerable to secondary infections and malignancies that are generally termed as opportunistic infections. This is because they take the advantage of the opportunity offered by a weakened immune system. Opportunistic infections are common complications of HIV infection and other AIDS (Acquired Immune Deficiency Syndromes) defining conditions that rarely cause harm in healthy individuals (3).

Pulmonary complications have been one of the commonest causes of morbidity and mortality since the advent of Acquired Immune deficiency Syndrome (AIDS) (4).

Sero-positive patients nonetheless, are also prone to other infectious and non-infectious conditions. However, the types of pulmonary complications that develop depend on the degree of immune suppression. The pulmonary complications are also likely to vary according to geographical location, HIV risk factors, gender, race or ethnicity and social habits of patients. Tuberculosis (TB) is a chronic infectious disease that has a major health problem over the centuries (5, 6).

In developing countries like Ethiopia, where economic imbalances are extreme, literacy is low and basic health service delivery is scarce; determining the prevalence of Tuberculosis among HIV patients is critical to prevent opportunistic infections like Tuberculosis among HIV patients. However, little work has been done to systematically document information on the prevalence and associated factors on the diseases among HIV patients. In light of this background information; the aim of this study was to identify the magnitude of Tuberculosis and associated factors among HIV patients at Felege Hiwot hospital in Bahir Dar city.

2. Methods

Institution based Cross-sectional study design was used to assess prevalence of Tuberculosis and its associated factor among HIV cases at Felege Hiwot Referral Hospital, The study was conducted from September 1-30/2012 at Felege Hiwot referral Hospital, which is found in Bahir Dar city. The hospital is located in Bahir Dar city in Northwest of Amhara National Regional State, at a distance of 565 kilometers from Addis Ababa, the capital city of Ethiopia.

2.1. Sampling

All HIV cases whose age greater than 18 years and had follow up at Felege Hiwot referral Hospital were enrolled in 2012 and who visited the hospital in the study period were eligible for this study. The sample size was determined using single population proportion formula, by using 50% expected proportion of TB among HIV cases attending in Felege Hiwot hospital, 5% margin of error with 95% confidence interval, the total sample size included in the study was 385 HIV cases.

The respondents were selected using Systematic sampling technique, by taking average 100 HIV cases coming daily for the services; every k^{th} interval cases were selected from the HIV patients visited the hospital during data collection periods.

2.2. Data Collection and Management

A structured face to face interview questionnaires were prepared in English and translated in to the local language (Amharic) and then back-translated into English to check for any inconsistencies or distortions in the meaning of words and concepts.

Pretest was done among 20 randomly selected HIV cases before the actual date of study period at Han health center, Bahir Dar city. Five health professionals who were working in ART clinic were recruited for data collection and training was given on how to approach the HIV patients and collect the data. Both primary and secondary data were collected by interviewing HIV cases and reviewing their cards. Besides, a close supervision was done by the principal investigators to keep the validity of the data during data collection cross checking of every filled questionnaire were done in every data collection days.

The collected data were coded and entered in to the computer, using SPSS version 20 statistical package; univariate, bivariate and multivariate analysis were done for the association. The result was described using frequency tables in numbers, percentage, and summarized using tabular presentation. Odds ratio and confidence intervals were used to assess the presence and degree of association between TB prevalence and HIV. P-value of<0.05 and confidence interval not including 1 were set for the significance of association between dependent and independent variables.

2.3. Ethical Considerations

Ethical clearance was obtained from Bahir Dar University ethical review committee, official permission paper was obtained from ANRS Health bureau, and it was given to the hospital administrators and case team leaders. During data collection, the purpose of the study was clearly explained to the participants, and informed consent was obtained. Participants were assured of confidentiality the information by excluding personal identifiers in the questionnaire and Charts were kept in a secure place.

3. Results

3.1. Socio Demographic Characteristics of HIV Patients at Felege Hiwot Hospital Bahir Dar City

In this study among a total of 385 HIV cases, 247 (64.2%)

were females and 138 (35.8%) were males. Three hundred two (78.4%) of respondents were in age range 25-44 years and the rest 83(16.1%) were in the age range 45-64 years. The average age of respondents of this study was 35.89 years and standard deviation of the study was about nine years (S.D. = +/- 9.16). Concerning the marital status of the study population, more than half of the respondents, 201(52.2%) were married and 87(22.6%) were divorced. Majority, 327(84.9%) of the respondents live in urban and 58(15.1) live in rural areas. In the study area, religious variability was found to be orthodox the predominant 353(91.7%) followed by Muslim 26(6.8%). Besides, regarding educational status of the study, 142(36.9%) had no education, followed by 105 (27.3%) had primary education. Moreover, the majority of respondents 341(88.6%) had a family size of 1 to 5 and 52(13.5%) had a family size of above 5 (Table1).

Table1. Socio-demographic characteristics HIV patients at Felege Hiwot Referral Hospital, Bahir Dar city, Northwest, Ethiopia, September 2012

Characters =385	Categories	Frequency	Percent (%)
Age of patient	<24	17	4.4
	25-44	302	78.4
	45-64	62	16.1
	>=65	4	1.0
Sex of patient	Male	138	35.8
	Female	247	64.2
Religion	Orthodox	353	91.7
	Muslim	26	6.8
	Protestant	6	1.6
Residence	Urban	327	84.9
	Rural	58	15.1
Marital status	Married	201	52.2
	Unmarried	39	10.1
	Divorced	87	22.6
	Widowed	58	15.1
Educational status	no education	142	36.9
	Primary	105	27.3
	Secondary	81	21.0
	Tertiary	57	14.8
Occupation	Employed	99	25.7
	Unemployed	286	74.3
Family size	1-5	341	88.6
	>5	44	11.4

This study declared that about two third 263(63.3%) of respondents had normal BMI (18.51-24.5), and more than 10% of the participants of the study were overweight whereas 25(6.5%) of respondents were severely malnourished (BMI <16). This study indicated that 247(64.2%) of respondents were in stage III, 21(5.5%) stage IV and other 55(14.3%), 62(16.1%) were in stage I and stage II respectively. Besides, the study showed that more than one fourth (26.8%) respondents of the study had CD4 count<200/µL, and about half of respondents 195(50.6%) had CD4 count from 200-499/µL. Moreover, our study indicated that almost three fourth 286(74.3%) of respondents were unemployed be it in government or private sectors. According to this study, out of the total respondents 350(90.9%) were on ART (Table 2).

Table2. Description of study population with other variables, at Felege Hiwot Referral Hospital, in Bahir Dar city, Northwest Ethiopia, September 2012

Characteristics N=385	Categories	Frequency	Percent (%)
BMI final	<16	25	6.5
	16-18.5	45	11.7
	18.51-24.5	263	68.3
	>24.5	52	13.5
WHO stage of HIV	stage I	55	14.3
	stage II	62	16.1
	stage III	247	64.2
	stage IV	21	5.5
CD4 count	<200	103	26.8
	200-499	195	50.6
	>=500	87	22.6
Functional status	Working	360	93.5
	ambulatory	12	3.1
	bedridden	13	3.4
Occupation	employed	99	25.7
	unemployed	286	74.3
Smoking status	Yes	12	3.1
	No	373	96.9
HIV case	On ART	350	90.9
	Pre ART	35	9.1

This study declared that the prevalence of Tuberculosis among HIV cases was 10.1%; the magnitude varies with age group 25-44 years the prevalence being 7.5%, and the prevalence in the age range 45-64 years was 2.1%. About two third of tuberculosis cases were occurred in females (6.5%) and (3.6%) in males.

Out of the respondents who developed TB, 4.9%, 3.1% and 2.1% were participants with no education, primary education and secondary education and above respectively. Besides, prevalence of the Tuberculosis in terms of marital status about (4.9%) married (2.6%) divorced and 1.6% were widowed. Moreover, out of the total respondents positive for tuberculosis, 37(9.6%) were orthodox Christian and 2(0.3%) were Muslims (Table 3).

Table3. Prevalence of Tuberculosis among HIV cases by socio demographic characters, Felege Hiwot Referral Hospital, Bahir Dar city, Northwest, Ethiopia, September 2012.

Characters(N=385)	Categories	Prevalence of TB		n (%).
		positive	negative	
Age	<24	1(0.3%)	16(4.2%)	17(4.4%)
	25-44	29(7.5%)	273(70.9%)	302(78.4%)
	45-64	8(2.1%)	54(14%)	62(16.1%)
	>=65	1(0.3%)	3(0.8%)	4(1%)
sex	Male	14(3.6%)	124(32.2%)	138(35.8%)
	Female	25(6.5%)	222(57.7%)	247(64.2%)
Religion	Orthodox	37(9.6%)	316(82.1%)	353(91.7%)
	Muslim	2(0.5%)	24(6.2%)	26(6.8%)
	Protestant	0	6(0.2%)	6(0.2%)
Educational status	No education	19(4.9%)	123(31.9%)	142(36.9%)
	Primary	12(3.1%)	93(24.2%)	105(27.3%)
	Secondary and tertiary	8(2.1%)	130(33.8%)	138(35.8%)
Marital status	Married	19(4.9%)	182(47.3%)	201(52.7%)
	Unmarried	4(1%)	35(9.1%)	39(10.1%)
	Divorced	6(1.6%)	81(21%)	87(22.6%)
	Widowed	10(2.6%)	48(12.5%)	58(15.1)
Family size	1-5	32(8.3%)	309(80.3%)	341(88.6%)
	>5	7(1.8%)	37(9.6%)	44(11.4%)

Of the total respondents, 3.6%, 2.6% and 3.1% were TB reactive with normal BMI (18.51-24.5), mild BMI (16-18.5) and sever BMI (<16) respectively. Of the 385 respondents, 7% were TB positives at clinical stage III and 2.3% at clinical stage IV. Of the respondents, 8% and 1.6%were TB positives with CD$_4$count <200/μL and CD4count200-499/μL but 0.5% TB cases among the respondents, who had CD4count>500/μL. Out of the respondents 6% were TB reactive and working, 1.6% ambulatory, and 2.6% were bedridden patients. From the total participants, 36(9.4%) TB reactive were unemployed and 3(0.8%) were employed (Table 4).

Table4. Prevalence of Tuberculosis with other variables, Felege Hiwot Referral Hospital, Bahir Dar city, Northwest, Ethiopia, September 2012

Characters	Categories	Prevalence of TB by percent (N=385)		
		positive	negative	Total
BMI	<16	14(3.6%)	11(2.9%)	25(6.5%)
	16-18.5	11(2.9%)	34(8.8%)	45(11.7%)
	18.51-24.5	12(3.1%)	251(65.2%)	263(68.3%)
	>24.5	2(0.5%)	50(13%)	52(13.5%)
WHO stage of HIV	stage I	1(0.3%)	54(14%)	55(14.3%)
	stage II	2(0.5%)	60(15.6%)	62(16.1%)
	stage III	27(7%)	220(57.1%)	247(64.2%)
	stage IV	9(2.3%)	12(3.1%)	21(5.5%)
CD4 count	<200/μL	31(8 %)	72(18.7%)	103(26.7%)
	200-499/μL	6(1.6%)	189(49.1%)	195(50.7%)
	>=500/μL	2 (0.5%)	85(22.1%)	87(22.6%)
Functional status	working	23(6%)	337(87.5%)	360(93.5%)
	ambulatory	6(1.6%)	6(1.6%)	12(3.1%)
	bedridden	10(2.6%)	3(%)	13(3.4%)
Occupation	employed	3(0.8%)	96(24.9%)	99(25.7%)
	unemployed	36(9.4%)	250(64.9%)	286(74.3%)

3.2. Logistic Regression Analysis between Tuberculosis and Predictor Variables among Patients with HIV at Felege Hiwot Referral Hospital, Bahir Dar City, September 2012

According to this study BMI, CD4 count, Functional status and WHO clinical stages were significant predictors of TB among HIV cases.

The study declared that HIV cases whose BMI less than 18.5 were more than five times more likely to develop Tb compared to those with BMI greater than 24.5 (AOR= 5.24, 95%CI:1.01-27.13), HIV cases whose CD4 count less than 200 were more than seven times likely to develop Tuberculosis compared to those whose CD4 count greater than 500 (AOR= 7.33, 95%CI:1.57-34.28), besides, the study explored that respondents who were bed redden and ambulatory were more than eight and six times more likely to develop Tuberculosis compared to those respondents who were able to work respectively (AOR=8.61, 95%CI: 1.83-40.40 and AOR=6.22, 95%CI: 1.40-7.65). Moreover, HIV cases in WHO clinical stage III and IV were more than eight and about eleven times more likely to develop Tuberculosis compared to HIV cases in stage I respectively (AOR=8.4, 95%CI: 1.00 - 51.5 and AOR= 11, 95%CI: 1.01-22.02)

Table5. *Factors associated with Tuberculosis among HIV cases on multivariate analysis, Felege Hiwot Referral Hospital, Bahir Dar city, September 2012.*

Variables	TB status		OR (95%CI for OR)	
	Yes	No	Crude	Adjusted
BMI				
<16	14	11	31.82(6.3- 160.62)	5.07(.830-31)
16-18.5	11	34	8.1(1.69- 38.81)	5.24(1.01-27.13)
18.51-24	12	251	1.2(0.26- 5.50)	0.87(0.179-4.22)
>24	2	50	1.00	1.00
CD4 count				
<200				
201-499	31	72	18.3(4.23- 79.11)	7.33(1.57-34.28)
>=500	6	189	1.349(0.267-6.82)	1.25(0.242- 6.45)
	2	85	1.00	1.00
Functional status				
Working	23	337	1.00	1.00
Ambulatory	6	6	14.65(4.38- 49.03)	6.22(1.40- 7.65)
Bedridden	10	3	48.84(12.566- 189.83	8.61(1.83-40.40)
WHO HIV stage				
Stage I	1	54	1.00	1.00
Stage II	2	60	1.80(0.159-20.414)	0.76(0.05-12)
Stage III	27	220	6.627(0.881-49.859)	8.4(1.00 - 51.5)
Stage IV	9	12	40.50(4.677-350.689)	11(1.01-22.02)

4. Discussion

It is evident that HIV infection increases the individuals' susceptibility to TB by impairing the immune response to mycobacterial infection. In this study among a total of 385 HIV cases, 247 (64.2%) were females and 138 (35.8%) were males. It is consistent with the study done in Ethiopia, by 2010. The Majority, 344 (58.2%) of the study participants were females [18]. As the two studies showed the number of HIV cases females were higher than males this is because of their biological factor, which makes them susceptible for HIV infection.

This study indicated that the sexually active age groups from 25-44 years 302 (78.4%) were predominant followed by 45-64(16.1%) with an average age of 35.89 years and standard deviation of nine years (SD= 35 +/- 9.16).This is consistent with the findings of other study which is done in India, age group of 20 - 40 years (93%), with the mean age of 30.27 ± 5.5 years [14].

According to a study done on the pattern of Co-infection amongst HIV seropositive individuals in the tertiary care hospital, Kolkata; TB can occur at any point in the course of HIV infection [14]. Whereas in this study, of the total tuberculosis cases 69.2% were occurred in WHO clinical stage III and of the total study subjects 62(16.1%) and 247(64.2%) were in WHO clinical stage II and III respectively. This is consistent with the study done in Ethiopia where 107(18%) and 355 (60%) of participants of the study were in the 2nd and 3rd stage of the WHO clinical stage classification [18]. Even if, the occurrence of TB infection is at any clinical stage, this study revealed that more than two third of TB cases were in clinical stage III.

The findings of our study showed that majority of the respondents were married 201(52.2%), this is in accordance with other study conducted in Arsi zone (Ethiopia) where about half of the respondents were married 195 (46.5%), but in current study, 87(22.6%) were divorced which had some variation with the same study in Arsi zone where 32 (7.6%) of the respondents were divorced [19]. In the current study the reason could be because of the residential area of the respondents, where more than 80% of respondents 327(84.9%) of this study live urban areas that could lead them to have multiple partners.

In the study concerning to religious variability orthodox was found to be the predominant 353(91.7%) followed by Muslim 26(6.8%). This was somewhat consistent with study done in Arsi, Ethiopia 231(55.5%) were followings of orthodox religion, while180 (42.3) were Muslims [19].   In this study prevalence of tuberculosis among HIV cases was 10.1% whereas a study done in Dare Salam Tanzania prevalence of Tuberculosis among HIV patients was 20.2% of tuberculosis compared to those individuals who were negative for HIV (3.2%) [13]. similarly our finding is not consistent with another study done in the other parts of Ethiopia where the prevalence of Tuberculosis was 20.9% [18]. Accordingly the prevalence of TB among HIV cases was lower compared to those mentioned above this could the service delivery at Felege Hiwot hospital is good and other possible reason for difference could be the time gap. Besides, in the another study, in India pattern of Co-infection amongst HIV seropositive individuals in tertiary care hospital, Kolkata, HIV seropositive patients were mostly from middle age group (31-40 yrs) with CD4+ counts in majority of symptomatic AIDS patients below 200cells/mm3, of the common co-infections/opportunistic infections, TB (35.29%) was significant in follow-up patients[14]. This difference in the study area is due to the presence of integrated services delivery and availability of skilled manpower as the hospital is referral hospital. In addition since the institution in which this study was conducted is a referral hospital, patient's come referred from health facilities or with self-referral and also there were prevention activities like health education and preventive care package distribution which reduces the burden of opportunistic infections.

In this study, of the total TB cases, 79.5% of tuberculosis infection occurred in low CD4 level (<200/μL) in other study done in Ethiopia, by 2010 about two third (67.2%) of the patients had CD4 count less than 200/μL [18]. Similarly, a study done in India, opportunistic infections in relation to CD4 level among HIV seropositive patients, revealed that17% prevalence of tuberculosis was observed as soon as the CD4 level falls below 200/μL. This study also declared that the patients who had CD4 count below 200/μL has association with TB infection (AOR= 7.33, 95%CI: 1.57-34.28) compared to patients who had CD4 count greater than 500/μL. This study declared that BMI is predictors of TB among HIV patients, especially

patients whose BMI is within the range of 16-18.5 is more than eight times more likely to develop TB compared to those whose BMI is greater than 24 (AOR= 8.1, 95%CI: 1.69- 38.81). This is in line with a study done in Uganda among patients with HIV/AIDS in the hospital where BMI less than 20 was significant predictors of co infection of TB [20]. Similarly a study conducted in Botswana revealed that HIV patients whose BMI less than 18.5 were more than four times likely develop tuberculosis compared to those with higher BMI [21]. Besides, another study conducted among patients on ART, indicated that individuals whose BMI less than 18.5 were at risk of developing TB [22].

5. Strength

The magnitude and Correlates of Tuberculosis among HIV Patients at Felege Hiwot Referral Hospital were identified. The quality of the data was assured by pretest of the questionnaires on similar population in another health institution, training of the data collectors and supervisors. Besides, the study participants were selected using systematic sampling technique to minimize bias. Moreover, appropriate tests were employed and findings were compared with other related studies.

6. Limitations

Even though the topic could demand both quantitative and qualitative measurements, the study was conducted only using quantitative method. Besides, the data were collected both from medical chart review and face to face interview of the patients, there were a problem with chart review because of some incompleteness while it was filled with physicians.

7. Conclusions

This study declared that the magnitude of TB among HIV cases was 10.1%; HIV patients whose CD4 count less than 200/μL, BMI less than 18.5, functional status and WHO clinical stages have great contribution in developing TB among patients with HIV. Besides, not well ventilated service providing areas and rooms need to aerated to minimize the risk of developing TB among patients specially HIV patients. Moreover, reception or waiting room of TB/HIV co-infected patients should be isolated from HIV patients with no TB; and specially the triaging room of coughing patient need to be isolated from another patients.

Acronyms

ANRS	Amhara National Regional State
ART	Anti-Retroviral Therapy
HIV	Human Immunodeficiency Virus
IP	Infection Prevention
OIs	Opportunistic Infections
PLHA	People Living with HIV/AIDS

Computing Interests

Authors declared that they have no computing interests

Author's Contribution

AB conceptualized the research problem, designed the study, conducted field work, collected data, and drafted the manuscript.

ZA was involved in revision of the research proposal, data analysis and revision of the manuscript for publication.

YB and BT were involved in preparing the research

proposal, field work, and revision of the manuscript.

GT and **AF** were involved in revision of the proposal and research report

All authors of the manuscript have read and agreed to its content.

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