

Determinants of Treatment Outcomes In TB/HIV Co-Infected Patients In Resource-Limited Settings

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Article Info	Abstract
Article History Submitted, 2026-05-11 Accepted, 2026-05-20 Published, 2026-06-30	Tuberculosis (TB) and human immunodeficiency virus (HIV) co-infection remain important public health problems, particularly in resource-limited settings. HIV-related immunosuppression increases susceptibility to opportunistic infections, especially tuberculosis, which contributes significantly to morbidity and mortality among people living with HIV. In Bulungan District, North Kalimantan, TB/HIV co-infection cases continue to be identified, indicating ongoing challenges in treatment continuity and integrated healthcare services. This study used a retrospective descriptive design using secondary data obtained from medical records and HIV-TB program documentation in Bulungan District from 2022–2025. A total sampling technique was applied, involving 39 patients with TB/HIV co-infection. Variables analyzed included demographic characteristics, TB treatment outcomes, and HIV treatment status. Data were analyzed descriptively using frequencies and percentages. Result of this study was Most patients were male (64.1%) and belonged to productive age groups, particularly 25–34 years and 35–44 years. TB treatment outcomes showed that 20.5% of patients completed treatment, 25.6% died during treatment, and 10.3% experienced drop out or loss during follow-up. Meanwhile, 43.6% of patients were still undergoing treatment or had unknown final outcomes at the time of data collection. Most patients (84.6%) had received antiretroviral therapy (ARV), while several patients died before ARV initiation and one patient was categorized as lost to follow-up. Conclusion on this study was TB/HIV treatment outcomes in Bulungan District remain varied and indicate ongoing challenges related to continuity of care, treatment adherence, and patient follow-up. Strengthening integrated TB/HIV services, improving adherence support, and expanding nurse-led and community-based interventions are important to improve treatment outcomes in resource-limited settings.
Keywords: TB/HIV co-infection, treatment outcomes, adherence, nursing care	

Introduction

Human immunodeficiency virus (HIV) remains a major global public health challenge, particularly in low- and middle-income countries where access to comprehensive healthcare services is still limited. HIV attacks the immune system, especially CD4 lymphocytes, causing progressive immunosuppression and increasing susceptibility to opportunistic infections. Despite advances in antiretroviral therapy (ART), HIV-related morbidity and mortality remain high, particularly among individuals who experience delayed diagnosis, poor treatment adherence, or limited healthcare access (UNAIDS, 2024); (Kementerian Kesehatan Republik Indonesia, 2023)

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Tuberculosis (TB) is recognized as the most common opportunistic infection and one of the leading causes of death among people living with HIV (PLHIV) worldwide. HIV infection significantly increases the risk of progression from latent TB infection to active TB disease because impaired cellular immunity reduces the body's ability to control *Mycobacterium tuberculosis* infection. In patients with HIV, TB often presents atypically, resulting in delayed diagnosis and treatment initiation, which may worsen clinical outcomes (Organization., 2023).

In Indonesia, including Bulungan District, North Kalimantan, HIV cases continue to increase and remain an important public health concern. Surveillance reports from the local HIV program documented ongoing TB/HIV co-infection cases between 2022 and 2025 (Bulungan District Health Office, 2025). Based on medical record data, a total of 39 TB/HIV co-infected patients were identified during the study period (Bulungan District Health Office, 2025). Most cases were recorded in 2024 (38.5%), while the majority of patients were male (64.1%) and within productive age groups. These findings indicate that TB/HIV co-infection predominantly affects economically productive populations, potentially increasing both clinical and socioeconomic burdens within the community.

The management of TB/HIV co-infection remains challenging, particularly in resource-limited settings. Several factors contribute to poor treatment outcomes, including delayed diagnosis, treatment interruption, poor adherence, comorbidities, stigma, and limited access to healthcare services. In addition, some patients discontinue treatment or are lost to follow-up during therapy, which may increase mortality risk and reduce treatment effectiveness. Local data also showed that a considerable proportion of patients were still undergoing treatment or had incomplete treatment outcomes at the time of data collection, particularly among recently diagnosed patients.

Previous studies have demonstrated that treatment adherence and early initiation of ART are strongly associated with improved treatment outcomes among TB/HIV co-infected patients (Abdool Karim et al., 2010); (François Anicet Onana Akoa et al., 2024). Patients with higher baseline immune status and better continuity of care generally achieve more favorable outcomes. Conversely, delayed treatment initiation, severe immunosuppression, and healthcare barriers contribute to increased treatment failure and mortality (Hassab et al., 2025); (Faye et al., 2025).

In Bulungan District, several treatment outcomes were identified among TB/HIV co-infected patients, including treatment completion, death during treatment, drop out, and ongoing treatment status. Mortality before ARV initiation was also identified in several patients, indicating possible delays in HIV diagnosis or access to treatment services. These findings highlight the importance of strengthening integrated TB/HIV services, improving adherence support, and expanding continuity of care for co-infected patients.

Nursing care plays an important role in supporting TB/HIV management through patient education, adherence counseling, routine monitoring, and community-based support interventions. Nurse-led approaches may help improve treatment adherence, reduce loss to follow-up, and strengthen continuity of care, particularly in resource-constrained settings where healthcare accessibility remains limited.

Therefore, this study aimed to analyze the characteristics and treatment outcomes among TB/HIV co-infected patients in Bulungan District, North Kalimantan, using secondary data from 2022–2025. This study is expected to provide context-specific evidence regarding TB/HIV treatment outcomes and contribute to the development of more effective integrated TB/HIV management strategies in resource-limited settings.

Methods

This study used a retrospective descriptive design to analyze the characteristics and treatment outcomes among patients with TB/HIV co-infection in a resource-limited setting. The research was conducted in Bulungan District, North Kalimantan, Indonesia, using secondary data obtained from medical records and HIV-TB program documentation at healthcare facilities in the study area (Bulungan District Health Office, 2025). Patient data from January 2022 to December 2025 were included in this study, while data collection and analysis were conducted between January and March 2026.

The study population consisted of all patients diagnosed with TB/HIV co-infection during the study period. A total sampling technique was applied, resulting in 39 patients who met the inclusion criteria. Inclusion criteria included documented TB/HIV co-infection and available treatment records for TB and HIV management. Patients with incomplete identification data were excluded from the analysis.

The variables analyzed included demographic characteristics (age, sex, and year of diagnosis), TB treatment outcomes, and HIV treatment status. TB treatment outcomes were categorized into treatment complete (PL), died (M), drop out/lost during treatment (DO), and still on treatment or outcome unknown. HIV treatment status was categorized into ARV treatment, died before receiving ARV (BLM), and lost to follow-up (LFU). In several patients, dates recorded in the TB treatment column represented the initiation date of anti-tuberculosis

treatment (OAT), indicating that treatment was still ongoing and final outcomes had not yet been determined at the time of data collection.

Data were collected using a standardized extraction sheet to ensure consistency during the retrieval process. All patient information was anonymized to maintain confidentiality and privacy throughout the research process.

Descriptive statistical analysis was used to summarize patient characteristics and treatment outcomes. The data were presented in the form of frequencies, percentages, and narrative descriptions to illustrate the distribution of TB/HIV co-infection cases and treatment outcomes in Bulungan District. Relevant national and international references related to TB/HIV co-infection and treatment outcomes were used to support the interpretation and discussion of the study findings. Ethical principles of confidentiality, anonymity, and data protection were maintained throughout the study process.

Results and Discussion

A total of 39 patients with TB/HIV co-infection were included in this study using secondary data obtained from medical records and HIV program documentation in Bulungan District from 2022–2025(Bulungan District Health Office, 2025). The data were analyzed to describe patient characteristics and treatment outcomes among TB/HIV co-infected patients in a resource-limited setting.

Table 1. Characteristics of TB/HIV Co-infected Patients (n=20)

Variable	Category	Frequency (n)	Percentage (%)
Year	2022	5	12.8
	2023	10	25.6
	2024	15	38.5
	2025	9	23.1
Age Group	≤24 years	3	7.7
	25–34 years	12	30.8
	35–44 years	12	30.8
	45–54 years	6	15.4
	≥55 years	6	15.4
Sex	Male	25	64.1
	Female	14	35.9
TB Treatment Outcome	Treatment Complete (PL)	8	20.5
	Died (M)	10	25.6
	Drop Out/Lost (DO)	4	10.3
	Still on Treatment / Outcome Unknown	17	43.6
HIV Treatment Status	ARV	33	84.6
	BLM (died before ARV initiation)	4	10.3
	LFU (lost to follow-up)	1	2.6

PL = completed treatment; M = died; DO = drop out/lost to follow-up; BLM = died before receiving ARV; LFU = lost to follow-up.

The results showed that most TB/HIV co-infected patients were recorded in 2024 (38.5%), followed by 2023 (25.6%) and 2025 (23.1%). The majority of patients were male (64.1%), indicating that men remain the dominant population affected by TB/HIV co-infection in this setting. This finding is consistent with previous studies showing higher HIV and TB incidence among males due to occupational mobility, delayed health-seeking behavior, and higher exposure to risk factors.

Most patients were within the productive age groups of 25–34 years and 35–44 years (30.8% each). These findings indicate that TB/HIV co-infection predominantly affects economically productive populations, potentially increasing the socioeconomic burden on individuals, families, and healthcare systems. Younger productive-age adults are generally more socially active and mobile, which may increase vulnerability to HIV transmission and subsequent opportunistic infections such as tuberculosis.

Regarding TB treatment outcomes, only 20.5% of patients were categorized as having completed treatment (PL), while 25.6% died during treatment. In addition, 10.3% of patients experienced drop out or were lost during follow-up. The largest proportion of patients (43.6%) were still undergoing treatment or had unknown final outcomes because treatment was ongoing at the time of data collection, particularly among patients from 2024 and 2025 whose OAT initiation dates were still recent.

These findings indicate ongoing challenges in TB treatment continuity and monitoring among TB/HIV co-infected patients. Mortality among co-infected patients may be associated

with delayed diagnosis, advanced immunosuppression, poor nutritional status, comorbid conditions, and barriers to healthcare access. Meanwhile, treatment interruption and loss to follow-up may reduce treatment effectiveness and increase the risk of drug resistance and disease transmission.

For HIV treatment outcomes, most patients had received antiretroviral therapy (ARV) (84.6%), indicating relatively good linkage to HIV care services. However, four patients (10.3%) died before ARV initiation (BLM), suggesting delayed HIV diagnosis or severe clinical deterioration before treatment initiation. One patient (2.6%) was categorized as lost to follow-up (LFU), indicating ongoing challenges in maintaining continuity of HIV care.

From a healthcare system perspective, these findings demonstrate that integrated TB/HIV management remains a major challenge in resource-limited settings. Delayed treatment initiation, incomplete follow-up, and patient loss during treatment continue to affect treatment outcomes. Strengthening early detection, improving adherence support, and ensuring continuity of integrated TB/HIV services are therefore essential to improve patient outcomes.

Nursing interventions play an important role in improving treatment success among TB/HIV co-infected patients. Patient education, adherence counseling, home visits, routine monitoring, and community-based support may help reduce treatment interruption and improve continuity of care. Nurse-led approaches are particularly important in resource-limited settings where healthcare access and patient monitoring remain limited.

Overall, the findings suggest that TB/HIV treatment outcomes in Bulungan District are influenced not only by clinical conditions but also by continuity of care and healthcare accessibility. Strengthening integrated services and adherence support programs remains crucial to improve treatment success and reduce mortality among TB/HIV co-infected patients.

Conclusion

This study showed that TB/HIV co-infection cases in Bulungan District were predominantly found among male patients and productive age groups. Most patients had received antiretroviral therapy (ARV), indicating relatively good access to HIV treatment services. However, TB treatment outcomes remained varied, including treatment completion, death, drop out, and patients who were still undergoing treatment or whose final outcomes had not yet been identified at the time of data collection.

The findings indicate that continuity of treatment and patient follow-up remain important challenges in TB/HIV management in resource-limited settings. Mortality during treatment, loss to follow-up, and delayed treatment completion suggest the need for stronger monitoring systems, earlier detection, and better adherence support for patients with TB/HIV co-infection.

Efforts to improve treatment outcomes should focus on strengthening integrated TB/HIV healthcare services, improving patient adherence through education and counseling, and expanding community-based follow-up programs. Nurse-led interventions, routine monitoring, and family support may help improve continuity of care and reduce treatment interruption among patients with TB/HIV co-infection.

Further studies involving larger populations and more comprehensive clinical variables are recommended to provide deeper understanding regarding factors affecting TB/HIV treatment outcomes in resource-limited settings.

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