



PREVALENCE OF HIV INFECTION AMONG TUBERCULOSIS (TB) PATIENTS IN A TB/HAART-HAART REFERRAL CENTRE IN NIGERIA

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ABSTRACT

The prevalence of HIV infection among TB patients in the TB/HAART-HAART Referral Centre of General Hospital Ugep, Yakurr Local Government Area of Cross River State, Nigeria from 2009 to 2010 was studied. Samples of blood were collected from 738 TB patients in 2009 and 377 TB patients in 2010, and their HIV status determined. Viral antibody detection was carried out using World Health Organization approved kits called “Chembio HIV 1/2 STAT-PAK assay” and “Determine HIV 1/2 test kits” which detects both HIV-1 and HIV-2. Out of 738 TB patients screened in 2009, 338 (45.80%) patients were HIV positive. Out of 377 TB patients screened in 2010, 105 (27.90%) were HIV positive. This gave a 17.90% decrease from 2009. The prevalence of co-infection was higher among females (32.52%) than males (13.28%) in 2009. Similar result was observed in 2010, with higher prevalence in females 21.22%, than males 6.63%. The co-infection was higher among those aged 21-30 years (70.00%) in 2009. In 2010, the prevalence was higher within the age range 31-40 (38.60%). HIV/TB co-infection was statistically significant ($p < 0.05$) with respect to gender and age. The results further underscore the need for routine screening of TB patients for HIV infection as required by World Health Organization.

Key words: HIV, Prevalence, Screening, Tuberculosis.

INTRODUCTION

Tuberculosis (TB) is reported to have existed in humans since ancient past and also as the most common expressive and infective respiratory disease that result from the inhalation of air droplets infected with the tubercle, *Mycobacterium tuberculosis* [1]. Over a century ago Robert Koch identified *Mycobacterium tuberculosis* as the causative agent of TB [2]. At the time, TB was rampant, causing one-seventh of all deaths in Europe and one-third of deaths among productive young adults. Today, TB remained a global health problem of enormous dimension. An estimated one-third of the world's population is infected with the bacterium, with the highest prevalence of the disease found in sub-Saharan Africa and Asia [1]. Nigeria has been noted to be among the leading countries affected by the scourge and even ranks 4th among the 22 countries that account for 80% of the worlds' TB cases [3].

Despite the technical advancement in tuberculosis research, improved environmental conditions especially in the developed countries and the discovery of effective treatment, the disease remain a health problem world-wide [4]. The emergence of multi-drug resistance TB is contributing to the worsening impact of the disease [5]. Also, reports show that close relationship exist between HIV/AIDS and TB [6]. Therefore, further spread of HIV infection among the population is resulting in dramatic increase in TB disease [7].

Acquired immune deficiency syndrome (AIDS) was the great pandemic of the second half of the twentieth century [2]. First described in 1981, AIDS is the result of an infection by the “Human immune deficiency virus (HIV), a linear, single-stranded, segmented, diploid, positive-

strand RNA virus within the family “Retroviridae” [2]. The emergency of human immunodeficiency virus (HIV) has facilitated the resurgence of *Mycobacterium tuberculosis* infection [8]. While HIV is the most powerful risk factor for the progression of *Mycobacterium tuberculosis* infection to TB disease, TB accelerates the progression of HIV infection to AIDS and shortens the survival of such patients [8, 9]. Among HIV infected persons, there is a high risk of progression to active tuberculosis once infection with *Mycobacterium tuberculosis* occurs [6]. Also, when TB patient become infected with HIV, they are more likely to progress faster to full-blown AIDS than are people without TB [10]. Hence, being infected with both HIV and *M. tuberculosis* is the world's leading cause of death due to infectious agents [11]. The World Health Organization estimates that about 8 million new cases of TB and nearly 2 million deaths from the disease occur each year [12]. According to Erhabor *et al.* [12], approximately 10 million people are estimated to be co-infected with TB and HIV, and over 90% of these individuals are from developing countries. It has been noted that HIV patients are highly vulnerable to TB because of their weakened immune system making TB their number one killer [13]. HIV/AIDS and TB infections are intricately linked to malnutrition, unemployment, poverty, drug abuse, alcoholism etc. [14].

However, reports on the prevalence of HIV infection among TB infected patients in Sub-Saharan Africa range from 24-67% [14]. In some parts of Nigeria, a prevalence of 6.1% was reported among those aged 20-40 years in Jos [15], 12.0% among TB patients in Ile-Ife [16], 10.8% in Irrua [17], 37.5% in Benin City [18], 4.2% in Oyo [19],

35.1% in Benue state [20], 10.5% and 14.9% among children and adults respectively in Sagamu [19], and 10.0% in Kano [21]. Surveillance of HIV among TB patients has been recognized as important as HIV infection continues to fuel TB epidemics [22].

In light of the above, this research is aimed at determining HIV infection prevalence rate among TB patients in TB/HAART-Referral Centre of General Hospital Ugep, Yakurr Local Government Area (L.G.A) of Cross River State, Nigeria.

MATERIALS AND METHODS

Study area

The study was carried out in Ugep, the Headquarters of Yakurr Local Government Area of Cross River State, Nigeria, from January 2009 to October 2010 among patients attending the TB/HAART-Referral Centre of General Hospital, Ugep, Yakurr L.G.A. of Cross River State, Nigeria.

Sample collection

One thousand, one hundred and fifteen (1,115) samples of sputum and blood were collected for this study within the stipulated period above. Each patient was made to produce about 10 ml early morning sample of sputum into a clean, sterile, wide-mouth container with fitting screw cap. They were stored at 4°C until ready for analysis. Also, samples of venous blood were obtained from each patient into ethylenediamine-tetra-acetic acid (EDTA) anti-coagulated tube and non anti-coagulated tubes. The non anti-coagulated tubes were centrifuged at 2000 revolution per minute (rpm) for 5 minutes to obtain serum for serological assay.

Human immunodeficiency virus detection

The Chembio HIV 1/2 STAT-PAK assay and 'determine' HIV-1/2 test strips approved by the World Health Organization were used for the HIV detection. The Chembio HIV 1/2 STAT-PAK assay is a single-use immunochromatographic, rapid screening test for the detection of antibodies to HIV types 1 and 2 (HIV 1/2) in whole blood, serum, or plasma specimens. It is intended for use as a point-of-care test to aid in the diagnosis of infection with HIV-1 and HIV-2. The 'determine' HIV 1/2 is also an *in vitro*, visually read, qualitative immunoassay for the detection of antibodies to HIV-1 and HIV-2 in human serum, plasma or whole blood. The test is intended as an aid to detect antibodies to HIV-1/HIV-2 from infected individuals.

Test procedure with stat-pak

The chembio HIV 1/2 STAT-PAK test device was removed from its pouch and placed on a flat surface and labeled with patients identification number. Using a precision pipette, 50 µl of sample was applied onto the centre of the SAMPLE (S) well of the device. The running buffer bottle was inverted and held vertically over the sample well and 3 drops (105 µl) of the buffer was added slowly, drop-wisely into the SAMPLE (S) well. The test result was read after 10 minutes of addition of the running buffer.

When the test is completed, a pink/purple line is seen in the CONTROL (C) area of the test device on non reactive (negative) as well as reactive (positive) samples. This control line serves as an internal control and gives

confirmation. Pink/purple line in both the TEST (T) and CONTROL (C) areas indicate a reactive (positive) sample. Pink/purple line in the control (C) area, with no line in the TEST (T) area indicates a non-reactive (negative) result. When there is no line in both CONTROL (C) and the TEST (T), it indicates invalid result. When the test line appears without the control line, the result is also invalid.

Test procedure with "Determine"

The Determine HIV 1/2 test kits were brought to room temperature and the protective foil cover removed from each test strip. Exactly 50 µl of sample was applied to the sample pad with a precision pipette. After 1 minute, one drop of chase buffer was applied to the sample pad and kept for about 15 minutes before the result is read.

When red bars appear in both control window (labeled "Control") and the patient window (labeled "Patient") of the strip, the result is interpreted as positive. When red bar appears in the control window of the strip (labeled "Control"), and no red bar appears in the patient window of the strip (labeled "Patient"), the result is interpreted as negative. When there is no red bar in the control window of the strip, and even if a red bar appears in the patient window of the strip, the result is invalid and the test is repeated.

Mycobacterium tuberculosis test

The samples of sputum were pre-treated with 4% sodium hydroxide, concentrated by centrifugation before making smears on the slides from the sediments. Each slide was heat-fixed and stained using the Ziehl-Neelsen's (ZN) technique [23].

Statistical analysis

The chi-squared test was employed as a statistical tool to determine the relationship between sex and age to HIV/TB co-infection. Probability values of < 0.05 ($P < 0.05$) were considered to be statistically significant.

RESULTS

2009 Result analysis

Out of 738 TB patients screened for HIV in 2009, 438 patients were females while 300 patients were males. The prevalence of HIV/TB co-infection was determined and expressed in percentage (Table 1).

The overall prevalence of HIV/TB co-infection in this population was 45.80%. In relation to gender, it was 32.52% and 13.28% among females and males respectively (Table 1). The prevalence of co-infection also varied with age of the patients. It was highest among TB patients aged 21-30 with a prevalence of 70%, followed by those aged 31-40, (50%). No case of co-infection was observed among those aged 0-10 years (Table 2). There was a statistically significant ($P < 0.05$) association between age and gender to HIV/TB co-infection in this study.

2010 Result analysis

Out of 377 TB patients screened for HIV, 270 patients were females and 107 patients were males. The prevalence of HIV/TB co-infection was determined and expressed in percentage (Table 3).

The overall prevalence of co-infection of HIV/TB in this population was 27.90%. In relation to gender, it was 21.22% and 6.63% among females and males respectively (Table 3).

The prevalence of co-infection also varied with age of the patients. It was highest among TB patients aged 31-40 years (38.1%) followed by those aged 41-50 (33.3%), 21-30 years (28.6%), 51-60 years (17.5%) and the least was among those aged 61 years and above (9.4%). Those aged

0-10 years recorded no case of co-infection; hence, there is no prevalence in the age group (Table 4). There was a statistically significant ($P < 0.05$) relationship between age and HIV infection among TB patients in this study.

TABLE 1: Prevalence of HIV infection among TB patients in relation to gender in 2009

Gender	Number screened	Number positive	Prevalence (%)
Feme	438	240	32.52
Male	300	98	13.28
Total	738	338	45.80

TABLE 2: Prevalence of HIV infection among TB patients in relation to age in 2009

Age group (Years)	Number screened	Number positive	Prevalence (%)
0 – 10	8	0	0.00
11 – 20	50	10	20.00
21 – 30	200	140	70.00
31 – 40	240	120	50.00
41 – 50	130	40	30.80
51 – 60	70	16	22.90
61 >	40	12	30.00
Total	738	338	45.80

TABLE 3: Prevalence of HIV infection among TB patients in relation to gender in 2010

Gender	Number screened	Number Positive	Prevalence (%)
Female	270	80	21.22
Male	107	25	6.63
Total	377	105	27.90

TABLE 4: Prevalence of HIV infection among TB patients in relation to age in 2010

Age group (Years)	Number screened	Number positive	Prevalence (%)
0 – 10	10	0	0.00
11 – 20	30	5	16.70
21 – 30	70	20	28.60
31 – 40	105	40	38.10
41 – 50	90	30	33.30
51 – 60	40	7	17.50
61 >	32	3	9.40
Total	377	105	27.90

DISCUSSION

These studies showed overall HIV/TB co-infection prevalence of 45.80% and 27.90% among TB patients attending the TB/HAART-HAART Referral Centre of General Hospital, Ugep, Yakurr L.G.A. of Cross River State in 2009 and 2010 respectively. The prevalence rate recorded in this study in 2009 is the highest that has been reported for such studies in Nigeria.

Available statistics have shown rates of HIV infection prevalence among active TB patients to vary considerably depending on the population and region studied. In Nigeria, reports on HIV/TB prevalence ranged from 6.1% reported among those aged 20-40 years in Jos [15], 12.0% among TB patients in Ile-Ife [16], 10.8% in Irrua [17], 37.5% in Benin city [18], 4.2% in Oyo [19], 35.1% in Benue state [20], 10.5% and 14.9% among children and adults respectively in Sagamu [19], 10.0% in Kano [21] and 41.2% among TB patients in northern Nigeria [13]. However, the latter is similar to our finding for 2009, while that of Erhabor *et al.*[12] who reported HIV

prevalence of 30 (25%) among 120 TB patients in Port Harcourt is similar to our finding in 2010.

Results from this study correlates well with a study in Tanzania where 44.1% prevalence was reported [24], although it is higher when compared to reports from other parts of the globe. For example, 0.4%-20.1% was reported in India [14, 25], 28.2% in Guyana [26], 9.9% in Cambodia [27], whereas the 30.0% prevalence in Trinidad and Tobago [28] is similar to our 2010 report.

Recent reports on the prevalence of HIV/TB co-infection worldwide indicates that developed nations are recording a gradual decline in HIV/TB incidence as opposed to developing nations. For example, Erhabor *et al.* [12] reported HIV prevalence of 30 (25%) among 120 TB patients in Port Harcourt, our study recorded HIV prevalence of 45% in 2009 and 27.7% in 2010 among 738 and 377 TB patients respectively. In China (one of the countries with a high TB burden), Wang *et al.* [29] reported a very low prevalence of 0.5% (12 of 2300). This observation is of concern considering the number of TB patients screened in each case. This gap may not be

unconnected to factors such as poverty and lack of education on the side of patients, poor aggressive public awareness on the dangers of HIV infection. The fight against HIV/AIDS should be seen as a collective responsibility by the government and the individual. This could lead to large-scale implementation of public health strategy to jointly address HIV/TB co-infection [30].

There was a statistically higher prevalence of HIV/TB co-infection ($P < 0.05$) among females than males. This is related to the higher incidence of HIV infection usually found in females [7, 12, 13], which predisposed them to TB as the former is known to activate dormant TB infection [14]. Also, women have a higher susceptibility to HIV infection being exposed to sexual activities earlier than men for economic circumstance [31]. Biological, cultural and socio-economic factors contribute to women's vulnerability to HIV/AIDS. The vagina's large surface area of susceptible tissue and micro trauma during intercourse makes women four times at risk of contracting HIV during unprotected sexual intercourse than males [12]. Furthermore, most African woman are so subordinated to their husbands that they have little or no say in issues related to sexual relationships [17]. This study was carried out in an area where polygamy and sexual promiscuity thrive. It is therefore possible for one male to be the source of infection to several females.

The preponderance of HIV/TB co-infection among patients aged 21-40 years observed in this study for the both years is similar to other reports [8, 15, 20, 27]. This is a sexually active age group in which TB and HIV prevail most [13]. However, there was a reduction in prevalence of HIV/TB co-infection in 2010 result when compared to the 2009 result. This may be due to higher number of patients in 2009 than 2010. Also, it may be due to somewhat governments' intervention in creating awareness and management of HIV/TB co-infection.

The high rate of HIV/TB co-infection observed in this study is of great concern both in terms of patient management and public health prospective. It also underscores the need for routine HIV serology on all TB patients so as to reduce the synergistic effect of the co-infection.

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