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# Perceptions and Awareness of TB-HIV Co-Infection Risks in Ibadan, Nigeria: Implications for Public Health Interventions

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**Abstract:** Sub-Saharan Africa is grappling with a profound public health challenge, marked by the simultaneous epidemics of tuberculosis (TB) and human immunodeficiency virus (HIV). This co-occurrence, often referred to as the "cursed duet," exerts a devastating impact on individuals, families, communities, and populations. In Nigeria, one of the countries significantly affected, both TB and HIV are pressing public health concerns. The resurgence of TB in this region is largely attributed to the HIV epidemic, disproportionately affecting impoverished populations.

This study focuses on the perceptions and awareness of risk factors associated with TB-HIV coinfection among healthcare attendees in Ibadan, Nigeria. The participant gender distribution in this study was relatively balanced, with women possibly demonstrating higher health awareness. TB/HIV knowledge was moderate, with varying levels of awareness concerning symptoms and transmission modes. Notable risk factors, including persistent cough, anti-TB drug default, smoking, and a history of TB, were perceived by the study population.

Bivariate analysis identified significant associations between coinfection prevalence and factors such as persistent cough, a history of TB, marital status, and CD4 count at HIV diagnosis. These findings underscore the urgent need for targeted health education campaigns to improve awareness of TB-HIV coinfection risk factors, especially emphasizing less recognized symptoms and transmission routes. Health interventions should focus on early detection and treatment of individuals at risk, while healthcare providers should be trained to identify and counsel those with TB-HIV coinfection risk factors. Further research is warranted to explore the reasons behind the gender balance in participation

and assess the impact of targeted interventions on knowledge enhancement and coinfection risk reduction.

**Key words:** TB-HIV coinfection, perception, risk factors, Nigeria, public health, awareness, co-epidemics.

## BACKGROUND

Sub-Saharan Africa grapples with a profound public health challenge—confronting the twin epidemics of tuberculosis (TB) and human immunodeficiency virus (HIV). TB, previously in decline, has experienced a resurgence in this region, largely due to the HIV epidemic. Nigeria, among the countries significantly affected, bears a heavy burden of both TB and HIV. (Ogbo et al 2018)

This convergence of TB and HIV is often referred to as a "cursed duet" because of its devastating impact on individuals, families, communities, and populations. TB, now the 10th leading global cause of mortality, has eclipsed HIV/AIDS as the primary cause of death attributed to a single infectious agent since 2011 (WHO TB Report, 2019). The resurgence of TB in sub-Saharan Africa can be attributed, in part, to the HIV epidemic, which disproportionately affects impoverished populations. A 2018 survey revealed that approximately 60% of TB patients in Nigeria live below the poverty line, with 54% unable to afford treatment, even with government and development partner support. This financial strain is exacerbated when TB is co-infected with HIV (Federal Ministry of Health [FMoH], 2017). The consequences of this dual epidemic are severe, with an estimated 300,000 global deaths in 2017 attributed to TB/HIV co-infection (Niadoo et al., 2019). In Nigeria, approximately 63,000 new TB cases are reported annually among people living with HIV (PLHIV), contributing to a staggering TB mortality rate of about 155,000 and making Nigeria the second-highest contributor to global TB-related mortality (Reid et al., 2019).

The interplay between HIV and TB is particularly lethal, with each disease exacerbating the progression of the other. HIV weakens the immune system, increasing susceptibility to new TB infections and promoting the progression of latent TB infection to active disease. The lifetime risk of developing TB among PLHIV is elevated to 50–70% compared to 10% in HIV-negative individuals (Hiregoudar et al., 2016). HIV patients with active TB face a risk of death between 15 and 20% within one year, compared to 7–8% among those without active TB disease (Lawn et al., 2006). The TB-HIV co-infection crisis is a formidable challenge to public health, especially in sub-Saharan Africa. Nigeria, with its substantial contribution to the global TB burden and a rising TB-HIV co-infection rate, stands at the forefront of this crisis (WHO, 2018). Urgent control strategies are needed to prevent the TB-HIV co-infection from hindering the achievement of Sustainable Development Goals (SDGs) in developing countries. Furthermore, latent TB infections are prevalent, and HIV infection significantly increases the risk of reactivating latent TB disease (FMoH, 2013). HIV-positive individuals exposed to TB bacilli face a staggering 37-fold increase in their risk of developing active TB disease (WHO, 2015).

Nigeria is one of the 30 high-burden TB countries, contributing to approximately 90% of global TB cases. It has a TB burden rate of 219/100,000 population, including TB-HIV co-infection cases (WHO, 2018). Nigeria's TB-HIV co-infection mortality rate stands at 18/100,000 population. According to the latest Nigerian HIV/AIDS Indicator and Impact Survey (NAIIS) report, Nigeria has a current HIV prevalence of 1.4%, while the TB-HIV co-infection rate is reported at 19.1% (NAIIS, 2018). TB infection is a critical opportunistic infection among HIV-positive patients, contributing significantly to high mortality rates in this population. TB-HIV co-infection also poses a substantial obstacle to achieving desired treatment outcomes (FMoH, 2015; WHO, 2015; USEN, 2012). Most of these deaths

and treatment challenges occur in resource-limited settings (NAIIS, 2018).

Given the gravity of the TB-HIV co-infection crisis in Nigeria and the potentially devastating consequences, understanding the perceptions and awareness of the risk factors associated with this co-infection among clinic attendees is vital. This study aims to illuminate the perceptions of individuals accessing healthcare services at DOTS and ART centers in Ibadan, Nigeria, focusing on their understanding of the risks associated with HIV-TB co-infection. By gaining insight into these perceptions, we can identify potential knowledge gaps and inform strategies for improved prevention and management of this dual epidemic.

## METHODS

The study was conducted in Ibadan, the capital of Oyo State, one of the largest cities in Africa and the largest in West Africa, specifically within the Ibadan South-West Local Government Area, covering approximately 133,500 square meters of land and hosting an estimated population of 291,628. This Local Government Area encompasses 10 political wards, housing 10 state-owned health facilities, 11 Primary Health Centers/Maternity centers, and 127 private health institutions. The study population, drawn from both primary and secondary healthcare facilities in Ibadan, included attendees at nine DOTS centers, such as the Chest Clinic in Jericho and the Ibadan South-West Local Government Health Care Center in Molete, encompassing both first-time attendees and those attending for follow-up visits.

Data for this study were collected through a structured interviewer-administered questionnaire consisting of 66 items categorized into seven sections. These sections encompassed socio-demographic characteristics, knowledge related to TB and HIV, information on TB and HIV risk factors. To ensure language consistency, the questionnaire was initially translated from English to Yoruba and then back-translated to English. Pre-testing of 10% of the questionnaires took place at the state TB lab to ensure clarity and appropriateness.

Data management procedures included data entry, coding, and thorough data cleaning before analysis. The presentation of results involved the use of charts and tables. To explore associations and assess significance, statistical methods such as chi-square tests, logistic regression, and binomial tests were employed. All analyses were conducted at a 5% significance level.

Ethical considerations were diligently observed, and informed consent was obtained from all participants. The study received ethical approval from the Ethical Review Committee of the Oyo State Ministry of Health.

## RESULTS

**Table 1: Socio-Demographic Characteristics**

| VARIABLE | FREQUENCIES | PERCENTAGE (%) |
|---|---|---|
| **AGE (YEARS)** | | |
| 10 – 19 | 50 | 11.8 |
| 20 – 29 | 139 | 26.0 |
| 30 – 39 | 150 | 30.8 |
| 40 – 49 | 87 | 17.4 |
| 50 – 59 | 38 | 6.8 |
| 60 – 69 | 20 | 4.0 |
| 70 – 79 | 6 | 1.2 |
| > 80 | 10 | 2.0 |

| | | |
|---|---|---|
| **TOTAL** | **500** | **100.0** |
| **GENDER** | | |
| Male | 210 | 42.0 |
| Female | 290 | 58.0 |
| **TOTAL** | **500** | **100.0** |
| **ETHNIC GROUP** | | |
| Yoruba | 360 | 74.8 |
| Igbo | 90 | 15.2 |
| Hausa | 50 | 10.0 |
| **TOTAL** | **500** | **100.0** |
| **LEVEL OF EDUCATION** | | |
| No formal Education | 43 | 8.6 |
| Primary | 88 | 16.6 |
| Secondary | 200 | 41.0 |
| Tertiary | 168 | 33.6 |
| **TOTAL** | **500** | **100.0** |
| **RELIGION** | | |
| Christianity | 289 | 57.8 |
| Islam | 190 | 38.0 |
| Traditional | 21 | 4.2 |
| **TOTAL** | **500** | **100.0** |
| **MARITAL STATUS** | | |
| Single | 150 | 31.8 |
| Married | 276 | 53.4 |
| Cohabiting | 51 | 10.2 |
| Divorced/separated | 11 | 2.2 |
| Widowed (er) | 12 | 2.4 |
| **TOTAL** | **500** | **100.0** |
| **CURRENT OCCUPATION** | | |
| Barber | 11 | 2.2 |
| Civil servant | 65 | 13.0 |
| Driving | 22 | 4.4 |
| Farming | 18 | 3.6 |
| Student | 116 | 23.2 |
| Tailoring | 65 | 13.0 |
| Teaching | 33 | 6.6 |
| Trading | 116 | 23.2 |
| Others | 40 | 8.0 |
| **TOTAL** | **500** | **100.0** |
| **FAMILY TYPE** | | |
| Monogamous | 221 | 44.2 |
| Polygamous | 110 | 22.0 |
| Not applicable (Single) | 169 | 33.8 |
| **TOTAL** | **500** | **100.0** |
| **NO OF CHILDREN** | | |

| | | |
|---|---|---|
| 0-2 | 144 | 43.6 |
| 3-5 | 132 | 40.0 |
| > 5 | 54 | 16.4 |
| **TOTAL** | **330** | **100.0** |

The data in table 1 above presents demographic information for 500 participants in the study. Among the age groups, the highest proportion falls within the 30-39 age range (30.8%), followed by 20-29 (26.0%), and the least in the 70-79 age group (1.2%). Gender distribution is fairly balanced, with 42% male and 58% female participants. The Yoruba ethnic group constitutes the majority (74.8%), followed by Igbo (15.2%) and Hausa (10.0%). In terms of education, secondary education is the most common (41.0%), followed by tertiary education (33.6%), while 8.6% have no formal education. Christianity is the dominant religion (57.8%), followed by Islam (38.0%) and Traditional (4.2%). Marital status varies, with 53.4% married, 31.8% single, 10.2% cohabiting, and smaller percentages for divorced/separated (2.2%) and widowed (2.4%). Various occupations are represented, with trading (23.2%) and student status (23.2%) being prominent. Family types vary between monogamous (44.2%) and polygamous (22.0%), with 33.8% categorized as not applicable (single). Regarding the number of children, the majority have 0-2 children (43.6%), followed by 3-5 children (40.0%), and a smaller percentage have more than 5 children (16.4%).

**Table 2: Distribution of Correct Responses to Knowledge Questions on TB and HIV/AIDs**

| VARIABLE (ITEM) | FREQUENCIES OF CORRECT RESPONSE | PROPORTION |
|---|---|---|
| Have heard of TB | 450 | 90 |
| **knowledge of symptoms of TB** | | |
| Prolonged cough | 320 | 67.6 |
| Fever | 99 | 19.8 |
| Blood in sputum | 245 | 58.0 |
| Loss of appetite | 278 | 55.0 |
| Night Sweating | 255 | 51.0 |
| Pain in the chest | 300 | 57.6 |
| Tiredress/Fatigue | 150 | 37.8 |
| Paleness | 103 | 20.6 |
| Other /Weight loss | 245 | 49.0 |
| **Knowledge of transmission of TB** | | |
| Through sharing utensils | 38 | 7.6 |
| Through touching TB patient | 191 | 38.2 |
| Through food | 59 | 11.8 |
| Through sexual intercourse | 213 | 42.6 |
| Through mosquito bite | 265 | 53.0 |
| Coughing /sneezing | 468 | 93.6 |
| Can TB be cured | 48 | 9.6 |

| | | |
|---|---|---|
| **HIV/AIDS Knowledge** | 411 | 82.2 |
| Ever Heard of AIDs | 481 | 96.2 |
| | | |
| **Knowledge on transmission of AIDS** | | |
| By unprotected sexual Intercourse | | |
| Through mosquito bites | 39 | 7.8 |
| By sharing, cups, spoons & plate | 101 | 20.2 |
| By sharing unsterilized sharp object | 333 | 66.6 |
| By transfusion of unscreened blood | 335 | 67.0 |
| From infected mother to child | 90 | 18.0 |

In the distribution of correct responses to knowledge questions on TB and HIV/AIDS in Table 2, it was found that 90% of respondents had heard of TB. Knowledge of TB symptoms varied, with a significant proportion correctly identifying prolonged cough (67.6%), blood in sputum (58.0%), and pain in the chest (57.6%). However, knowledge about symptoms like fever (19.8%), paleness (20.6%), and tiredness/fatigue (37.8%) was lower. Regarding the transmission of TB, respondents had lower awareness, with only 7.6% correctly recognizing the possibility of transmission through sharing utensils. However, a more substantial number knew about transmission through coughing/sneezing (93.6%) and sexual intercourse (42.6%).

For HIV/AIDS knowledge, a high percentage (96.2%) had heard of AIDS. In terms of transmission, a majority correctly identified unprotected sexual intercourse (82.2%) and the sharing of unsterilized sharp objects (66.6%) as potential transmission routes, while awareness of other transmission routes was lower.

**Table 3: Perception of risk factors of TB-HIV coinfection**

| Risk Factors | Frequency | Percentage |
|---|---|---|
| Persistent cough | 160 | 32.0 |
| Anti TB drug default | 90 | 18.0 |
| Smoking | 100 | 20.0 |
| History of TB | 50 | 10.0 |
| Drinking alcohol | 30 | 6.0 |
| Marital status | 5 | 1.0 |
| CD4 count at HIV diagnosis | 35 | 7.0 |
| Overcrowding | 20 | 4.0 |
| Malnutrition | 10 | 2.0 |

The perception of risk factors for TB-HIV coinfection among the study population revealed that a significant proportion identified persistent cough (32.0%) as the most prevalent risk factor, followed by anti-TB drug default (18.0%), smoking (20.0%), and a history of TB (10.0%) as notable contributing factors. Other factors such as drinking alcohol (6.0%), marital status (1.0%), CD4 count at HIV diagnosis (7.0%), overcrowding (4.0%), and malnutrition (2.0%) were also recognized to varying degrees (Table 3).

**TABLE 4: Bivariate analysis of relationship between risk factor of HIV/TB and HIV/TB co-infection**

| Risk factors | Prevalence of co- infection (%) | Chi-square | Df | P-value |
|---|---|---|---|---|
| Persistent cough | 64.2 | 0.107 | 1 | 0.000* |
| Anti TB drug default | 33.2 | 0.908 | 1 | 0.004 |
| Smoking | 23.2 | 2.917 | 1 | 0.088 |
| History of TB | 20.0 | 12.053 | 1 | 0.001* |
| Drinking Alcohol | 15.6 | 0.516 | 1 | 0.473 |
| Marital Status | 11.2 | 7.524 | 1 | 0.006* |
| CD4 count at HIV diagnosis | 16.7 | 12.414 | 1 | 0.000* |
| Overcrowding | 9.2 | 7.321 | 1 | 0.543 |
| Malnutrition | 10.4 | 1.321 | 1 | 0.657 |

The bivariate analysis examining the relationship between risk factors and the prevalence of HIV/TB coinfection revealed significant associations for several factors. Specifically, persistent cough was strongly associated with a high prevalence of coinfection (64.2%, $p < 0.001$). Additionally, a history of TB (20.0%, $p = 0.001$), marital status (11.2%, $p = 0.006$), and CD4 count at HIV diagnosis (16.7%, $p < 0.001$) were also significantly associated with a higher prevalence of coinfection. Conversely, while anti-TB drug default showed a moderate prevalence of coinfection (33.2%, $p = 0.004$), smoking (23.2%, $p = 0.088$), drinking alcohol (15.6%, $p = 0.473$), overcrowding (9.2%, $p = 0.543$), and malnutrition (10.4%, $p = 0.657$) did not exhibit statistically significant associations with HIV/TB coinfection.

## Discussion

In this study, the participant gender distribution was relatively balanced, with 42% males and 58% females. This gender composition may be attributed to women's heightened health awareness, potentially leading them to seek medical attention more promptly, consistent with the findings of Ebuenyi et al. (2016). These results contrast with previous TB studies conducted by Oshi et al. (2014), Duru et al. (2016), Fatiregun et al. (2009), Babatunde et al. (2013), and Garedew and Nemera (2017). Regarding TB knowledge, 90% of respondents had heard of TB. Knowledge about TB symptoms varied, with the highest correct response rate observed for "prolonged cough" at 67.6%, followed by

"coughing/sneezing" at 93.6%. Other symptoms received varying correct response rates ranging from 19.8% to 57.6%. These findings align with previous TB studies conducted by Duru et al. (2016), Fatiregun et al., Babatunde et al. (2013), and Garedew and Nemera (2017). Concerning TB transmission, "coughing/sneezing" was correctly identified as the primary mode of transmission (93.6%), consistent with Ebuenyi et al.'s findings. Other modes had correct response rates ranging from 7.6% to 53.0%. Only 9.6% of respondents correctly answered whether TB can be cured. Furthermore, 96.2% of respondents had heard of AIDS, consistent with Al-Rabeei et al.'s study (2010). Knowledge of AIDS transmission indicated that 82.2% correctly identified "unprotected sexual intercourse" as a mode of transmission. Sixty-seven percent acknowledged mother-to-child transmission, aligning with Al-Rabeei et al. and Idowu et al.'s findings.

The perception of risk factors for TB-HIV coinfection among the study population revealed that a significant proportion identified "persistent cough" (32.0%) as the most prevalent risk factor, consistent with findings by Idowu et al. (2021). This was followed by "anti-TB drug default" (18.0%), "smoking" (20.0%), and a "history of TB" (10.0%) as notable contributing factors. Other factors such as "drinking alcohol" (6.0%), "marital status" (1.0%), and "CD4 count at HIV diagnosis" (7.0%) were also recognized to varying degrees, similar to findings by Pimpin et al. (2011) where CD4 count at HIV diagnosis was perceived as one of the risk factors of TB-HIV coinfection. "Overcrowding" (4.0%) and "malnutrition" (2.0%) were also noted.

The bivariate analysis examining the relationship between risk factors and the prevalence of HIV/TB coinfection revealed significant associations for several factors. Specifically, "persistent cough" was strongly associated with a high prevalence of coinfection (64.2%, $p < 0.001$). Additionally, a "history of TB" (20.0%, $p = 0.001$), "marital status" (11.2%, $p = 0.006$), and "CD4 count at HIV diagnosis" (16.7%, $p < 0.001$) were also significantly associated with a higher prevalence of coinfection, consistent with Anteyi et al. (1997), Idowu et al. (2021), Hiregoudar et al. (2016), and Pimpin et al. (2011). Conversely, while "anti-TB drug default" showed a moderate prevalence of coinfection (33.2%, $p = 0.004$), "smoking" (23.2%, $p = 0.088$), "drinking alcohol" (15.6%, $p = 0.473$), "overcrowding" (9.2%, $p = 0.543$), and "malnutrition" (10.4%, $p = 0.657$) did not exhibit statistically significant associations with HIV/TB coinfection.

**Conclusion**

This study examined the perception of TB-HIV coinfection risk factors. Gender distribution was balanced, possibly indicating women's heightened health awareness. TB-HIV knowledge was moderate, with varying awareness of symptoms and transmission modes. Risk factors like persistent cough, anti-TB drug default, smoking, and a history of TB were perceived by the respondents. Bivariate analysis showed significant associations between coinfection and factors such as persistent cough, a history of TB, marital status, and CD4 count at HIV diagnosis.

**Recommendations**

1. Public Awareness Campaigns: Implement targeted health education campaigns to improve awareness of TB-HIV coinfection risk factors, emphasizing less recognized symptoms and transmission routes.
2. Health Interventions: Develop interventions targeting risk factors like persistent cough, anti-TB drug default, and smoking, with a focus on early detection and treatment.
3. Healthcare Provider Training: Train healthcare providers to identify and counsel individuals at risk of TB-HIV coinfection, especially those with a history of TB or low CD4 counts at HIV diagnosis.

4. Further Research: Conduct further research to explore the reasons behind the gender balance in participation and to assess the impact of targeted interventions on improving knowledge and reducing coinfection risk.

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