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# Prevalence of Human Immunodeficiency Virus among Presumptive Tuberculosis Patients Offered HIV Testing Services in Federal Capital Territory, Abuja Nigeria

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***Abstract***

*Human Immunodeficiency Virus has a prevalence of 1.4% in Nigeria, 2.0% in North Central Nigeria and, 1.4% among adults in Abuja. This study determined prevalence and predictors of Human Immunodeficiency Virus among 737 presumptive tuberculosis patients in Federal Capital Territory Abuja Nigeria from 1st April 2019 to 30th May 2021 through retrospective cross-sectional study and multi-stage sampling. From Non-Municipal Area Councils, Bwari was selected while from Health Facilities, General Hospital Bwari and Gwarimpa were selected from Bwari and Abuja Municipal Area Council respectively by simple random sampling and data abstractions were done and analyzed using Statistical Package for Social Sciences version 23.0 Software. The prevalence of Human Immunodeficiency Virus amongst patients with known status was 29.0%, unknown status 1.9% while their cumulative prevalence was 30.7%. The prevalence of Human Immweredeficiency Virus amongst patients with tuberculosis was 1.1%. Factors associated with Human Immunodeficiency Virus were Area Council (p = 0.001), age (p = 0.001) and gender (p = 0.001). For predictors, residency in Bwari was 0.196 times less likely compared to residency at AMAC, Abuja and, place of Residence was a predictor (aOR = 0.001; 95% C.I. = 0.130-295). The age group 31-40 years were 2 times more likely compared to other age groups and, age it was predictor (aOR = 0.019; 95% C.I. = 1.125-3.852). and male gender gender were 0.601 time less likely compared to females and, gender is a predictor (aOR = 0.021; 95% C.I. = 0.391-0.925).*

***Keywords:*** *Human Immunodeficiency Virus, Presumptive, Tuberculosis.*

## Introduction

Human Immunodeficiency Virus (HIV) is a virus that attacks the human immune system, making a person infected with HIV. The virus destroys T-helper cells (CD4 cells) and makes copies of itself inside them. The two main types of HIV are HIV-1 (the commonest type worldwide) and HIV-2 (mainly in Western Africa, some cases in India and Europe) [1]. The HIV targets immune system and weakens defense against infections and some types of cancer. As the virus destroys and impairs the function of immune cells, infected individuals become immunodeficient [2–6]. Immune function is measured by CD4 cell count, but immunodeficiency results in increased susceptibility to infections, cancers and other diseases healthy immune systems can fight off. The most advanced stage of HIV infection is

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acquired immune deficiency syndrome (AIDS), defined by the development of certain cancers, infections, or other severe long term clinical manifestations [2–6].

People living with HIV are mostly infectious in the first few months of infection, but many are unaware of their status until the later stages, occasionally following an influenza-like illness including fever, headache, rash, or sore throat. Progression of infection is accompanied by other signs and symptoms, such as swollen lymph nodes, weight loss, fever, diarrhoea, and cough. Without treatment, severe illnesses such as TB, cryptococcal meningitis, severe bacterial infections, and cancers (lymphomas and Kaposi's sarcoma) could occur [2–7].

Human immunodeficiency virus is transmitted via exchange of body fluids from infected individuals, such as blood, breast milk, semen, and vaginal secretions. It is detected using WHO prequalified tests used in combination in a specific order validated and based on HIV prevalence of the population being tested [3]. Serological tests, Rapid Diagnostic Tests (RDTs) or Enzyme Immunoassays (EIAs) as well as self-tests, detect antibodies produced by an individual as part of their immune system to fight off foreign pathogens [3]. It is important that HIV Testing Services (HTS) involve consent, confidentiality, counselling, correct results, and connection with Anti-Retroviral Treatment (ART) immediately following diagnosis, and consistency on ART also prevents HIV transmission [5, 3].

Babies carry their biological mothers' antibodies, and it can take months before it disappears thus, testing and diagnosis of HIV-exposed infants is a challenge. For infants and children less than 18 months, serological testing is not sufficient to identify HIV infection: virologic testing must be provided (at 6 weeks, or at birth) to detect HIV in infants born to mothers living with HIV [3].

If the person's CD4 cell count falls below 200, their immunity is severely compromised, which leads to more susceptible to infections and that person is described as having AIDS [5, 3].

Globally, new HIV infections have been reduced by 40% since the peak in 1998. In 2019, around 1.7 million people were infected with HIV, compared to 2.8 million in 1998. In 2019, the burden of HIV was 38.0 million (36.2 million adults and 1.8 million children 0–14 years. AIDS-related deaths have reduced by 60% since the peak in 2004. In 2019, 690 000 deaths were AIDS-related worldwide compared to 1.7 million in 2004 and 1.1 million in 2010 [5].

Though HIV now affects all countries, it has reached epidemic proportions across large parts of Africa. Out of the global 34 million women and men with HIV, about 23.5 million (69%) are in n Sub-Saharan Africa (SSA). In addition, 92% of pregnant women have HIV and 90% are children. About 71% of all AIDS-related deaths worldwide in 2011 occurred with SSA [8]. The East and Southern Africa is the region hardest hit by HIV, around 54% of the global HIV of 20.6 million people [7].

Nigeria's national HIV prevalence is 1.4% among adults 15–49 years (women 15–49 years 1.9% while men 0.9%). Among younger adults, women 20–24 years are three times as likely to be living with HIV as young men in the same age group. Among children aged 0–14 years, HIV prevalence is 0.2%. In 2019, about 45 thousand AIDS-related deaths occurred in Nigeria, a 35% decrease from 2010. The HIV prevalence is 2.0% in the North Central zone where Federal Capital Territory (FCT) Abuja is 1.4% among adults aged 15-64 years [9, 1, 10-12].

It is noted that HIV and TB form a lethal combination, speeding each other's progress. In 2019, about 208,000 people died of HIV-associated TB and the percentage of TB patients who had documented HIV test result was 69% [13, 14]. In the WHO African Region, the burden of HIV-associated TB is the highest and, 86% of TB patients had a documented HIV and 88% of TB patients were on ART [13, 14]. In Africa, 34% of people living with HIV were infected with TB bacteria who are 20 to 30 times more

likely to develop active TB disease than people without HIV. About 42% of HIV positive people (newly enrolled) are on preventive treatment against TB [5].

The WHO recommends collaborative approaches of TB-HIV actions for prevention and treatment of infection and disease to reduce deaths [13-15]. The early detection of TB and prompt linkage to TB treatment and ART prevents deaths. The screening for TB should be routinely at HIV care services and routine HIV testing vice versa to all patients with presumptive and diagnosed TB. Those diagnosed with HIV and active TB should start effective TB treatment (including multidrug-resistant TB) and ART immediately and TB preventive therapy offered to all people with HIV who do not have active TB [3].

The HIV/AIDS pandemic fuels the burden of TB and poses great challenge to its diagnosis and management and, the prevalence of TB among HIV cases in Nigeria is estimated at 17.8% [16, 8]. In FCT, TB/HIV co-infection is 44.3%, with 19.5% defaulted, 11.5% deaths and 0.7% treatment failures [17]. It has been documented that HIV-positive TB patients suffer significant HIV-related morbidity during TB treatment. Adverse reactions to anti-TB drugs are frequent and lead to interruptions and fatalities. They have a much higher mortality rate during and after anti-TB treatment than HIV-negative patients [18]. This may change with ART without which, 20 to 30% of HIV-positive and smear-positive TB patients die before completion of treatment, and 25% of survivors die during next 12 months [18].

The immunity of patients is a predictor of death: lower $CD4^+$ cell counts at diagnosis in HIV-positive and smear-positive TB patients are associated with higher mortality rates. HIV-positive patients with smear-negative TB have higher case-fatality rates during treatment than those with smear-positive TB (typically more immunosuppressed) [18]. Those TB/HIV patients on drug regimens without rifampicin have higher case-fatality and relapse rates, than those on regimens with rifampicin. Rifampicin-containing regimens improve survival, by acting more strongly against TB and, prevent other bacterial infections through the broad-spectrum antibiotic activity of rifampicin [18].

Also, providing HIV testing to TB patients and supporting HIV treatment for people with TB and HIV co-infection and expansion of TB preventative treatment, whose weakened immune systems make them vulnerable to being ill from TB [8]. This study will determine the prevalence of HIV and associated factors among presumptive TB patients in FCT, Abuja [17]. It is hoped that the study will help to support sustained strengthening and expansion of strategies on prevention and control of HIV through public health interventions at individual, community, area council and State level in FCT.

## Materials and Methods

The Federal Capital Territory (FCT) is the capital city of Nigeria located in the North-Central region of the country [19], and is divided into six area councils (Abaji, Bwari, Gwagwalada, Kuje, Kwali and Abuja Municipal Area) [20, 21]. The Municipal Area Council is the largest of all the area councils [21] with a projected population of 1,894,513 [19] and the 2019 projected population of FCT was 4,464,785 people [22]. A retrospective cross-sectional study was conducted among presumptive tuberculosis patients who accessed care in FCT from 1$^{st}$ April 2019 to 30$^{th}$ May 2021 who met the inclusion criteria and were eligible for this study while those that did not have complete records of age, sex, Xpert MTB/RIF results, and HIV status were excluded.

A multi-stage sampling technique was used for the selection of Health facilities offering DOTS services in Federal Capital Territory, Abuja North Central Zone of Nigeria. The area councils in FCT Abuja were stratified into Municipal Area council and Non-Municipal Area councils. The study was conducted in the Abuja Municipal Area Council (AMAC) and in Bwari Area Council (a Non-Municipal Area

Council). Bwari Area Council was selected from the list of Area Councils amongst the Non-Municipal Area Councils in FCT [20, 21, 22], by simple random sampling technique through a computer-generated table of random numbers by WINPEPI statistical software. One (1) health facility providing ART and DOTS services in AMAC (General Hospital Gwarimpa) and Bwari Area Council (General Hospital Bwari) [21] respectively was selected through a simple random sampling technique by a computer-generated table of random numbers by WINPEPI statistical software.

From the selected Health facilities, data abstraction for all presumptive TB patients who received care during the study period of 1st April 2019 to 30th May 2021 who met the inclusion criteria and not excluded were retrieved for the research. The HIV data were extracted from presumptive TB Registers, Health facility central TB register and PLHIV presumptive and TB diagnostic evaluation and treatment register using quantitative tool (checklist) by trained six (6) Research Assistants after advocacy visits to the Chief Medical Directors of the selected facilities with introductory letter from the University and ethical clearance granted by the FCT Health Research Ethics Committee for support and permission to conduct the study. All data were entered, processed, and analyzed using Statistical Package for Social Sciences (IBM SPSS) version 23 software. Data was cleaned and double entry done for the variables and analyzed using SPSS version 23. Statistical analyses were done for frequencies and percentages (proportions) of HIV status. Proportions of HIV status of clients with and without TB were compared using chi-square test or Fisher exact test (when the value of any of the cells was < 5 or more than 20% of any of the expected cells was < 5) to calculate the p value; statistical association tested at a significant level of 0.05 [p=0.05 (95% confidence interval)]. The association between factors influencing HIV status of clients were assessed by Chi-Square and logistic regression was done and adjusted Odds ratio and Confidence Intervals were computed to determine the predictors of HIV.

## Results

The study population consisted of 737 presumptive tuberculosis patients whose data met the inclusion criteria and extraction done from the presumptive tuberculosis and tuberculosis registers from the selected facilities (General Hospital Gwarimpa and General Hospital Bwari). The findings are as follows.

### Socio-demographic Characteristics of Patients

The mean age of the presumptive TB patients was 36.66±14.2 years, the age range was ≤30 to ≥51 years. Other results are as presented below. The ages of most of the presumptive TB patients were in the age group ≤30 years (36.0%) and majority (64.5%) were female. The Area Council of the presumptive TB patients showed that 64.9% are in Bwari Area Council (Table 1).

**Table 1.** Demographic Characteristics of Study Participants

| Demographic characteristics | Frequency | Percentage |
|---|---|---|
| **Age group** | | |
| ≤30 | 265 | 36.0 |
| 31-40 | 217 | 29.4 |
| 41-50 | 136 | 18.5 |
| ≥51 | 119 | 16.1 |
| **Gender** | | |
| Male | 262 | 35.5 |
| Female | 475 | 64.5 |
| **Area Council** | | |

| | | |
|---|---|---|
| Bwari | 478 | 64.9 |
| AMAC | 259 | 35.1 |
| **Total** | **737** | **100.0** |

## Prevalence of HIV among Presumptive Tuberculosis Patients

Out of the 737 presumptive tuberculosis patients, about 29.0% had HIV among those with previously known HIV status, 1.9% had HIV among those with previously unknown HIV status and the cumulative prevalence of HIV among the presumptive tuberculosis patients was 30.7% (Table 2).

## Prevalence of HIV among Presumptive Tuberculosis Patients with Tuberculosis

Out of the 737 presumptive tuberculosis patients, 1.1% had HIV among the presumptive tuberculosis patients with tuberculosis (Table 3).

**Table 2.** Prevalence of HIV among Presumptive Tuberculosis Patients

| HIV status | Frequency | Percentage |
|---|---|---|
| **Previously known HIV status** | | |
| Positive | 212 | 28.8 |
| Negative | 525 | 71.2 |
| Total | 737 | 100.0 |
| **Previously unknown HIV status** | | |
| Positive | 14 | 1.9 |
| Negative | 723 | 98.1 |
| Total | 737 | 100.0 |
| **HIV status** | | |
| Positive | 226 | 30.7 |
| Negative | 511 | 69.3 |
| Total | 737 | 100.0 |

**Table 3.** Prevalence of HIV among Presumptive Tuberculosis Patients with Tuberculosis

| HIV status | Frequency | Percentage |
|---|---|---|
| Positive | 8 | 1.1 |
| Negative | 27 | 3.7 |
| Unknown | 702 | 95.3 |
| Total | 737 | 11.8 |

## Factors Associated with HIV

The presumptive tuberculosis patients from Bwari Area Council had prevalence of HIV of 18.6%. The association between Area Council of Resident and HIV is significant ($p = 0.001$). About 39.6% of the presumptive tuberculosis patients with HIV were within the age group 31 – 40 years. The association is statistically significant ($p = 0.001$). Considering the gender of the presumptive tuberculosis patients, 36.6% of them with HIV were females. The association is statistically significant ($p = 0.001$) (Table 4).

**Table 4.** Factors Associated with HIV among Presumptive Tuberculosis Patients

| Characteristics | HIV | | $\chi^2$ | p-value |
|---|---|---|---|---|
| | Positive | Negative | | |
| **Area council** | | | | |
| Bwari | 89(18.6) | 389(81.4) | 92.824 | 0.001 |
| AMAC | 137(52.7) | 122(47.1) | | |
| **Age group** | | | | |
| ≤30 | 67(25.3) | 198(74.7) | 19.823 | 0.001 |
| 31-40 | 86(39.6) | 131(60.4) | | |
| 41-50 | 49(36.0) | 87(64.0) | | |
| ≥51 | 24(20.2) | 95(79.8) | | |
| **Gender** | | | | |
| Male | 51(19.7) | 208(80.3) | 18.568 | 0.001 |
| Female | 175(36.6) | 303(63.4) | | |
| **Type of presumptive TB** | | | | |
| Drug sensitive | 219(31.2) | 484(68.8) | 1.702 | 0.192 |
| Drug resistant | 7(20.6) | 27(79.4) | | |

The Odds Ratio (aOR) showed that presumptive tuberculosis patients that reside in Bwari Area Council were 0.196 times less likely to have HIV compared to those who reside in AMAC, Abuja and, Area Council of Residence was a predictor of HIV (aOR = 0.001; 95% C.I. = 0.043 - 0.141). The Odds Ratio (aOR) showed that presumptive tuberculosis patients within the age group 31-40 years were 2 times more likely to have HIV compared to other age groups and age is a predictor of HIV (aOR = 0.019; 95% C.I. = 1.125 – 3.852). The Odds Ratio (aOR) showed that presumptive tuberculosis patients with male gender were 0.601 times less likely to have HIV compared to females and, gender is a predictor of HIV (aOR = 0.021; 95% C.I. = 0.391 – 0.925) (Table 5).

**Table 5.** Logistic Regression of Predictors of HIV among Presumptive Tuberculosis Patients

| Factors | AOR | 95% C. I. of AOR | p-value |
|---|---|---|---|
| **Area council** | | | |
| Bwari | 0.196 | 0.130-295 | 0.001 |
| AMAC | 1 | - | - |
| **Age group** | | | |
| ≤30 | 1.163 | 0.634-2.135 | 0.626 |
| 31-40 | 2.082 | 1.125-3.852 | 0.019 |
| 41-50 | 1.796 | 0.914-3.533 | 0.090 |
| ≥51 | 1 | - | - |
| **Gender** | | | |
| Male | 0.601 | 0.391-0.925 | 0.021 |
| Female | 1 | - | - |
| **Type of presumptive TB** | | | |
| Drug sensitive | 0.834 | 0.346-2.010 | 0.685 |
| Drug resistant | 1 | - | - |

## Discussion

The study involved secondary data analysis of presumptive tuberculosis patients of Gwarimpa General Hospital and Bwari General Hospital Abuja Municipal Area Council (AMAC) and Bwari Area Council respectively of Federal Capital Territory Abuja, Nigeria to determine the prevalence of HIV among presumptive tuberculosis patients. Out of the 737 presumptive tuberculosis patients, about 29.0% had HIV among those with previously known HIV status, 1.9% had HIV among those with previously unknown HIV status and the cumulative prevalence of HIV among the presumptive tuberculosis patients was 30.7%.

Findings from the study indicated that the prevalence of HIV among presumptive tuberculosis patients of 29.0% among those with previously known HIV status is lower than the prevalence from a study in Mandalay, Myanmar, where 44.5% of the presumptive TB patients had known HIV status [24]. The possible explanation to low prevalence of HIV among presumptive patients in FCT Abuja is due to HIV preventive behavioural change occasioned by previous HTS where leaving negative from HIV was intervention was done during health education at previous visits.

From this study, about 29.0% of the presumptive tuberculosis patients with previously known HIV status had HIV which is more than the prevalence of HIV from a study in India where the presumptive TB patients with previously known HIV positive status was 12% ([24]. Another study with lower HIV positive prevalence is that conducted in Zimbabwe, among presumptive TB patients which showed that 26% of them were known HIV-positives ([25]. The possible reason for higher prevalence of HIV amongst those with previously known HIV could be attributed to poor adherence to ART which lead to poor suppression and tuberculosis in FCT, Nigeria.

For the prevalence of HIV among presumptive tuberculosis patients of 1.9% among those with previously unknown HIV status, this is lower than that from Mandalay, Myanmar where the prevalence of HIV among the newly tested presumptive patients was 85.3% [23]. In India, among the presumptive TB patients, 40% were new HIV-positives [24]; in Zimbabwe among presumptive TB patients 75% were newly tested HIV-positive [25] and in Tigray, Northern Ethiopia 95.7% of the presumptive TB patients were treatment naïve [26]. This infers that HIV interventions in FCT Abuja has contributed immensely towards the reduction of new cases of HIV amongst presumptive tuberculosis patients.

The cumulative prevalence of HIV among presumptive tuberculosis patients from this study of 30.7% is relatively higher than the prevalence from a study in Southern Africa where the prevalence of HIV was reported as 14% and 10% in Mangaung and Capricorn respectively [27]. In North-West Ethiopia, the prevalence of HIV among presumptive TB patients was 5.2% [28] which is also lower the prevalence revealed by this study. The possible reason for the higher cumulative prevalence of HIV among presumptive tuberculosis patients from this study compared to the prevalence of HIV among presumptive tuberculosis patients revealed by studies conducted elsewhere could be explained by HIV now reaching epidemic proportions across large parts of Africa [6] and a higher prevalence of HIV in North Central Nigeria where FCT Abuja is located than certain states in Nigeria [9, 29, 10-12].

Considering the prevalence of HIV among presumptive tuberculosis patients with tuberculosis, out of the 737 presumptive tuberculosis patients, 1.1% had HIV among the presumptive tuberculosis patients with tuberculosis. The prevalence of HIV in patients with tuberculosis from this study is lower than the findings from Port Harcourt and Ekiti both in Nigeria which showed that 3.4% and 53.4% of the participants respectively had HIV [30, 31]. The possible reason behind the variation in these studies is the choice of study population where

they could have been mostly people living with HIV as against the one here that are presumptive tuberculosis who presented for HIV testing.

Considering factors associated with HIV, the presumptive tuberculosis patients from Bwari Area Council had 18.6% HIV prevalence. The association between Area Council of Resident and HIV is statistically significant (p = 0.001). There is agreement between findings from this study and the study from Malawi which showed 13.2% prevalence of HIV in urban Residents and is statistically significant [32]. It is however dissimilar to a study from Cameroun where the prevalence of HIV was 5.68% (95% CI: 95%: 4.88–6.35) for urban and 5.87% (95% CI: 5.04–6.78) in rural settings which are lower than the prevalence from this study [33]. The possible reason for the variation between this study and that Cameroun is the study design which was multi-regional compared to this study. For the association between HIV and age, about 39.6% of the presumptive tuberculosis patients with HIV were within the age group 31 – 40 years. The association is statistically significant (p = 0.001). There is similarity between the finding from this study and that from Port Harcourt, Nigeria, and a systematic review where HIV is associated with age and the prevalence showed that age group 16-24 years and greater than >25 years had prevalence of 4.7% and 2.8% respectively (P<0.05) [30]. For the gender of the presumptive tuberculosis patients, 36.6% of them with HIV were females. The association between gender and HIV is statistically significant (p = 0.001). There is similarity between the finding from this study and that from Port Harcourt, Nigeria, and a systematic review where HIV was higher in females (4.7%) and sex was the main correlate (P<0.05) of HIV [30].

Considering the predictors of HIV among presumptive tuberculosis patients, the Odds Ratio (aOR) showed that presumptive tuberculosis patients that reside in Bwari Area Council were 0.196 times less likely to have HIV compared to those who reside in AMAC, Abuja and, Area Council of Residence was a predictor of HIV (aOR = 0.001; 95% C.I. = 0.130 - 0.295). There is agreement between the finding from this study and that in Malawi which showed that people residing in urban areas were 2.2 times more likely to have HIV compared to those in the rural areas (AOR = 2.16; 95%CI = 1.57–2.97) [32]. For age, the Odds Ratio (aOR) showed that presumptive tuberculosis patients within the age group 31-40 years were 2 times more likely to have HIV compared to other age groups and, age is a predictor of HIV (aOR = 0.019; 95% C.I. = 1.125-3.852). There is agreement between this study and the study in Port Harcourt, Nigeria which showed that age was a correlate for HIV (P<0.05) [30] also, the study in Malawi revealed that age was an independent predictor of HIV [32]. For gender, the Odds Ratio (aOR) showed that presumptive tuberculosis patients with male gender were 0.601 times less likely to have HIV compared to females and, gender is a predictor of tuberculosis (aOR = 0.021; 95% C.I. = 0.391-0.925). There is agreement between this study and those in Port Harcourt which showed that gender was a main correlate (P<0.05) of HIV [30] and the study in Malawi which revealed that gender was an independent predictor of HIV [32]. It is suggested that in future there should be improvement of the research methodology to prospective or quasi experimental study.

## Conclusion

The prevalence of Human Immunodeficiency Virus among presumptive Tuberculosis patients and presumptive tuberculosis patients with tuberculosis in Federal Capital Territory Abuja, Nigeria was moderate and low respectively. Residing in Bwari Area Council (non-Municipal Area Council) by the presumptive tuberculosis patients was associated with having less Human Immunodeficiency Virus which was statistically significant compared to those who resided in Abuja Municipal Area Council and, Area Council of Residence was a predictor of Human Immunodeficiency Virus. Furthermore, the age

of the presumptive tuberculosis patients was associated with Human Immunodeficiency Virus, which was statistically significant, and age was a predictor of Human Immunodeficiency Virus. Also, statistical association was established between gender and Human Immunodeficiency Virus and, gender was a predictor of Human Immunodeficiency Virus among the presumptive tuberculosis patients in Federal Capital Territory Abuja, Nigeria.

## Conflict of Interest

The authors declare that there is no conflict of interest.

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