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Tuberculosis screening coverage and isoniazid preventive therapy among people living with HIV at Gambella Hospital, southwest Ethiopia: a retrospective study design

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Abstract

Objective: We aimed to assess the coverage of tuberculosis screening and isoniazid preventive therapy (IPT) among people living with human immunodeficiency virus (PLHIV) at Gambella Hospital, southwest Ethiopia.

Methods: We conducted a 5-year retrospective study of PLHIV receiving care in an antiretroviral therapy clinic from 1 January 2011 to 30 December 2015. We reviewed a total of 900 medical records of patients with complete information.

Result: Of the total, 897 (99.7%) PLHIV were screened for tuberculosis, among which 77 (8.6%) were found to be positive for active tuberculosis. Among 820 (91.4%) individuals eligible for IPT, only 545 (66.5%) were provided IPT; 275 (33.5%) eligible PLHIV were not provided IPT. Male sex (adjusted odds ratio [AOR] 1.63) and ages 18–29 years (AOR 0.33) and 30–44 years (AOR 0.31) were significantly associated with the likelihood of tuberculosis infection.

Conclusion: The present study findings demonstrated that tuberculosis screening for PLHIV at Gambella Hospital was improved in comparison with reports from many African countries and other parts of Ethiopia. Despite this improvement, the implementation rate of IPT was below national and World Health Organization recommendations. Overall, tuberculosis diagnostic approaches and available preventive measures should be strengthened in the study area.

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Introduction

Tuberculosis (TB) is an infectious disease caused by the bacillus *Mycobacterium tuberculosis*. Globally in 2019, TB was a top 10 cause of death and the leading killer of people living with human immunodeficiency virus (PLHIV).[1,2] The chance of developing TB is 20 to 37 times higher among PLHIV.[3] According to the World Health Organization (WHO) Global Tuberculosis Report 2020, the estimated incidence of TB is 130 per 100,000 population, with 10.0 million prevalent cases of TB, of which 8.2% are among PLHIV.[2] The TB/HIV coinfection rate is highest in Africa. Among all TB cases in 2018, approximately 8.6% were among people with HIV infection. TB/HIV coinfections are most prevalent in African countries, with more than 50% occurring in the southern part of Africa.[4] Ethiopia is among the 30 countries with the highest rates of both TB and TB/HIV coinfection in the world, with an estimated TB incidence of 164 per 100,000 population and 112 per 100,000 among people with HIV.[5]

As part of basic HIV and TB prevention, care, and treatment services, the WHO as well as the Federal Ministry of Health of Ethiopia have formulated and recommend three TB/HIV-related activities to decrease rates of TB/HIV coinfection. These activities integrate TB/HIV service delivery via the use of "the three I's" (intensive TB case finding, isoniazid preventive therapy, and infection prevention at health institutions) to reduce the incidence of HIV among patients with TB.[6,7] IPT is a key public health intervention for the prevention of TB among PLHIV and has been recommended since 1998 by the WHO and the Joint United Nations Programme on HIV/AIDS (UNAIDS) as part of a comprehensive HIV/AIDS care strategy.[8] However, since this recommendation, only 2.3 million individuals have been screened for TB, of whom 178,000 were offered IPT.[9]

Ethiopia began implementing IPT in 2007; however, its implementation has remained very low and has been hindered by numerous factors including stigma, access to health care facilities, and drug side effects as well as a lack of the following: IPT training, social support, supportive supervision, good client–provider communication, standard operating procedures, quality adherence counseling, and patient registers[10–12]

IPT is given to PLHIV with latent TB infection to prevent progression to active TB disease.[13] Screening to exclude active TB among patients with HIV infection is the single most important step that should precede the decision to initiate IPT. In adolescents and adults with HIV infection, the regimen for TB preventive therapy is isoniazid 300 mg + pyridoxine 50 mg (vitamin B6) daily for at least 6 months, as recommended by the WHO.[14,15] IPT can be provided without harm to individuals with HIV infection who have a negative test result for TB, which decreases their probability of developing TB from 33% to 67% for 1 to 19 years.[15–17] Regardless of

substantial improvement in focusing on individuals with TB, the accomplishment of measures to decrease the occurrence of TB among HIV-infected individuals is much lower than the objectives of the global plan to stop TB.[9] Evidence is lacking regarding the status of accomplishments regarding TB/HIV overall as well as decreasing the risk of TB among people with HIV, especially in Ethiopia. Thus, in this study, we aimed to assess TB screening coverage and IPT among PLHIV at Gambella Hospital in southwest Ethiopia.

Methods

We conducted a study with a facility-based retrospective design at Gambella Hospital in October 2016. Gambella is the capital of Gambella regional state and is located 777 km from Addis Ababa, the capital of Ethiopia. In this study, we included PLHIV aged 18 years and above who were registered for HIV care during a 5-year period from 1 January 2011 to 30 December 2015 at the Gambella Hospital antiretroviral therapy (ART) clinic and who had started using ART drugs. PLHIV registered for HIV care with incomplete medical records were excluded from the study. We determined the sample size in this study using all recent data. The total number of PLHIV in care from 2011 to 2015 was 1008; of these, 71 were under 18 years old and 37 had incomplete records.[18] The information of all HIV-infected patients with TB in HIV care was recorded in the ART center HIV/TB register. Hence, we reviewed the medical records of PLHIV receiving care who had complete data records in the HIV/TB register from 2011 to 2015.

We adapted a structured checklist from the medical records in the ART and HIV/TB registers to use in data collection. Data collection was conducted by ART data clerks with close supervision by the principal investigator. Data were cross-checked daily for completeness, accuracy, clarity, and consistency immediately after the record was reviewed and necessary corrections were made. The recorded data were coded, and data cleaning was done by running the frequency of variables using IBM SPSS version 21.0 (IBM Corp., Armonk, NY, USA) software before analysis; any identified errors were corrected. We also used IBM SPSS version 21.0 for the data analysis. We used descriptive analysis, such as frequency and percentage, to describe the sociodemographic characteristics of participants.. Bivariate and multivariate analyses were done using binary logistic regression to identify factors associated with TB infection among PLHIV. Candidate variables in the final model (multivariate binary logistic regression) were identified using a binary logistic regression model with $P < 0.25$; in the final model, multiple logistic regression was used to determine the independent effect of each explanatory variable on the study variable, with significance set to $P < 0.05$.

The national ART guidelines clearly state that all patients attending ART centers should be actively screened for TB. HIV-infected clients with undiagnosed or untreated TB may seek care at ART centers. Therefore, active efforts toward intensified TB case finding at ART centers is critical for early detection and treatment of TB. Adults and adolescents living with HIV/AIDS should be regularly and actively screened for TB using a clinical algorithm, and those who do not report at least one of the symptoms (current cough, fever, weight loss, or night sweats) are unlikely to have active TB and should be offered IPT. Individuals who report any one of the above symptoms are suspected of having active TB and should be assessed for TB and other coinfections. However, before initiating IPT, the patient should be assessed for contraindications; once

completed, IPT is then immediately dispensed. IPT is collected on a monthly basis by the individual for daily use. Each patient should be counseled on adherence and monitored for side effects at every visit. According to Ethiopian national guidelines, a tuberculosis skin test (TST) is not a required for initiating IPT in PLHIV. PLHIV who have a positive TST result will benefit more from IPT; thus, TST can be used where feasible to identify such individuals (Figure 1).[19] Acid-fast bacillus (AFB) tests and chest X-ray are common diagnostic tools used to detect TB infection among PLHIV at the study hospital. AFB testing is recommended for PLHIV who report any of the signs and symptoms suggesting an active TB lung infection for any duration during a visit to a health facility or contact with a health care provider.[18]

Ethics approval and consent to participate

Ethical approval was obtained from the Ethical Review Board of the Ethiopia Public Health Association (Ref. No of EPHA/OG/2919/2016) and an official letter of cooperation was sent to the Gambella Regional Health Bureau, which provided a formal letter of cooperation to Gambella Hospital. Full informed consent was obtained from the Medical Director and ART clinic head at the hospital after explaining the objectives of the study in an official letter of request to permit collection of the necessary data. Confidentiality of the information contained in the ART register was maintained. All data collection was carried out with a guarantee of absolute patient privacy.

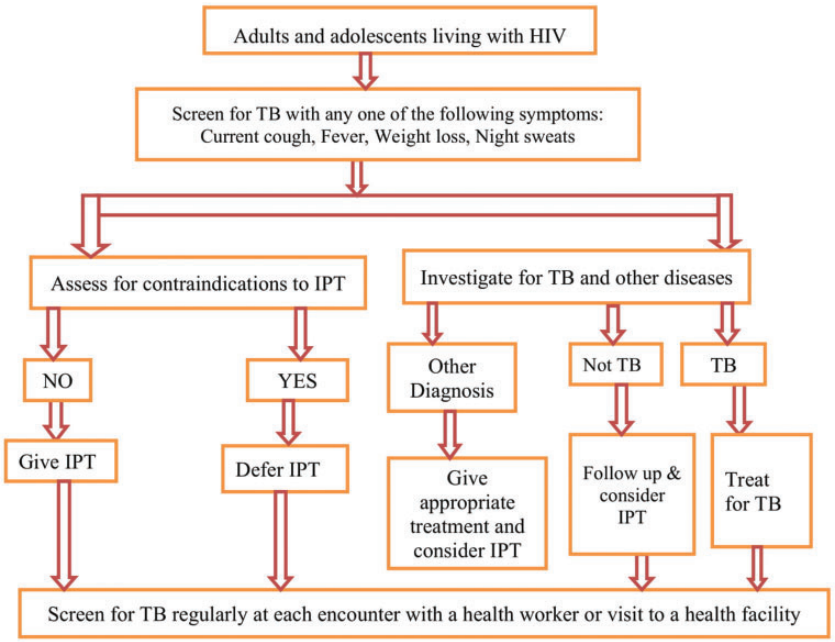

Figure 1. Algorithm for TB screening among adults and adolescents living with HIV in HIV-prevalent and resource-constrained settings (FMOH Guideline 2017).
TB, tuberculosis; IPT, isoniazid preventive therapy; FMOH, Federal Ministry of Health Ethiopia.

Results

Sociodemographic characteristics of people living with HIV (PLHIV)

We reviewed the medical records of 900 PLHIV and patients receiving ART who had complete information. Of the 900 PLHIV, 511 (56.8%) were male and 389 (43.2%) were female patients; 561 (62.3%) patients were married and 217 (24.1%) were widowed. The median patient age was 28 years (range 18–85 years), and 543 (60.3%) were in the age group 25 to 39 years. Nearly half (n = 464, 51.6%) of patients had at least a high school diploma and 207 (23%) had completed secondary school (grades 9–12). Among the remaining PLHIV, 162 (18.0%) were illiterate and 67 (7.4%) had completed primary school (grades 1–8). As for patients' occupation, 286 (31.8%) were government employees, 184 (20.4%) were students, 133 (14.8%) drivers, 111 (12.3%) were self-employed, and 90 (10%) patients were privately employed (Table 1).

Tuberculosis (TB) screening coverage and isoniazid preventive therapy (IPT)

The flow diagram in Figure 2 depicts the overall results of TB screening and IPT service delivery among PLHIV. Of the total, 897 (99.7%) PLHIV were provided TB screening services, among which 77 (8.58%) reported a positive diagnosis for active tuberculosis from the time they began receiving HIV/AIDS care and follow-up support; all of these patients were enrolled in the TB clinic for TB treatment. Among 820 (91.4%) patients with HIV who were eligible for IPT (screened for tuberculosis and found to be negative) only 545 (66.5%) were provided IPT; 275 (33.5%) patients who were eligible for IPT were not provided IPT for unrecorded reasons (Table 2).

Table 1. Sociodemographic characteristics of people living with HIV at Gambella Hospital, southwest Ethiopia, January 2011to December 2015.

Variable (N=900)	Category	n	Percent
Sex	Female	389	43.2%
	Male	511	56.8%
Marital status	Married	561	62.3%
	Single	60	6.7%
	Divorced	62	6.9%
	Widowed	217	24.1%
Age	18–24	216	24.0%
	25–39	543	60.3%
	≥40	141	15.7%
Educational status	Illiterate	162	18.0%
	Primary school (grades 1–8)	67	7.4%
	Secondary school (grades 9–12)	207	23.0%
	High school diploma and above	464	51.6%
Occupational status	Merchant	96	10.7%
	Self-employed	111	12.3%
	Government employee	286	31.8%
	Driver	133	14.8%
	Student	184	20.4%
	Nongovernmental organization employee	90	10.0%

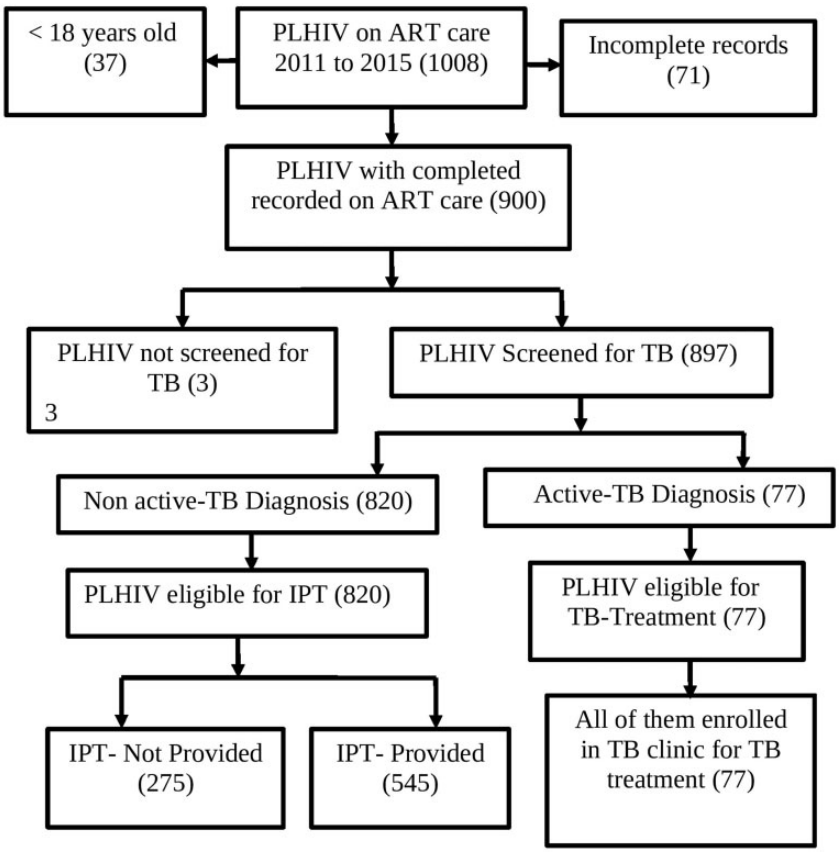

Figure 2. Tuberculosis screening and isoniazid preventive therapy service delivery among people living with HIV at Gambella Hospital southwest Ethiopia, January 2011 to December 2015.

Table 2. Tuberculosis screening and IPT service delivery among PLHIV at Gambella Hospital southwest Ethiopia, January 2011to December 2015.

Variable	Category	n	Percent
Screened for TB	Yes	897	99.7%
	No	3	0.3%
	Total	900	100%
Active TB diagnosis	Yes	77	8.58%
	No	820	91.4%
	Total	897	99.7%
IPT prophylaxis given	Yes	545	66.5 %
	No	275	33.5%
	Total	820	91.4%

TB, tuberculosis; IPT, isoniazid preventive therapy; PLHIV, people living with HIV.

Factors associated with TB infection among PLHIV

The result of backward likelihood multivariate logistic regression analysis revealed that only sex and age showed a statistically significant association with TB infection, after controlling for potential confounders Hence, male clients were 1.63 times more likely to develop *M. tuberculosis* infection than their female counterparts (AOR 1.63; 95% CI 1.01–2.65; $P < 0.05$), and PLHIV in the age groups 18 to 29 and 30 to 44 years were 67% and 69% less likely to have TB infection, respectively, than those aged 45 years and above (AOR 0.33; 95% CI

Table 3. Multivariable logistic regression model to predict TB infection among people living with HIV at Gambella Hospital, southwest Ethiopia, January 2011to December 2015.

Variable (N = 897)	Category	TB diagnosis (n) Negative (N-820)	Positive (N = 77)	COR (95% CI)	AOR (95% CI)
Sex	Male	344	43	1.75 (1.10–2.80)**	1.63 (1.01–2.65)**
	Female	476	34	1.00+	1.00+
Age	18–29	445	36	0.30 (0.15–0.56)**	0.33 (0.17–0.65)**
	30–44	320	26	0.30 (0.48–0.59)**	0.31 (0.15–0.62)**
	≥45	55	15	1.00+	1.00+
Marital status	Married	513	48	1 (0.61–1.60)	0.93 (0.56–1.54)
	Other	307	29	1.00+	1.00+
Educational status	Illiterate	143	17	1.33 (0.73–2.30)	0.94 (0.46–1.93)
	Grades 1–12	252	22	1.00 (0.57–1.70)	1.10 (0.58–1.97)
	High school diploma and above	425	38	1.00+	1.00+
Occupation	Government employee	464	45	1.08 (0.67–1.73)	1.00 (0.57–1.64)
	Other	356	32	1.00+	1.00+

+Reference group.
**$P < 0.05$.
AOR, adjusted odds ratio; COR, crude odds ratio; CI, confidence interval.

0.17–0.65; AOR 0.31: 95% CI: 0.15–0.62; $P < 0.05$) (Table 3).

Discussion

In this study, we found that 99.7% of PLHIV had been screened by health care providers for the usual signs and symptoms of TB, using a clinical algorithm. Our findings showed that a larger number of PLHV were screened for TB than the number reported in Harar by Geleto et al. where 75.2% of PLHIV were screened for TB.[20] Our findings were also somewhat higher than those in Addis Ababa reported by Denegetu and Dolamo (92.8%) and by Wesen and Mitike in which 87.9% of people with HIV/AIDS were offered TB screening.[21,22] In a national survey conducted in Ethiopia, 71% of people with HIV/AIDS were offered TB screening, which is also lower than our results.[23] Similarly, a study on TB/HIV integration services in Sub-Saharan Africa indicated that only 64% of newly registered people with HIV were offered TB screening.[14]

The findings of the present study are encouraging in that a high proportion of PLHIV were screened for TB. This increment over time might be attributed to the improvement in HIV/TB treatment and care services at the study hospital. Gambella regional state is an emerging region and special attention has been given to health care delivery services by the Ethiopian government, with an increased number of trained health care providers to meet the needs of high-risk populations. The results of our study were similar to those of research carried out in northern Ethiopia in which 98.2% of PLHIV were provided TB screening,[24] as well as the findings of another study in Ethiopia where 96% of patients with HIV enrolled in HIV care were screened for TB.[25]

Our study findings showed that 77 (8.58%) patients with HIV infection were diagnosed with active TB during the course of their follow-up HIV care. In this study, the proportion of TB-positive cases among HIV-positive individuals was lower than those reported in other parts of Ethiopia (39.0%), in Harar (29.8%), in northeast Ethiopia (24.3%), and in Addis Ababa in 2008 and 2011 (15.6% and 10.4%, respectively).[20–22,24,26] Similarly, we found a lower proportion of TB infection among HIV-positive people than those from studies conducted in Hong Kong (39%), Pakistan (30.2%), and Georgia (22%).[27–29] Our study results indicated that a significantly lower proportion of PLHIV were diagnosed with active TB during their HIV treatment and follow-up care than in other parts of Ethiopia and in some developed countries. These differences might be attributed to false negatives reported for AFB testing and chest x-ray in diagnostic services.

A study conducted in Addis Ababa indicated a low coinfection rate, with 32 (7%) PLHIV positively diagnosed with active TB.[30] In a study carried out in Germany among a group of 11,693 PLHIV, 233 (2%) were confirmed to have active TB, 62 at admission and 171 during the course of follow-up, which is lower than the rates in our study.[31]

We found that among 820 clients eligible for IPT, only 545 (66.5%) were offered IPT during the course of follow-up HIV/AIDS care. This is lower than the rate reported in Harar where 78.7% of PLWHI were provided with IPT.[20] However, our finding was higher than that of an earlier study in Addis Ababa where 28.7% of PLHIV were given IPT and another study in Ethiopia in which 39% of eligible patients had initiated IPT.[22,26] In line with the global report on TB, the statistical data show that the IPT coverage is 15.1% in Ethiopia, 5.4% in Bangladesh, 8.0% in Myanmar, and only 3.0% in Nigeria.[32] We revealed that a high proportion of eligible PLHIV had initiated IPT during HIV follow-up care in comparison with most reports from Ethiopia and other countries. The present high rates of IPT among patients in our study may indicate improvement in TB/HIV collaborative services over time; these could also be owing to differences in the study setting, sample size, and study design among studies.

In our study, age and sex showed a statistically significant association with the likelihood of TB infection among PLHIV. Male sex showed a significant effect on TB infection, which is consistent with other study findings reported from southern Ethiopia.[33] A possible explanation might be that women have better health service-seeking behavior, with frequent visits to health facilities for services like maternal and child health care. Our study findings indicated that PLHIV age 45 years and above were at higher risk for TB infection than those in other age groups. This might be owing to decreasing immune function, leading to increased vulnerability to TB infection among older individuals.

Limitations

The limitations in this study included its cross-sectional design and the limited number of similar studies conducted in the study area with which to compare our findings. The retrospective nature of this study limited the inclusion of all possible factors that could affect TB infection. Similarly, using secondary data by excluding patients with incomplete records is an additional limitation of this study. The lack of some important variables in the ART register may decrease the ability of our study findings to explain the association between the dependent and independent variables.

Conclusion

The present study demonstrated that the implementation of TB screening among individuals with HIV infection in the Gambella region was higher than that in many African countries, as well as in other parts of Ethiopia. However, despite improvements, implementation of IPT was below national and WHO recommendations. This low IPT coverage is the result of a number of barriers that require the attention of policymakers and implementers of IPT services. Overall, TB diagnostic approaches and available preventive measures should be strengthened by implementing the existing national and WHO recommendations.

Ongoing support of health care workers through continuous capacity building and experience sharing can serve to advance the implementation of TB screening and IPT initiation. Additionally, service providers must be part of the solution by ensuring complete documentation and strengthening rapid diagnostics as well as providing targeted patient education and counseling (to men and PLHIV age >45 years) so as to create awareness about the benefits and importance of IPT and improve its uptake. Moreover, prospective studies are needed, which include all factors that might influence the risk of TB among PLHIV. Additionally, collaborative research comprising several regions of the country are recommended to provide a more balanced view of TB infection and potential risk factors among patients with HIV infection.

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Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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Authors' contributions

MA conceived and designed the study, carried out data collection, performed the statistical analysis, wrote the final report, and reviewed and edited the final draft of the manuscript. ND participated in designing the study, performing the statistical analysis, and reviewing and editing the final draft of the manuscript. Both authors read and approved the final manuscript.

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