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Treatment of Tuberculosis in Hiv Patients Attending Two Health Care Facilities in Osun State

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Abstract

Introduction: HIV/TB co-infection presents a complex and challenging public health issue globally, particularly in resource-limited settings such as Nigeria. The intersection of these two diseases has profound implications for healthcare systems, as co-infected individuals often experience poorer health outcomes and face increased mortality rates compared to those with either infection alone.

Understanding the prevalence, treatment outcomes, and determinants of HIV/TB co-infection is essential for informing targeted interventions and improving patient care.

Objectives: This study aimed to assess the prevalence of HIV/TB co-infection in Osun State, Nigeria, and investigate treatment outcomes among co-infected individuals. Additionally, demographic factors and socio-economic determinants influencing co-infection rates were examined to identify potential areas for intervention and policy development.

Method of Data Analysis: A retrospective analysis of case notes and pharmacy records from two healthcare facilities in Osun State was conducted. Simple descriptive statistics, including percentages, were utilized to analyze the data. Chi-square tests were employed to assess associations between demographic variables and co-infection rates.

Results: The study revealed a prevalence rate of 6.5% for HIV/TB co-infection among the study population, highlighting the substantial burden of this dual epidemic in Osun State. Females accounted for the majority of co-infected patients, comprising 68.8% of the total cases. Treatment outcomes varied based on the timing of antiretroviral therapy (ART) initiation relative to TB treatment. Notably, 92.1% of patients who received concurrent treatment for TB and HIV experienced successful treatment outcomes. However, delaying ART initiation until after completion of TB treatment resulted in poorer outcomes, with only 40% of patients achieving successful treatment.

Conclusion: The findings underscore the urgent need for integrated approaches to HIV/TB co-infection management in Osun State, Nigeria. Efforts to improve access to timely diagnosis, treatment initiation, and adherence support are critical for optimizing patient outcomes. Additionally, addressing socio-economic determinants and promoting awareness and education on co-infection risks are essential for mitigating the burden of HIV/TB co-infection and improving public health outcomes in the region.

Keywords: HIV/TB co-infection, prevalence, treatment outcomes, Osun State, Nigeria, socio-economic determinants

Introduction:

Tuberculosis and HIV have been closely linked since the emergence of HIV/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 in co infected individuals and leading 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. Worldwide, tuberculosis is the most common opportunistic infection affecting HIV- seropositive individuals, and it is the commonest cause of death in patients with AIDS (Corbett, 2003). The impact that HIV has on the pathogenesis of tuberculosis (TB) is clear. It is one of the most important risk factors associated with an increased risk of latent TB infection (LTBI) progressing to active TB disease. HIV-infected people have an annual risk of 5% to 15% of developing active TB once infected (Corbett, 2003).

Globally, more than 1.7 billion people are infected with tuberculosis (IUATLD, 2000). Nigeria is ranked 6th amongst the 22 countries in the world known to be highly plagued by tuberculosis with about 259,000 cases annually and 113,000 being smear positive (FMOH, 2000). The association between HIV and tuberculosis presents a public health and socio-economic threat in developing countries (Corbett, 2003;

Styllblo, 1990). The implication of HIV infection is that it activates dormant tuberculosis and may lead to persons infected with tubercle bacilli having about 10% chance of developing tuberculosis during the remainder of their lives; that is, they have less than 0.5% chance of developing the disease annually (WHO, 2004; Griffith, 1996). This is while 10% of persons infected with both tuberculosis and HIV develop TB disease annually (IUATLD, 2000).

In Nigeria, study on the treatment pattern of TB/HIV co-infection from any of the states is scanty, majority of the studies have been on only prevalence. Report from the Federal Ministry of Health revealed that the prevalence of HIV among pulmonary tuberculosis persons ranges between 4% and 35% depending on the State. Oyo State recorded 4% while Abia and Kano States recorded 9% and 12% respectively. Lagos State recorded 5.3 %, Kaduna State, 31% and Benue State 35% (FMOH, 2000).

Reports from Osun State and some other States in Nigeria are limited. This present study is therefore timely since it is undertaken to have an insight into the prevalence and evaluate treatment options of TB cases among HIV/AIDS patients attending clinics at the Ladoke Akintola University of Technology (LAUTECH) Teaching Hospital, and the State Specialist Hospital, Asubiaro. These two hospitals are the only health care facilities in Osogbo, Osun State that carry out collaborative TB and HIV services. It is believed this information will assist health managers and health care providers in increasing vigilance and providing integrated services that improve outcomes for people living with HIV/AIDS.

Materials and Methods

The study was conducted at two healthcare institutions in Osun State: Ladoke Akintola University of Technology (LAUTECH) Teaching Hospital in Osogbo and the State Specialist Hospital in Asubiaro, Osogbo. These hospitals are the sole providers of collaborative TB and HIV services in the city.

LAUTECH Teaching Hospital is a tertiary healthcare facility with a capacity of approximately 300 beds. It serves as a referral center and offers residency training across various medical specialties. The hospital operates free health programs at its HIV and Chest clinics, supported by donor agencies like The Institute of Human Virology of Nigeria and Damien Foundation.

The State Specialist Hospital in Asubiaro, managed by the Osun State Government, is a secondary healthcare facility with around 120 beds. It serves as a training center for interns and house officers in pharmacy, physiotherapy, and medicine. The hospital also offers free health services across most departments, including specialty clinics such as the HIV clinic for people living with HIV/AIDS and the Chest clinic managed by Damien Foundation for tuberculosis patients.

Both hospitals hold HIV clinics twice a week, each led by a Consultant in Family Medicine and staffed with a full medical team, including pharmacists supervised by a consultant clinical pharmacist. In contrast, the Chest clinics operate daily and are supervised by the same principal medical officer, who serves as the State TB officer. Unlike the HIV clinics, the Chest clinics do not have pharmacists on staff. There is a collaborative effort between the HIV and Chest clinics, with all newly diagnosed HIV-positive patients referred to the Chest clinic for tuberculosis screening and subsequent treatment if needed.

Design

This study involves a retrospective analysis of the medical records of newly diagnosed HIV patients and the pharmacy prescriptions of HIV-positive individuals diagnosed with TB infection. The analysis encompasses cases seen at the designated healthcare facilities from January 2009 to December 2012.

Data Collection

Data collection involved gathering the case notes of newly diagnosed HIV patients treated in the HIV clinics of both hospitals from January 2009 to December 2012. These records were examined to understand the demographic characteristics of the infected individuals. Subsequently, the case notes and

pharmacy prescriptions of patients co-infected with TB were analyzed separately. This analysis aimed to assess the prescribed treatment regimens and compare them with the recommendations outlined in the National guidelines on ARV and TB co-infection. The anti-tuberculosis regimens administered to co-infected patients were also scrutinized. Furthermore, key informant interviews were conducted to gauge the knowledge and experience of the prescribers in TB treatment.

Data analysis

Data analysis involved the application of basic descriptive statistics, including measures such as mean, mode, median, and percentages. Qualitative data analysis focused on interpreting, describing, and documenting the content of the information provided. Themes relevant to the data were identified and used for organizing and categorizing qualitative data through coding and sorting processes.

Ethical consideration

Before the commencement of the work, ethical approvals were obtained from the ethical review committees of both the LAUTECH Teaching Hospital, and the State Hospitals Management Board. Permission to conduct the study and to access data was also obtained from the management of the State Specialist Hospital, Asubiaro–Osogbo.

Results

Table 1: Sociodemographic Characteristics of the respondents

Sociodemographic Characteristics	HIV patients	Co-infected patients
Sex		
Male	546(31.2)	43(37.7)
Female	1204(68.8)	71(62.3)
Age group(years)		
1 – 20	55(3.1)	5 (4.4)
21 – 40	1310(74.9)	82(71.9)
41 – 60	350(20.0)	25(21.9)
> 60	35(2.0)	2(1.8)
Occupation		
Civil servants	201(11.5)	11(9.6)
Drivers	535(30.6)	34(29.8)
Farmers	311(17.8)	22(19.3)
Students	237(13.5)	14(12.3)
Traders	466(26.6)	33(28.9)
Marital status		
Single	700(40.0)	46(40.4)
Married	875(50.0)	57(50.0)
Separated	88(5.0)	6(5.3)
Widowed	88(5.0)	6(5.3)

Table 1 presents the sociodemographic characteristics of respondents, distinguishing between HIV patients and those co-infected with tuberculosis (TB). Among HIV patients, 31.2% were male and 68.8% were female, while among co-infected patients, the distribution was 37.7% male and 62.3% female. Regarding age groups, the majority of HIV patients (74.9%) fell within the 21-40 years range, with smaller proportions in the 41-60 years (20.0%) and over 60 years (2.0%) categories. Similarly, co-infected patients were predominantly in the 21-40 years range (71.9%), with lesser proportions in the 41-60 years (21.9%) and over 60 years (1.8%) categories. Occupational distribution showed a diverse

representation, with drivers comprising the largest proportion among both HIV patients (30.6%) and co-infected patients (29.8%). Additionally, civil servants accounted for 11.5% of HIV patients and 9.6% of co-infected patients, while farmers, students, and traders also represented notable segments in both groups. Regarding marital status, a significant portion of both HIV patients (40.0%) and co-infected patients (40.4%) were single, followed closely by married individuals constituting 50.0% in both groups. Separated and widowed individuals represented smaller proportions in both cohorts, with 5.0% each among HIV patients and 5.3% each among co-infected patients.

Table 2 HIV treatment options adopted in co-infection

Baseline CD4 count	Frequency	Percentage
≤ 200 /mm^3	10	8.8
≥200 – 350 /mm^3	28	24.5
>350 /mm^3	76	66.7

The treatment approach for each co-infected patient depended on their baseline CD4 count upon presentation at the clinic, as indicated in the table above. Among co-infected patients with a baseline CD4 count exceeding 350/mm3 (66.7%), the prescribers opted for concurrent treatment of TB and HIV, utilizing a regimen containing rifampicin alongside Zidovudine, Lamivudine, and Efavirenz (300mg bd, 150mg bd, and 600mg daily respectively). For those presenting with a baseline CD4 count ranging from ≥200 to 350/mm3 (24.5%), ART initiation was deferred until the completion of the initial TB treatment phase when rifampicin was no longer administered. In such cases, a combination of Zidovudine, Lamivudine, and Nevirapine (300mg bd, 150mg bd, and 200mg bd respectively) was employed. Additionally, a portion of co-infected patients (8.8%) with a baseline CD4 count below 200/mm3 had their ART initiation postponed until the completion of short-course TB treatment. Upon completion of TB treatment, these patients were then initiated on the Zidovudine, Lamivudine, and Nevirapine combination regimen (300mg bd, 150mg bd, and 200mg bd respectively).

Table 3: Treatment outcome of the treatment options

Treatment options	Number of Patients	No of patients successfully treated	Percentage
Treat TB and HIV concurrently	76	70	92.1
Delay ART until completion of initial phase of TB	28	22	78.6
Delay ART until completion of TB treatment	10	4	40

The treatment outcome was measured using the proportion of patients that were successfully treated of their TB in relation to the total number of patients that actually started the TB treatment under the different HIV treatment options. At the end of the short course TB treatment, microscopic examination of the patient's sputum was repeated to confirm the patient status; if the examination was negative, then the patient was said to have been successfully treated of the TB infection. From table 3 above, among

those who received concurrent treatment for TB and HIV, totaling 76 patients, 70 were successfully treated, representing a success rate of 92.1%. In cases where ART initiation was deferred until the completion of the initial phase of TB treatment, involving 28 patients, 22 individuals achieved successful treatment, resulting in a success rate of 78.6%. However, for patients whose ART initiation was delayed until the completion of TB treatment, comprising 10 patients, only 4 patients experienced successful treatment, reflecting a notably lower success rate of 40%. These findings highlight the varying treatment outcomes associated with different treatment approaches for co-infected patients, emphasizing the importance of tailored management strategies in optimizing treatment efficacy and patient outcomes.

Tuberculosis Treatment regimens adopted

Most (93%) (106) of the co-infected patients were in category 1, while (7%) (8) were in category 11. The patients in the two categories were treated with the recommended regimen for patients in the respective category as recommended by the Federal Ministry of Health through the National Tuberculosis Programme. Those in category 1 were treated with a combination of isoniazid 5mg/kg daily, rifampicin10mg/kg daily, pyrazinamide 25mg/kg daily and ethambutol 15mg/kg daily in the initial phase of two months; and only isoniazid 5mg/kg daily and ethambutol 15mg/kg daily in the continuation phase of six months. However, a streptomycin injection 15mg/kg daily was added to the initial phase and rifampicin10mg/kg was added to the continuation phase of those patients in category11.

Result of the key informant interview

Distribution of Respondents by profession

Table 5: Respondents' Profession

Respondents' Profession	Frequency	Percentage
Medicine	4	75.0
Nursing	2	25.0
Total	6	100

Majority of the respondents (75%) were medical doctors, while the remaining 25% were nurses.

Table 6: Respondents' Years of Experience at TB unit

Years of Experience	Frequency	Percentage
1 – 5	0	0.0
6 – 10	2	25.0
11 – 15	4	75.0
Total	6	100

All the respondents have been working in the TB unit for more than six years with majority (75%) being there for more than ten years.

Table 7 Guiding principle in Pattern of Prescription

What Guides Patterns of Prescription	Frequency	Percentage
National Guidelines 6	100	

Total	6	100

All the prescribers said they are guided by the recommendation of the National Guidelines for the treatment of TB in HIV patients.

Table 8 Distribution of Respondents by TB Workshop Attended

Attendance of TB workshop	Frequency	Percentage
Yes	6	100.0
N0	0	0.0
Total	6	100.0

As presented in table 8 above, all the respondents 6, (100.0%), said they have attended workshops on tuberculosis.

Table 9 Distribution of Respondents by the Period the Workshop was Organized

Period of Workshop	Frequency	Percentage
Recently	4	75.0
Long ago	1	12.5
Can't remember	1	12.5
Total	6	100

Four (75%) of the respondents said they attended TB workshops recently while one (12.5%) respondent said he attended long ago, and another one (12.5%) respondent said he could not remember exactly when he attended the workshop

Table 10 Distribution of Respondents by Organizer of Workshop

Organizer of Workshop	**Frequency**	**Percentage**
Damien foundation	6	100
National Tuberculosis and Leprosy Control Programme	6	100

All the respondents had on different occasions attended workshops organized by both the Damien foundation and the National Tuberculosis and Leprosy control program of the Federal ministry of Health.

Table 11 Distribution of Assessment of Workshops

Assessment of workshop	**Frequency**	**Percent (%)**
Beneficial	6	100.0
Not Beneficial	0	0.0
Total	6	100.0

Table 11 depicts the distribution of workshop assessments, with all 6 assessments indicating that the workshops were perceived as beneficial, accounting for 100% of the responses. None of the assessments reported the workshops as not beneficial. These findings suggest a unanimous consensus among

participants regarding the positive impact and value of the workshops, highlighting their effectiveness in achieving their intended objectives.

Table 12 Distribution of Respondents by Compliance with National Guidelines

Do you Comply with National Guidelines?	Frequency	Percent (%)
Yes 6	100.0	
No	0	0.0
Total	6	100.0

Table 12 illustrates the distribution of respondents based on their compliance with National Guidelines. All 6 respondents reported compliance with the National Guidelines, constituting 100% of the responses. None of the respondents indicated non-compliance with the guidelines. These results indicate a high level of adherence among the respondents to the National Guidelines, reflecting a commitment to following established protocols and standards in their practices.

Discussion of Findings

The study showed a prevalence rate of 6.5% for HIV/TB co infection in the study population. This is in consonance with reports from some other parts of the country. In Lagos, Idigbe *et al* (1994) reported a prevalence rate of 5.3%. FMOH in 2010 reported a prevalence rate of 4.0% in Oyo State; Ejikeme and Godwin (2010) reported a prevalence rate of 6.4% in Umuahia, Abia State. In Edo and Kano state, a prevalence rate of 9.6% and 10.5% were reported by Okodua *et al* (2004), and Zubairu and Musa (2009) respectively. However, some other states of the country like Kano, Enugu, Borno, Plateau, and Benue recorded higher prevalence rates of 12%, 14%, 27%, 30%, and 35% respectively (FMOH, 2000). Higher prevalence rates `of 13.9% and 12.6% were reported in Ile- Ife, Osun State, and Ilorin, Kwara State (Olaniran *et al*, 2011; Salami and Olunloyo, 2000) .

The relatively lower prevalence rate observed in this study could be due to constant availability of drugs as there was no period of stock out during the study period in the facilities. Several factors have been suggested as contributing to the variation in the prevalence of TB among HIV patients. Among them are the demographic position of the patients and their socioeconomic status (Harris, 1990). Onipede *et al* (1999), also observed that tuberculosis thrives most in communities in which poverty and destitution abound.

All these factors coupled with the fact that drivers, traders, and farmers have higher rate of exposure to HIV because they often travel to different places and therefore have tendency to engage in extra marital and unprotected sexual activities could therefore explain the high incidence of HIV-TB co infection found among drivers (29.8%), traders (28.9%) and farmers (19.3%) in this study. Another reason could also be that since HIV infection is higher among these groups of people, it could have led to reactivation of dormant mycobacterium tuberculosis hitherto dormant in them.

Majority of the HIV patients in this study were females. Similarly, females had higher co infection of HIV/TB than males, similar to studies in Edo state (Okodua *et al*, 2004 and Nasarawa State (Grace *et al* 2010). However, similar studies in Lagos (Idigbe *et al*, 1994), Kano (Zubairu and Musa, 2011), Umuahia Abia State (Ejikeme and Godwin, 2010), and Ile-Ife (Olaniran *et al*, 2011) revealed a higher prevalence of HIV/TB co infection in males than females. But, the result of this study and other studies with similar results are in agreement with UNAIDS World AIDS Report 2011 where females were reported to have a higher prevalence of HIV/TB co infection than males in Africa. The higher occurrence of HIV infection in females could be due to the fact that the rate of transmission of HIV from males to females is twice that of females to males (WHO, 2008; Silvero *et al*, 2009). Also it was found out that majority of HIV

infections are acquired through unprotected sexual relations and the rate of transmission from male to female has been found to be 0.08% while that of female to male has been found to be 0.04% (Silvero *et al*, 2009).

Studies conducted in South Africa, Kenya, Uganda, have also shown male circumcision reduces female to male sexual HIV transmission considerably by male (Rothenberg *et al*, 1998; Halkitis *et al* 2008). Also, a panel of experts convened by WHO & UNAID secretariat has recommended that male circumcision can now be recognised as an additional important intervention to reduce the risk of heterosexually acquired HIV infection in men (Halkitis *et al*; 2008).

The higher prevalent rate among women in this study may be attributed to a reduction in heterosexual transmission of HIV to male due to male circumcision since studies have shown that about 90% of male above fifteen years of age in Nigeria are circumcised (WHO,2007). Studies of HIV among women having undergone female genital cutting (FGC) have reported mixed results but with some evidence of increased risk of transmission. This could also explain the higher occurrence of HIV infection among women in this study as studies have shown that in Africa traditional settings of which the study area is one, incidence of illegal female genital mutilation is still high (WHO, 2007).

It is not surprising to note that most of the HIV and HIV/TB co-infected patients in this study were adolescents & young adults in the age bracket of 20 – 40 years because this is the age group at which people are at their peak sexually. This is in agreement with studies carried out earlier in Edo state (Okodua *et al*, 2004), Kano (Zubairu and Musa, 2009), Umuahia (Ejikame and Godwin, 2010), and Ile-Ife (Olaniran *et al*, 2011). Other studies carried out in other states of Kano, Enugu, Borno, Plateau, and Benue also showed that majority of HIV and HIV/TB co infected patients are adolescent and young adults (FMOH, 2000). This will impact negatively on socio economic activities as this age group is the productive age group of any community.

Majority of the co-infected patients had their treatment for both TB and HIV started concurrently, with only few having their HIV treatment delayed until after the initial phase of TB treatment. However, a small proportion had their treatment delayed until after the completion of their TB treatment. This, according to the prescribers during the key informant interview, was due to their compliance with the year 2010 recommendation of the National Guidelines on HIV and AIDS treatment and care in adolescents and adults, as all the patients who had their ART treatment deferred until the completion of the TB treatment were actually attended to in 2009. Notwithstanding, the prescribers complied strictly with the recommendations of the National Guidelines on HIV and AIDS treatment and care in adolescents and adults (2010)) and Guidelines for the clinical management of TB and HIV/AIDS related condition in Nigeria (20 08).

The result of this study on treatment options adopted in co-infection could however not be compared with any local study as local studies were majorly restricted to prevalence of TB/HIV co-infection. Knoll *et al*, 2007 concluded that there is no empirical evidence for withholding treatment at any stage of HIV infection and death rates are almost twice as high when therapy is deferred (until the CD4 count falls below 500) compared to starting therapy when the CD4 count is above 500. The WHO panel on anti-retroviral guidelines for adults and adolescents in 2009 recommended that ART should be initiated in all patients with a CD4 count less than 350, with treatment also recommended for patients with CD4 count between 350 and 500. Early treatment of HIV infected people is said to protect 96% of partners from infection (Knoll *et al*, 2007).

From the study, minority (40%) of the patients who had their treatment deferred till the completion of the TB treatment were successfully treated of the TB infection, while the majority (60%) were either lost to follow up or were not successfully treated. In contrast, majority of the patients in the other two

categories (concurrent commencement of TB and ARV, and deferment of ARV until after the initial phase of TB therapy) were successfully treated of their TB infection. The result emphasized the need to commence ART at every stage of TB/HIV co infection irrespective of the CD4 count as recommended by National Guidelines on HIV and AIDS treatment and care in Adolescents and Adults (WHO 2010).

However, the result of this study on the outcome of the different treatment options adopted in co-infection could not be compared with any local study as most local studies were majorly restricted to prevalence of TB/HIV co-infection. WHO and National TB Programme recommends the use of isoniazid, rifampicin, pyrazinamide and ethambutol/streptomycin in the initial phase of two months and either the combination of isoniazid and rifampicin for four months or isoniazid and ethambutol for six months in the continuation phase for the treatment of patients in category 1, while it recommends the use of isoniazid, rifampicin, pyrazinamide, ethambutol and streptomycin for two months initial phase, and isoniazid, rifampicin, and ethambutol for five months continuation phase for the treatment of patients in category 11. This treatment guideline was strictly followed in the treatment of TB patients in the two selected health care facilities. This compliance with the recommended treatment guidelines, according to the prescribers during the key informant interview was attributed to the various workshops and seminars the prescribers have attended. It was also attributed to the experience they have gathered overtime as all the medical staffs in the clinics are officers with more than six years working experience in the chest clinic.

The key informant interview was organized for four doctors and two nurses of the two chest clinics. This is because the National Tuberculosis and leprosy control programme allows experienced nurses who have been trained appropriately to serve as the prescribers in the absence of a doctor. All the respondents have spent between six and fifteen years in the chest clinic of their respective facilities. They therefore have adequate experience and knowledge of the treatment of TB, and this also, tends to give credibility to their responses.

The National Guideline is the main authority on the treatment of tuberculosis. It is therefore not surprising that all the six respondents said they are guided by the Guidelines in prescribing drugs for TB patients. Their compliance with the National Guidelines also ensures the adequacy and quality of whatever they prescribed. All the respondents have attended workshop organized by the Damien foundation and the National tuberculosis and leprosy control programme office of the Federal ministry of Health. According to majority (75%) of them, the recent nature of the workshop and the content appropriateness has ensured that they complied with the stipulation of the National Guidelines.

Conclusion

This study revealed a prevalence rate of 6.5% for HIV/TB co-infection among the study population in Osun State, Nigeria. The observed prevalence is consistent with findings from other parts of the country, underscoring the significant burden of this co-infection. Factors such as the constant availability of drugs and adherence to National Guidelines likely contributed to the relatively lower prevalence rate observed in this study. However, demographic factors, socio-economic status, and occupational exposure also play significant roles in the incidence of co-infection, particularly among high-risk groups such as drivers, traders, and farmers. Notably, the majority of co-infected patients were females, consistent with trends observed in other regions of Nigeria and Africa. This higher prevalence among females may be attributed to various factors including differential rates of HIV transmission between genders and cultural practices such as female genital mutilation, which can increase HIV transmission risk.

Treatment outcomes varied depending on the timing of ART initiation relative to TB treatment, highlighting the importance of early initiation of ART regardless of CD4 count, as recommended by National Guidelines. Delaying ART until after completion of TB treatment resulted in poorer treatment

outcomes, emphasizing the need for prompt and integrated management of both infections. Moving forward, it is imperative to strengthen efforts aimed at early detection, prompt treatment initiation, and adherence to National Guidelines for the management of HIV/TB co-infection. This includes continuous training and capacity building for healthcare providers, as well as increased awareness and education targeting high-risk populations. Additionally, efforts to address socio-economic factors contributing to the incidence of co-infection are essential for mitigating its burden and improving overall public health outcomes.

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