

# Prevalence of tuberculosis-HIV co-infection and factors associated with treatment outcome among the tuberculosis patients in HIV treatment facility in a teaching hospital in Jos, North Central Nigeria

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## Abstract

**Background:** Globally, tuberculosis (TB) remains a disease of grave public health concern. It ranks above HIV/AIDS as the leading cause of death from a single infectious agent, and as one of the 10 most common causes of mortality. This study assessed the prevalence of TB-HIV co-infection and factors associated with treatment outcome among the TB patients in an HIV treatment facility in a Teaching hospital in Jos, North central Nigeria.

**Methods:** A 10-year retrospective, descriptive cross-sectional review was conducted and data was extracted through the review of TB registers. Data were analysed using SPSS version 20 and bivariate analyses was conducted at  $P < 0.05$ .

**Results:** The prevalence of TB-HIV co-infection was 9.25%, with the mean age of the study participants being  $41.8 \pm 11.6$  years. Of all the participants, 87.5% had successful treatment outcome, while 12.5% had unsuccessful treatment outcome. In the bivariate analysis, place of residence was the only socio-demographic factor significantly associated with treatment outcome ( $<0.001$ ).

**Conclusion:** The TB-HIV co-infection prevalence rate was about 10% of the total HIV population with a high TB treatment success rate. With the exception of place of residence, no other factor had statistically significant relationship with the treatment outcome.

**Keywords:** Jos, TB-HIV co-infection, treatment outcome, tuberculosis

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## INTRODUCTION

Globally, tuberculosis (TB) ranks above HIV/AIDS as the leading cause of death from a single infectious agent, and as one of the 10 most common causes of mortality. Annually,

millions of people are infected with the dreaded TB and HIV disease. HIV infection and other factors such as malnutrition, smoking, diabetes and alcohol consumption have been associated with the development of new TB

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disease. Total mortality for TB in 2017 was estimated at 1.6 million, and about a fifth of these deaths was due to TB/HIV co infection. Also, of the 10 million people newly infected with TB in 2017, 9-10<sup>th</sup> were adults, out of which about a tenth were HIV positive. About two-third of those that were HIV positive were located in Africa and eight countries including Nigeria contributed to two-third of this 10 million new infections. TB-HIV co-infection has accounted for the gap in the management and control of TB in the World Health Organization (WHO) African region due to the high prevalence of this co-infection.<sup>1</sup>

The TB and HIV duo are of grave public health concern, and if urgent control strategies are not put in place, this may hinder the attainment of SDGs in developing countries. About a quarter of the world's population are estimated to have a latent TB infection. HIV infection weakens the human defence mechanism and is one of the individual most important risk factor capable of reactivating latent TB disease to active disease.<sup>2</sup> Furthermore, HIV positive individuals who get exposed to TB bacilli are reported to be 37 times more at risk of developing active TB disease than HIV-negative individuals.<sup>3</sup>

According to 2018 global TB report, Nigeria is one of the 30 Tb high burden countries contributing to about 90% of world TB cases and has a burden of 219/100,000 population (inclusive of TB-HIV co-infection).<sup>1</sup> It also has a TB-HIV co-infection mortality rate of 18/100,000 population. About a tenth of HIV-positive patients in Nigeria are infected with TB.<sup>4</sup> However, according to the current Nigerian HIV/AIDS Indicator and Impact Survey (NAIIS) report, the current HIV prevalence in Nigeria stands at 1.4%<sup>5</sup> while the TB-HIV co-infection was reported to be 19.1%.<sup>6</sup>

TB infection is an important opportunistic infection among HIV-positive patients which has accounted for the high mortality recorded among HIV-positive patients.<sup>7</sup> TB-HIV co-infection have also been an impediment to desired treatment outcome as reported by a number of studies.<sup>8-11</sup>

TB is a leading preventable cause of death among people living with HIV and vice versa.<sup>2-4</sup> Most of these deaths occur in resource-limited settings.<sup>5</sup> Understanding the interplay of factors determining TB treatment outcome are pertinent in evaluating instituted DOTS control programs. This will help highlight patients that are likely to have unsuccessful treatment outcomes and will bring to bear the need for additional interventions to improve on the successful treatment outcome. This study is therefore aimed at assessing the prevalence of TB/HIV co-infection

and factors associated with treatment outcome among the TB patients in HIV treatment facility in a Teaching hospital in Jos, North central Nigeria.

## MATERIALS AND METHODS

### Background of the study area

The study was conducted at Bingham University Teaching Hospital (BhUTH) Jos North LGA, Plateau State, Nigeria. It is a faith-based tertiary health institution with 250 bed spaces. It is the health training institution for medical students of Bingham University and serves as an apex referral health Centre for health facilities in Plateau, Bauchi and Kaduna States, in addition to lower level health facilities owned by the ECWA Church. Various specialties include Surgery and Internal Medicine and their subspecialties, Paediatrics, Obstetrics and Gynaecology. The AIDS Preventive Initiative in Nigeria (APIN) clinic is a service unit for infectious diseases which provide services for HIV/AIDS and TB patients.

### Study design and study population

A 10-year retrospective, descriptive cross-sectional review was conducted among TB patients who attended the APIN clinic of the BhUTH, Jos North LGA Plateau State, Nigeria, from August 2009 to July 2019. It was a total population study and patients missing treatment outcomes in their registers or who were moved to other facilities were excluded from the study.

It was a total population study of all the TB-HIV co-infected patients who met the inclusion criteria. A total of 296 patients met the inclusion criteria and were included in the study.

### Data collection

This involved the use of a structured data extraction tool. The tool comprised the following sections, (a) socio-demographic characteristics, (b) clinical characteristics and laboratory test results conducted and (c) information on side effects, comorbidity and treatment outcome. Achieves of the TB-HIV registers, laboratory results and follow-up visits were reviewed to extract the needed information. Variables of interest were socio-demographic variables such as age, sex, marital status, religion, address and treatment supporter. Some behavioural variables included alcohol ingestion and smoking. Clinical variables included baseline CD4 counts, previous TB treatment, haemoglobin levels, comorbidities (diabetes and hypertension) and BMI were measured. Also of paramount importance was the treatment outcome. Data collection involved the use of 4 trained medical students who were in their final year.

### Statistical analysis

The data were coded, entered, cleaned and analysed using IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY, USA: IBM Corp. USA. Descriptive statistics were used such as means and frequencies to describe socio-demographics and clinical variables. Bivariate analysis was used to test for association between independent and dependent variables at 95% confidence interval. Cut-off points were set for quantitative variables with clinical relevance such as body mass index (BMI) and CD4 counts.

The socio-demographic and clinical variables were analysed against the treatment outcome to confirm the factors that were positively associated.

### According to the world Health Organization, outcome variables are defined as follows;<sup>12</sup>

- Cured: This was the proportion of smear positive patients that complete treatment and had at least two negative smears with an interval of at least 1 month, one of which should be obtained at the end of treatment
- Treatment completed: This was the proportion of patients that completed treatment but sputum examination results are not available or smear negative patients that completed treatment
- Died: The proportion of patients that died from any cause before completion of treatment
- Default: This was the proportion of patients that did not take drugs for at least two consecutive months
- Treatment failure: This was the proportion of patients who were sputum smear positive at 5 months or more after the commencement of treatment, or patients who interrupted treatment for more than 2 months after completing 1 month of chemotherapy afterwards returned to treatment and was found to be smear positive.

For this study, treatment outcomes were grouped into successful and unsuccessful treatment outcomes. Successful treatment outcome comprised patients who were “cured” and “completed treatment.” Unsuccessful treatment outcome comprised patients with “treatment failure,” “defaulted” and patients who “died.”

### Ethical consideration

Permission for this study was gotten from the Ethical and Research Committee of BhUTH Jos, Plateau State, Nigeria. The information retrieved was made anonymous and confidentiality ensured. Oral permission was also sought from the head of the unit where the records were domiciled.

## RESULTS

From 2009 to 2019, a total of 3200 patients were registered for treatment at APIN BhUTH for HIV/AIDS treatment. Of these, 296 patients had TB-HIV co infection and met the inclusion criteria for the study. The mean age of the study participants was  $41.8 \pm 11.6$  years, 56.6% were females, 65.4% were married, most (37.2%) were civil servants and 82.3% resided in urban areas. The most predominant religion was Christianity (82.4%) [Table 1].

The mean BMI at baseline was  $23.5 \pm 11.3$  kg/m<sup>2</sup>, most of the study participants (34.0%) at baseline belonged to the weight range 51–60 kg, with a mean baseline CD4 count of  $327.7 \pm 218.0$ . The most utilised treatment support was health care workers (95.3%). Of the study participants, 8.8%, 16.6% and 3.1% respectively had diabetes, hypertension and smoked cigarette, while 2.0% and 8.1% were involved in substance abuse and alcohol ingestion. Also of note, 12.1% had previous TB treatment [Table 2]. Those that were cured and completed treatment accounted for 87.5%, while default accounted for 8.7% and those that died accounted for 3.8% [Table 3].

There was no statistically significant relationship in the association between the treatment outcome and some selected variables except for the place of residence (<0.001) [Table 4].

**Table 1: Sociodemographic characteristics of tuberculosis/HIV co-infected patients**

Variables	Frequency (%)
Age	
<40	132 (46.5)
≥40	152 (53.5)
Sex	
Male	128 (42.5)
Female	167 (56.6)
Marital status	
Single	73 (25.3)
Married	189 (65.4)
Widow	17 (5.6)
Widower	6 (2.1)
Divorced	4 (1.4)
Occupation	
None	132 (45.5)
Farming	16 (5.5)
Civil servant	108 (37.2)
Artisan	18 (6.2)
Private employee	16 (5.5)
Address	
Urban	241 (82.3)
Rural	52 (17.7)
Religion	
Christianity	245 (82.4)
Islam	51 (17.2)

**Table 2: Clinical characteristic of tuberculosis/HIV co-infected patients**

Variables	Frequency (%)
BMI	
<25	209 (73.6)
≥25	75 (26.4)
Weight at initiation of treatment (kg)	
<40	14 (4.7)
41-50	69 (23.2)
51-60	101 (34)
61-70	73 (24.6)
71-80	25 (8.4)
>81	15 (5.1)
CD4 count at initiation of treatment	
<200	70 (30.4)
200-499.9	113 (49.1)
≥500	47 (20.4)
Treatment support	
Family member	128 (43.3)
Health care worker	281 (95.3)
Community member	4 (1.4)
Community health worker	17 (5.8)
Coexisting conditions	
Diabetes	26 (8.8)
Hypertension	49 (16.6)
Cigarette smoking	9 (3.1)
Substance abuse	6 (2.0)
Alcohol ingestion	24 (8.1)
Previous TB treatment	34 (12.1)

TB: Tuberculosis, BMI: Body mass index

**Table 3: Treatment outcome for tuberculosis/HIV co-infection**

Variables	Frequency (%)
Defaulted	25 (8.7)
Cured and completed treatment	251 (87.5)
Died	11 (3.8)

## DISCUSSION

In this study, a significant number of patients were females (56.6%). This could probably be due to the fact that women are more conscious of their health and would visit a health facility at the slightest feeling of unwell. This is similar to findings by Ebuenyi *et al.*<sup>13</sup> but contrasts findings from previous studies on TB by Oshi *et al.*,<sup>14</sup> Duru *et al.*,<sup>15</sup> Fatiregun, *et al.*,<sup>16</sup> Babatunde *et al.*<sup>17</sup> and Garedew and Namera.<sup>18</sup> The high prevalence of TB-HIV co-infection could be ascribed to the fact that women are a majority and secondly, this is an urban centre where the patients are likely to be more educated than their counterparts in the rural areas, hence more likely to seek medical health. The mean age of TB-HIV co-infected patients in this study was  $41.8 \pm 11.6$  years. This is similar but slightly higher than the findings from the Imo,<sup>15</sup> Ebonyi,<sup>14</sup> and Niger Delta studies.<sup>13</sup> The majority of these patients in our study fell within the age bracket of 40 years and above, which means a significant part of the workforce was affected, worsening catastrophic cost due to TB-HIV co-infection and hence socioeconomic burden.

A significant number of the patients had a BMI of less than 25 kg per m<sup>2</sup>. This implies that many of the patients were not overweight, hence, accounting for the low prevalence (8.8%) of diabetes among the patients. The retreatment category in this study was 12.1%, this corroborates findings from Imo,<sup>15</sup> but contrasts findings from Ebonyi,<sup>14</sup> and some other studies from Ethiopia.<sup>19-21</sup> A lot of these retreatment cases may be attributed to defaults and treatment failure. This highlights the importance of close monitoring and the need for regular health education and counselling of patients, to avert the unwanted effect of developing drug resistance.

The prevalence of TB-HIV co-infection in this study was 9.25%, corroborating findings of previous studies.<sup>20,22,23</sup> However, this prevalence was lower than the Nigerian<sup>6</sup> national figure of 19%, 35.2% in Cameroun,<sup>24</sup> and 19.7% in a study by Ukwaja *et al.*<sup>25</sup> Furthermore, other studies have reported figures of around one-third of TB-HIV co-infection.<sup>8,26,27</sup> The low prevalence reported from this study could probably be because this study was conducted among HIV patients and not the other way round. Possible reason for this low prevalence is the fact that TB/HIV co-infection is said to be prevalent among the sexually active age group,<sup>28</sup> however, this study population has a higher number of patients above this age.

Successful treatment outcome in this study was found to be 87.5%, therefore, complying with the WHO<sup>29</sup> recommendation of 85%. However, a lot of other studies have reported lower treatment success rates such as 78%<sup>13</sup> 76.6%,<sup>16</sup> 81% in Tanzania,<sup>30</sup> 72% in Malawi,<sup>31</sup> 71% in Vietnam,<sup>32</sup> and 60.3% in Sagamu Nigeria.<sup>8</sup> Perhaps, a possible explanation is that the treatment centre being urban, had better DOTS adherence and more female patients with presumed better healthcare-seeking behaviour. Furthermore, these women probably attended more pre-treatment health education sessions about TB and had sufficient education to understand the benefits of the DOTS treatment.

The unsuccessful treatment success rate in this study was found to be 12.5%, which contrasts findings of Ebuenyi *et al.*<sup>13</sup> which reported 19.2% and Ukwaja *et al.* 24.3%.<sup>25</sup> The low number of unsuccessful treatment outcomes in this study is possibly due to the better implementation of the DOTS strategy, which may be due to the additional support the facility gets from APIN Public Health Initiatives which is a non-governmental organisation.

Among the socio demographic and clinical characteristics selected, none was found to have had a statistically significant

**Table 4: Distribution of treatment outcome with some sociodemographic and clinical characteristics of tuberculosis/HIV patients**

Variables	Treatment outcome		$\chi^2$	P
	Successful	Unsuccessful		
Age				
<40	113	19	0.65	0.42
≥40	135	17		
Body Mass Index				
<25	185	24	1.01	0.31
≥25	63	11		
Address				
Urban	201	28	0.44	0.50
Rural	43	8		
CD4 count at initiation of treatment				
<200	55	10	3.67	0.15
200-499.9	99	11		
≥500	45	2		
Diabetes				
Yes	22	2	0.45	0.50
No	226	34		
Alcohol ingestion				
Yes	19	3	0.02	0.89
No	228	33		
Presence of hypertension				
Yes	38	7	0.37	0.54
No	208	29		
Cigarette smoking				
Yes	4	2	2.50	0.11
No	238	32		
Substance abuse				
Yes	3	2	3.45	0.06
No	246	34		

BMI: Body mass index

association with treatment outcome. This is however in contrast to previous studies that have documented the association of several other factors. One such study in Ethiopia<sup>33</sup> revealed that several factors including female sex, age >55 years, and pre-treatment weight between 22–29 and 38–54 were significantly associated with treatment outcome. Another study by Ebuenyi *et al.*,<sup>13</sup> also revealed treatment outcome to be significantly associated with several factors like age >30 years, being female, and being HIV positive on ART. Since about 4-5<sup>th</sup> of the patients in this study were urban residents and majorly females, the better healthcare-seeking behaviour previously mentioned may also be attributed to the high successful treatment outcome. Also is the issue of cost regarding transport and challenges of access which will be minimal for the urban as compared to the rural residents hence, this may have positively affected the treatment outcome.

This study was not without some limitations, we encountered cases with incomplete information and had to exclude such from the study. Important variables like educational qualification, site of the TB disease and socioeconomic were also not captured in the registers which could have possibly influenced the treatment outcome.

## CONCLUSION

The prevalence of TB-HIV co-infection was found to be 9.25% with a high treatment success rate of 87.5%. No socio-demographic factor was found to have been statistically significantly associated with treatment outcome. This treatment success rate recorded was above the WHO recommended standard. However, there is the need to sustain this through regular health education to patients and continuous monitoring of the implementation of the DOTS strategy. Also of importance is the need to put up intervention to reduce the default rate which is a possible candidate for the development of drug-resistant TB.

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## Conflicts of interest

There are no conflicts of interest.

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