

## **Incidence of HIV and pulmonary tuberculosis co-infection among patients attending out-patient clinic in a Nigerian hospital**

**Abiodun Ifeoluwa Silvanus<sup>\*</sup>**, Olanrewaju Adenike Itunu, Ladipo Oluwakemi Anike and Oluberu Aminat Oluwadamilola

*Diagnostic Laboratory, Babcock University Teaching Hospital, Ilishan-Remo, Ogun state, Nigeria*

### **\*Correspondence Info:**

Abiodun Ifeoluwa Silvanus  
Diagnostic Laboratory, Babcock University Teaching Hospital,  
Ilishan-Remo, Ogun state, Nigeria  
E-mail: [ifeoluwasylva@yahoo.com](mailto:ifeoluwasylva@yahoo.com)

### **Abstract**

HIV and Tuberculosis co-infection pose diagnostic and therapeutic challenges on public health care systems. *Mycobacterium tuberculosis* and HIV exert synergistic effects in accelerating the deterioration of host's immunologic functions and response. The demographic pattern of patients with suspected cases of tuberculosis were determined in this study. A total of 277 patient's records were retrospectively analyzed over an eighteen month period. Patient's sputum smears were screened using Ziehl-Neelsen staining technique. The rates of HIV infection in suspected tuberculosis patients was 7.22% (n=20). Incidence of infection was higher in females (58.3%) when compared with males (41.7%), while incidence of HIV-TB co-infection was highest among the 21-30 years age group. It is essential that strategies aimed at effectively controlling HIV and Tuberculosis be re-examined with emphasis being placed on public enlightenment, identification of sources and control of spread.

**Keywords:** Pulmonary Tuberculosis, HIV, Ziehl-Neelsen, *Mycobacterium tuberculosis*, Nigeria.

### **1.Introduction**

Out of the world's population of over 7 billion people, 2 billion people are estimated to be latently infected with tuberculosis[1], while 35.3 million people are living with HIV, [70% of which are living in sub-Saharan Africa][2]. Tuberculosis (TB) and Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) remain the main burden of infectious diseases and cause of death emanating from infectious diseases in developing countries [1].

Furthermore, there are an estimated 9 million new cases of tuberculosis and 2.6 million new HIV cases annually [1][2]. In 2011, out of the 8.7 million tuberculosis cases recorded, 1.1 million (13%) were among individuals living with HIV[2].

The epidemiological and physiologic synergy between HIV and TB, influencing the incidence, distribution and outcomes of both infections, has been well documented and established [3]. *Mycobacterium tuberculosis* and HIV co-infections pose peculiar diagnostic and therapeutic challenges, while exerting enormous pressure on the weakened healthcare systems characteristic of some African nations.

*Mycobacterium tuberculosis*-HIV co-infection exerts synergistic effects on one another, thereby fast-tracking a decline in immunological functions, leading to premature deaths, if left untreated [4]. Tuberculosis and HIV have potentiating effects on the immune system. Tuberculosis-HIV co-infection is capable of deactivating the hosts' immune response through mechanisms that remain to be fully understood. HIV-Tuberculosis co-infection remains a foremost risk factor, increasing the risk of progression of pulmonary tuberculosis from the latent stage to the active stage 20-fold [5][6].

One in every eight incident TB cases occurs in HIV positive individuals, while one in every five HIV-associated deaths occurs in incident TB cases [2]. Africa is significantly burdened with most of TB-HIV infection cases, where one third of the approximately 2.3 million individuals infected with TB in 2010 were HIV positive (World Health Organization, 2012). However, India and Eastern Europe are other regions affected by the twin epidemics [7][8].

HIV has also had an influence on the age associated prevalence of Tuberculosis characterized by a lowering of the peak age groups. This lowering is more pronounced in HIV endemic areas, with peak TB incidence cases seen among adults within the 20-45 years age group [9].

Nigeria remains one of the countries with the highest burden of Tuberculosis, with new cases being diagnosed annually in spite of the efforts being put in place at bringing the disease under control. The 2012 World Health Organization estimates puts the prevalence of Tuberculosis at 280,000 (171 per 100,000) cases, with an incidence of 190,000 (118 per 100,000) and a mortality of 27,000 (17 per 100,000)[1]. The control of tuberculosis in Nigeria has been slow, and riddled by inefficient public healthcare systems.

It is not uncommon to find HIV and Tuberculosis co-infecting the same patient, as HIV suppresses the immune system, thereby giving room for opportunistic infections. Available data puts the incidence of HIV in Nigeria at 3.6%, translating to 3.3 million people. Also, the World Health Organization estimates approximately 830,000 people living with tuberculosis in Nigeria, with 20% of these population infected with HIV [10].

### 1.1 Rationale for the study

Tuberculosis and HIV represent major public health threats globally. The burden of tuberculosis as well as HIV in sub-Saharan Africa is enormous, posing grave challenges to healthcare systems. This study was designed to highlight the demographic patterns of tuberculosis within Ikenne local government, demonstrate the magnitude of Tuberculosis-HIV co-infection, and provide information that will be vital in developing beneficial strategies for the prevention and management of tuberculosis.

## 2. Material and method

The study was a retrospective and quantitative study on the incidence and prevalence of suspected pulmonary tuberculosis and human immune-deficiency virus co-infection among patients in the sub urban area of Ikenne Local government, Ogun state, south west of Nigeria. The study was a cross-sectional study, carried out on patients being managed for Tuberculosis at the Tuberculosis laboratory of the Babcock University Teaching Hospital, Ilishan-Remo, Ogun state, Nigeria. The study was carried out from December 2013 – June 2015. The community is located at longitude 6°52'N 3°43'E, with an estimated population of 120,000.

### 2.1 Study population

New cases of TB patients attending National Tuberculosis and Leprosy Control Programme (NTBLCP), within Ikenne local government constitute the study population. Patients who presented with chronic cough, weight loss, night sweats and low grade fever were recruited into the study. Three sputum samples were collected from each patient i.e. early morning, spot and early morning. These sputum samples were immediately sent to the laboratory alongside each patient's relevant biodata which include- age, gender, ethnic group and HIV status. All sputum samples were stained using Ziehl-Neelsen technique, while the slides were read in line with World Health Organization's guidelines for reading acid fast bacilli slides. The HIV status of each patient was determined using the serial World Health Organization (WHO) algorithm for HIV testing. The results obtained were statistically analyzed using Statistical Package for the Social Sciences (SPSS) software version 17.0 by IBM technologies.

## 3. Results

A total of 277 patients were recruited into the study. There was a preponderance of female participants as 61.7% (n=171) were females while 38.3% (n=106) were males as shown in table 1. The mean age of patients being managed for tuberculosis at the Babcock University Teaching Hospital was 35.2 years. All the samples sent to the laboratory for the diagnosis of tuberculosis were sputum. Yoruba tribe was the predominant ethnic group, accounting for 86%, while Hausa, Igbo and other minority tribes accounted for 2%, 8% and 4% of the study subjects respectively. There was a preponderance of young adults in the study as 59.2% (n=164) of the research subjects were below the age of 40 while 40.8% (n=113) of the research subjects were above the age of 40.

Positive Acid Fast Bacilli was observed in 21.7% (n=60) of the study subjects while 78.3% (n=217) of the subjects showed no acid fast bacilli when their sputum samples were examined microscopically as shown in table 2 and 3.

It was also observed that out of the 60 positive cases for tuberculosis, 33.3% (n=20) tested positive to HIV, while 66.7% (n=40) tested negative for HIV. Most of the positive research subjects, who tested positive to both tuberculosis and HIV, fell within the 21-30 years age range as demonstrated in table 5. Table 5 shows a preponderance of females testing positive to both HIV and tuberculosis 75% (n=15), while 25% (n=5) of the research subjects who tested positive to both disease conditions were males.

69.3% (n=192) of the research subjects tested negative for HIV and tuberculosis, while the HIV results for 23.5% (n=65) were unavailable. In addition, 61.7 % (n=37) of the positive patients showed clinical improvement whereas, in 38.3% (n=23) of the patients, there was no clinical improvement after two months of treatment.

**Table 1: Age and Gender Distribution of new cases for pulmonary TB**

Distribution				
Age group (years)	Male	Female	Total	Percentage (%)
0 – 10	01	03	04	1.4
11- 20	11	16	27	9.7
21 – 30	17	38	55	19.9
31 – 40	30	48	78	28.2
>40	47	66	113	40.8
<b>Total</b>	<b>106</b>	<b>171</b>	<b>277</b>	<b>100</b>

**Table 2: Age and Gender Distribution of new cases positive for pulmonary TB**

Distribution				
Age group (years)	Male	Female	Total	Percentage (%)
0 – 10	0	1	1	1.7
11- 20	3	4	7	11.7
21 – 30	5	12	17	28.3
31 – 40	8	8	16	26.7
>40	9	10	19	31.7
<b>Total</b>	<b>25</b>	<b>35</b>	<b>60</b>	<b>100</b>

**Table 3: Age and Gender Distribution of new cases negative for pulmonary TB**

Distribution				
Age group (years)	Male	Female	Total	Percentage (%)
0 – 10	01	02	03	1.4
11- 20	08	12	20	9.2
21 – 30	12	26	38	17.5
31 – 40	22	40	62	28.6
>40	38	56	94	43.3
<b>Total</b>	<b>81 (37.3%)</b>	<b>136 (62.7%)</b>	<b>217</b>	<b>100</b>

**Table 4: Relationship of tuberculosis to variables**

Variable	Frequency (n)	Percentage (%)
<b>AFB seen</b>	Yes	60
	No	217
	<b>Total</b>	<b>277</b>
<b>Age category</b>	<40	164
	>40	113
	<b>Total</b>	<b>277</b>
<b>HIV status</b>	Negative	192
	Not available	65
	Positive	20
	<b>Total</b>	<b>277</b>
<b>Clinical improvement</b>	No	23
	Yes	37
	<b>Total</b>	<b>60</b>

**Table 5: HIV-TB Co-infection table**

Age groups (years)	Males	Females	Total	Percentage (%)
0-10	0	0	00	(0%)
11-20	1	1	02	(10%)
21-30	1	7	08	(40%)
31-40	2	2	04	(20%)
>40	1	5	06	(30%)
<b>Total</b>	<b>5</b>	<b>15</b>	<b>20</b>	<b>(100%)</b>

**Sample type:** sputum

**% Positivity rate**

$$\frac{\text{Total number of patients positive for Acid =Fast Bacilli (microscopy) x 100}}{\text{Total number of patients screened}}$$

$$\frac{60 \times 100}{277} = 21.7\%$$

**% Negativity rate**

$$\frac{\text{Total number of patients negative for Acid = Fast Bacilli (microscopy) x 100}}{\text{Total number of patients screened}}$$

$$\frac{217 \times 100}{277} = 78.3\%$$

**% Incidence rate of PTB and HIV co-infection=**

$$\frac{\text{Total number of patients positive for both HIV and Acid Fast Bacilli microscopy x 100}}{\text{Total number of patients screened}}$$

$$\frac{20 \times 100}{277} = 7.22\%$$

#### 4. Discussion

Tuberculosis (TB) and Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) remain the main burden of infectious diseases and cause of death emanating from infectious diseases in developing countries (World Health Organization, 2012). Despite enormous concerted efforts being made at eradicating both diseases, the incidence and prevalence of Tuberculosis and HIV in developing countries, such as Nigeria, remains worrisome while the cure rate is still low.

The study was designed to demonstrate the demographic patterns of tuberculosis and HIV co-infection in Ikenne local government, a sub-urban area in Ogun state, a South Western part of Nigeria. Findings from the study demonstrated a mean age of presentation with pulmonary Tuberculosis within Ikenne Local government of 35.2 years, most of the patients being females. This demonstrates the significant socio-economic burden associated with the synergistic effects of Tuberculosis and HIV co-infection, thus depriving countries of their able-bodied workforce in their productive and reproductive ages, and producing negative impacts on developing economies [11].

The findings of this study agrees with the report of Nwobu *et al*[12] in Edo state of Nigeria, with the preponderance of research subjects who tested positive for both HIV and tuberculosis being females. The differences in infection rate across both genders could be associated with biological factors such as increased susceptibility to infection, behavioural factors such as early exposure to sexual activity which is rampant due to economic circumstances and cultural factors [12].

The HIV-TB infection rate (7.22%) recorded in Ikenne local government of Nigeria slightly differs with reports by Idigbe *et al*[13], Onipede *et al*[14]and Okogun *et al*[15]. The study by Idigbe *et al*[13] reported 5.2% from Lagos state, while Onipede *et al*[14]reported 12.9% from Ile-Ife in Osun state and Okogun *et al*[15] reported a prevalence rate of 5.3% from Abeokuta and other environs of Ogun state. The difference in tuberculosis infection rates, over the years, may have been due to differences in public health awareness campaigns in Lagos which is an urban area, when compared to Ikenne Local Government.

The relatively low rate of clinical improvement reported in the study may be associated with poor adherence to treatment regimen by the patients. Poor adherence to therapy results in the emergence of multi-drug resistant strains of *Mycobacterium tuberculosis*, which further explains the low cure rate [16]. The sanitary and living conditions of the average Nigerian, characterized by the overcrowding in poorly-ventilated houses may also be responsible for the persistence of tuberculosis disease in our society.

The decline in death rates due to tuberculosis [17]demonstrates the importance of effective diagnosis, treatment as well as control of source of infection. The positive impact of concerted efforts by the World Health Organization and other donor agencies in reducing the global burden of tuberculosis has also played a huge role in the decline in the global burden and mortality rates arising from tuberculosis [16].

The findings of this study, which demonstrates a predominance of female patients among the research subjects testing positive to both tuberculosis and HIV, mirrors higher infection rates. These calls for renewed concerted efforts targeting females with aggressive education on prevention of HIV through the use of strategies such as female empowerment, safe sex as well as consistent use of condoms and contraceptives[18].

The demographics also establish higher rates of pulmonary tuberculosis among patients below the age of 40. This highlights the need for intervention

strategies targeted at youths in the near future, in an attempt to eradicate tuberculosis [18].

In addition, intervention strategies must target successful treatment in its attempt to reduce treatment failures to a barest minimum. Patients, who show no clinical improvement following treatment, harbor multi-drug resistant strains which are capable of posing a threat to their immediate environment [19].

Acid Fast Bacilli was also seen in one-fifth of the samples of patients recruited into this study. This demonstrates the need for more sensitive techniques such as the use of fluorescent microscopy and GeneXpert in the diagnosis of tuberculosis [20].

## 5. Conclusion

The incidence of tuberculosis remains worrisome, when compared to the concerted efforts of the World Health Organization and other donor organizations, yet there has been a decline in the mortality rates. The rate of clinical improvement still remains low. The co-existence of HIV and Tuberculosis remains a huge public health threat to health care systems, posing diagnostic and therapeutic challenges. The strategies aimed at effectively controlling both diseases have to be tailored to the affected populations, with measures targeted at identifying the sources of infection, preventing reactivation of infection, treatment of infected individuals and controlling the spread via public enlightenment. Ongoing surveillance activities, as well as, ability to translate the surveillance data to public health action is key to eradicating tuberculosis

## References

- [1] World Health Organization. Global Tuberculosis Report, 2012.
- [2] UNAIDS Global report on the global AIDS epidemic, 2013.
- [3] Venturini, E, Turkova A, Chiappini, E, Galli, L, De Martino, M, Thorne, C. Tuberculosis and HIV co-infection in children. *BioMed Central Infectious Diseases*2014;14(Suppl 1):S5
- [4] Pawlowski A., Jansson M, Skold M, Rottenberg, ME, Kallenius, G. Tuberculosis and HIV Co-Infection. *PLoS Pathog*2012; 8(2)
- [5] Selwyn PA, Hartel D, Lewis VA, Schoenbaum EE, Vermund SH *et al* A prospective study of the risk of tuberculosis among intravenous drug users with human immunodeficiency virus infection. *N Engl J Med* 1989; 320: 545-550
- [6] Getahun H, Gunneberg C, Granich R, Nunn P HIV-infection-associated tuberculosis: the

- epidemiology and the response. *Clin Infect Dis*2010; 50 (Suppl 3): S201-S207.
- [7] Swaminathan S, Ramachandran R, Baskaran G, Paramasivan CN, Ramanathan U, Venkatesan P, Prabhakar R, Datta M Risk of development of tuberculosis in HIV-infected patients. *Int J Tuberc Lung Dis* 2000; 4: 839-844
- [8] Kruk A, Bannister W, Podlekareva DN, Chentsova NP, Rakhmanova AG, Horban A, Domingo P, Mocroft A, Lundgren JD, Kirk O. EuroSIDA study group. Tuberculosis among HIV-positive patients across Europe: changes over time and risk factors. *AIDS*2011; 25: 1505-1513.
- [9] Marais BJ, Rabie H, Cotton MF. TB and HIV in children- advance in prevention and management. *PaediatrRespir Rev* 2011; 12:39-45
- [10] Dinic L, Akande P, Idigbe EO, Ani A, Onwujekwe D *et al.* Genetic determinants of drug resistant tuberculosis among HIV infected patients in Nigeria. *ASM*2012; 23:241-249
- [11] Onubogu CC, Nwokoye NN, Kunle-Ope CN, Raheem TY, Igbasi UT, Tochukwu *Net al.* Sensitivity of direct smear microscopy for the diagnosis of TB in high HIV prevalent population. *Scientific Research and Essays*2012; 7(5): 593-597.
- [12] Nwobu GO, Okodua MA, Tاتفeng YM. Comparative study of HIV associated pulmonary tuberculosis in chest clinics from two regions of Edo state, Nigeria. *Online J Health Allied Scs* 2004; 3:4.
- [13] Idigbe EO, Nasidi A, Anyiwo CE, Onubogu C, Alabi S, Okoye *et al.* Prevalence of Human Immunodeficiency Virus (HIV) antibodies in tuberculosis in Lagos, Nigeria. *J Trop Med Hyg*1994; 97(2): 91-97.
- [14] Onipede AO, Idigbe O, Ako-Nai AK, Omojola O, Oyelese AO, Aboderin AO *et al.* Seroprevalence of HIV antibodies in tuberculosis patients in Ile-Ife, Nigeria. *East Afr Med J*1999; 76(3): 127-132.
- [15] Okogun GRA, Okodua M, Tاتفeng YM, Nwobu GO, Isibor JO, Dare NW. Health point prevalence of pulmonary tuberculosis (PTB) associated human immunodeficiency virus (HIV) in western Nigeria. *Int J ExptHlth& Human Devpt.* 2002; 3(2):49-53
- [16] Ojizeh TI, Ogundipe OO, Adefosoye VA. A retrospective study on incidence of pulmonary tuberculosis and human deficiency virus co-infection among patients attending National Tuberculosis and Leprosy Control Programme, Owocentre. *The Pan African Medical Journal*2015; 20:345
- [17] World Health Organization. Global Tuberculosis Report, 2014
- [18] Shobowale EO, Elikwu CJ, Adegunle B. Tuberculosis and HIV co-infection in a tertiary hospital in south western Nigeria. *International Journal of Medical and Biomedical Sciences* 2015; 3(1):01-04.
- [19] Ibrahim LM, Hadeija SI, Nguku P, Dankoli R, Waziri NE. Factors associated with interruption of treatment of pulmonary tuberculosis patients in Plateau State, Nigeria. *Pan Afr Med J* 2014; 17:78.
- [20] World Health Organization. Global Tuberculosis Control, 2010.