ORIGINAL ARTICLE

AFRICAN JOURNAL OF CLINICAL AND EXPERIMENTAL MICROBIOLOGY SEPTEMBER 2015 ISBN 1595-689X VOL16 No.3
AJCEM/1519 http://www.ajol.info/journals/ajcem

AFR. J. CLN. EXPER. MICROBIOL. 16(3): 111-118 http://dx.doi.org/10.4314/ajcem.v16i3.5

PREVALENCE OF HIV/SPUTUM AFB POSITIVITY AMONG PATIENTS ATTENDING UNIVERSITY OF BENIN TEACHING HOSPITAL (UBTH), BENIN CITY, NIGERIA.

***Iyoha O[1], Osarogiagbon WO[2]**

[1]Department of Medical Microbiology, University of Benin, Benin City, Nigeria

[2]Department of Child Health, University of Benin, Benin City, Nigeria

***Correspondence: Dr. Iyoha Osaretin, Department of Medical Microbiology, University of Benin, Benin City, Nigeria**

Tel: +2348023352188, Email: osaretin.iyoha@uniben.edu.

ABSTACT

Human Immunodeficiency Virus (HIV) and Tuberculosis(TB) have synergistic interactions that speedily accelerate decline of the host's immune system and accentuate the progression of each other. Eight hundred and ninety five patients referred from different units of University of Benin Teaching Hospital, Nigeria were screened for antibodies to HIV-1 and HIV-2 using ELISA and sputum microscopy for acid-fast bacilli. The result showed that, 92(10.3%) were HIV positive with females 68(14.2%) higher than males 24(5.8%) though not statistically significant (p=0.066), 123(13.7%) patients were AFB positive, with males 75(18.1%) significantly higher than females 48(10%) (p=0.046) and 14(1.6%) patients were co-infected. Although the co-infection rate was higher among females 9(1.9%) than males 5(1.2%), there was no significant difference (p=0.450). The age group 40-49 and 50-59 had the highest TB/HIV co-infection (2.5% each).Regular screening for TB in HIV patients and HIV in TB patients would demonstrate the true burden of TB disease amongst HIV infected patients.

Key words: prevalence, TB, HIV, co-infection, Nigeria.

LA PREVALENCE DE LA POSITIVITE DU VIH/EXPECTORATIONS AFB CHEZ LES PATIENTS QUI FREQUENT L'UNIVERSITE HOPITAL D'ENSEIGNEMENT DE BENIN (UBTH), BENIN CITY, NIGERIA.

Dr. Iyoha O.[1], Dr.Osarogiagbon , WO[2]

[1]Departement de la Microbiologie Médicale, l'Universite de Benin, Benin City, Nigeria.

[2]Departement de la Sante d'enfant, l'Universite de Benin, Benin City, Nigeria.

***Correspondance : Dr. Iyoha Osaretin, Département de la Microbiologie Médicale, l'Université de Benin, Benin City, Nigeria.**
Tel :+2348023352188, Email : osaretin.iyoha@uniben.edu

RESUME

Le virus de l'immunodéficience humaine(VIH) et la tuberculose (TB) ont des interactions synergiques qui rapidement accélèrent le déclin du système immunitaire de l'hôte et accentuent la progression de l'un l'autre. Huit cent quatre – vingt quinze patients des différentes unités de l'université hôpital d'enseignement de Benin, Nigeria, ont été criblés pour les anticorps a VIH – 1 et VIH – 2 en utilisant ELISA microscopique des expectorations pour les bacilles acide – Résistant. Le résultat a montrée que 92 (10,3%) étaient séropositifs avec des femelles 68(14,2%) plus élevé que les males 24(5,8%), mais pas statiquement significatif, (p=0,066), 123(13,7%) patients étaient AFB positif, avec les males 75(18,1%) significativement plus élevés que les femelles 48 (10%) (p=0,046) et 14 (1,6%) patients ont été Co – infectés. Bien que le taux de la Co – infection était plus élevé parmi les femelles 9(1,9%) que les males 5 (1,2%), il n y avait pas de différence significative (p=0,450). Le groupe d'âges 40 – 49 et 50 – 59 avait la plus forte Co - infection de TB/HIV (2,5%). Le dépistage régulier de la tuberculose chez les patients VIH et VIH chez les patients tuberculeux démontrerait le véritable fardeau de la maladie de la tuberculose chez les patients infectés par le VIH.

Mots Clés : Prevalence, Tuberculose, VIH, Co – infection, Nigeria.

INTRODUCTION

Data from World Health Organization (WHO) shows that tuberculosis is the most common cause of death from infectious diseases, causing more death than HIV and malaria combined; with Africa harboring about 29% of those infected. Nigeria is one of the countries in sub-Saharan Africa noted to be saddled with a high prevalence of the disease [1]. It is known

to have the highest burden of tuberculosis infection in Africa (311 per 100,000, about 0.31% of the population) [2]. The prevalence of HIV infection in Nigeria is high; approximately 3.6% of the population (about 3 million people) is known to be living with HIV infection [2]. The country has the second largest number of people living with HIV-AIDS and accounts for 10% of the global HIV burden with approximately 215,000 HIV-AIDS related death in 2010 [2]. HIV infection is the single most important factor for the resurgence of TB globally and the major reason for failure to achieve set TB control targets especially in areas with high prevalence [3].

HIV and TB have synergistic interactions that speedily accelerate the decline of the host immune system, accentuating the progression of each other [4]. In the individual patient, HIV infection weakens the immune system and increases the susceptibility to TB. HIV increases the likelihood of reactivation, re-infection and progression of latent TB infection to active disease. It also alters the clinical presentation of TB, complicates the follow up and compromises the response to anti-TB treatment [5].

There were an estimated 1.1 million TB/HIV co-infected patients worldwide in 2011; 79% of these cases were in the African Region [6]. This is due to the high incidence of HIV in this region. HIV and TB are the two leading causes of death and continued to be a serious problem in developing countries [7]. People living with HIV/AIDS (PLWHA) have an exquisite vulnerability to TB and are 30-50 times more likely to progress to active TB, while the likelihood of progressing to full blown AIDS increases by 100 folds in HIV/TB co infected patients [8]. HIV/TB co-infection presently poses serious and major public health challenges especially in the African region, especially Nigeria. With a population of 162 million people, Nigeria is one of five countries with high TB/HIV burdens contributing 60% of the global HIV-associated TB in 2011 [6]. In Nigeria the prevalence of HIV among TB patients increased from 2.2% in 1991 to 19.1% in 2001 and 25% in 2010, indicating that the TB situation in the country is HIV-driven [9]. The need to define optimal timing of antiretroviral therapy during TB treatment and to find better alternatives to current drug regimens has been reasonably answered in Camelia, Sapit trials [10] . To mitigate the dual burden of TB/HIV in populations at risk of or affected by both diseases, the World Health Organization (WHO) published a document on priority research questions in 2010 [11], and an updated policy on collaborative TB/HIV activities in 2012 [6], which emphasize the importance of surveillance of HIV among TB patients and surveillance of active TB patients among people living with HIV in all countries.

In Benin City, Edo state, Nigeria, there is sketchy literature on prevalence of HIV and TB co-infection and associated risk factors. This study was carried out to determine the prevalence of HIV and TB co-infection among patients attending University of Benin Teaching Hospital, Benin City, South-southern Nigeria.

MATERIALS AND METHODS

Study design

This was a prospective cross sectional study carried out between January, 2014 and December, 2014 in which subjects referred from Accident & Emergency unit , Children Emergency unit, Outpatient clinics, Wards and TB centers to Medical Microbiology laboratory for sputum AFB examination and HIV testing were recruited for this study after obtaining inform consent

Study area

The study was conducted at the University of Benin Teaching Hospital, Benin City, Nigeria. The institution is located in the heart of Edo state and serves as a referral centre to other neighbouring health institutions in Western and South-South regions of Nigeria. The facility also serves as a regional center for TB and HIV control programmes in Nigeria.

Collection of samples

Sputum samples were collected based on the conventional method of on the spot day one, early morning and on the spot on day two or 3 (first) early morning specimens obtained after a deep, productive cough on consecutive days using clean transparent wide-mouthed sputum cups. Specimens were brought to the Medical Microbiology laboratory on the day of collection.

Sputum analysis for AFB

The sputum samples were handled in a class I safety cabinet. Sputa accepted were purulent, opaque or greenish in appearance with less than 10 epithelial cells/1 pf on Gram staining. Smears were made on grease free clean frosted slides, air-dried, heat-fixed and stained according to the standard operating procedure for the hot Ziehl Neelsen technique [12]. Smears were examined microscopically for acid fast bacilli (AFB) using oil immersion objective lenses and results were recorded appropriately.

HIV Screening

Blood samples were obtained by vene-puncture and centrifuged, and the sera obtained were screened for

antibodies to HIV-1 and HIV-2 using approved ELISA kits (Alere Determine™ and Double Check Gold™) (Alere industries, Japan), according to the manufacturer's instructions. Samples that tested positive were confirmed by Western blot.

Ethical Approval

Ethical approval was obtained from the Ethics Review Board of UBTH and informed consent was obtained from all study subjects.

Data analysis

The prevalence of HIV, TB and their co- infection was calculated. The data generated was subjected to non-parametric Mann-Whitney statistics and chi-square to determine any significant relationship between infection rate, age and gender. All statistical analyses were carried out using SPSS computer software version 16.0 for Windows. Significant and non-significant difference was determined at $p \leq 0.05$ and $p > 0.05$ respectively.

Inclusion and Exclusion Criteria
Newly diagnosed subjects who gave informed consent and provided sputum and blood for AFB test and HIV screening respectively were included, while those who decline to give consent or were unable to produce sputum were excluded from the study. Also, subjects who had already been diagnosed with TB and HIV and were already on therapy were excluded from the study.

TABLE 1: REFERRAL DISTRIBUTION OF PATIENTS FOR HIV AND AFB TEST FROM DIFFERENT UNITS

S/N	Referred from	Frequency	Percentage
1	A/E	87	9.7
2	CHER	66	7.4
3	CLINIC	289	32.3
4	DOT	285	31.8
5	WARD	168	18.8
	TOTAL	895	100

Key: A/E= accident and emergency, DOT= direct observed therapy, CHER = children emergency

LIMITATIONS OF THE STUDY
The selection of patients from a single center poses a major limitation for the applicability and generalization of the findings. The finding is also limited because participation was voluntary. The analysis was only restricted to smear-positive tuberculosis cases which is not enough to accurately diagnosed Mycobacterium tuberculosis. However, we believe that these not invalidate the study.

RESULTS
Eight hundred and ninety five (895) patients were included in this study. Most of these patients were referred from the outpatient clinic (32.3%) and TB centers (31.8%), while 18.8%, 9.75 and 7.4% were referred from the wards, Accident and emergency and children emergency center respectively (Table 1). The result in Table 2 showed that, of the total populations, 415(46.4%) were males while 480(53.6%) were females, with a male: female ratio of 0.87:1. Ninety-two patients (10.3%) were HIV positive with females 68(14.2%) showing a higher prevalence rate than males 24(5.8%) but with no statistical difference ($p=0.066$). The results further showed that 123(13.7%) patients are AFB positive with males 75(18.1%) showing significantly higher prevalence rate than females 48(10%) ($p=0.046$). The result of the co-infection rate among these populations showed that 14(1.6%) patients were co-infected with both AFB and HIV. Although the co-infection rate was higher in females 9(1.9%), the result however, showed no statistically significant difference ($p=0.450$).

TABLE 2: SEX DISTRIBUTION OF HIV, AFB AND AFB/HIV CO-INFECTION

Sex	No. Tested	HIV+	AFB +	HIV/AFB co-infection
Male	415	24 (5.8)	75 (18.1)	5 (1.2)
Female	480	68 (14.2)	48 (10)	9 (1.9)
Total	895	92 (10.3)	123 (13.7)	14 (1.6)

Age distribution of patients in this study is presented in Table 3. The age group with the highest HIV infection rate was 30-39 years (17.8%), with females (21.2%) having higher prevalence rate than males (13%) (Table 4). Also, TB infection is much more prevalent in the age group 30-39 years (17.8 %), with males (24%) having higher prevalence rate than females (12.4%). The age groups 40-49 years and 50-59 years had the highest TB/HIV co-infection (2.5% each) (Table 4).

TABLE 3: AGE DISTRIBUTION OF HIV, AFB AND AFB/HIV CO-INFECTION

Age distribution	No. Tested	Sex		No. of HIV positive(%)	No. of AFB positive(%)	AFB/HIV Co-infection
		Male	Female			
0-9	18(2.0)	10	8	0 (0)	1(5.6)	0(0)
10-19	63(7.0)	37	26	3(4.8)	8(12.7)	1(1.6)
20-29	167(18.7)	77	90	15(8.9)	25(14.9)	1(0.6)
30-39	213(23.8)	100	113	37(17.4)	38(17.8)	3(1.4)
40-49	118(13.2)	53	65	14(11.9)	13(11.0)	3(2.5)
50-59	120(13.4)	50	70	13(10.8)	16(13.3)	3(2.5)
60-69	118(13.2)	57	61	6(5.1)	15(12.7)	2(1.7)
70 and above	78(8.7)	31	47	4(5.1)	7(8.9)	1(1.3)
Total	895(100)	415(46.4)	480(53.6)	92 (10.3)	123(13.7)	14 (1.6)

TABLE 4: AGE AND SEX DISTRIBUTIONS OF HIV, AFB AND AFB/HIV CO-INFECTION

Age distribution	No. Tested (%)		HIV positive (%)		AFB positive (%)		AFB/HIV Co-infection (%)	
	Male	Female	Male	Female	Male	Female	Male	Female
0-9	10(55.6)	8(44.4)	0(0)	0(0)	0(0)	1(12.5)	0(0)	0(0)
10-19	37(58.7)	26(41.3)	1(2.7)	2(7.7)	4(10.8)	4(15.4)	1(2.7)	0(0)
20-29	77(46.1)	90(53.9)	2(2.6)	13(14.4)	15(19.5)	10(11.1)	0(0)	1(1.1)
30-39	100(46.9)	113(53.1)	13(13)	24(21.2)	24(24)	14(12.4)	2(2)	1(0.9)
40-49	53(44.9)	65(55.1)	2(3.8)	12(18.5)	8(15.1)	5(7.7)	0(0)	3(4.6)
50-59	50(41.7)	70(58.3)	1(2)	12(17.1)	10(20)	6(8.6)	1(2)	2(2.9)
60-69	57(48.3)	61(51.7)	3(5.3)	3(4.9)	9(15.8)	6(9.8)	1(1.8)	1(1.6)
70 and above	31(39.7)	47(60.3)	2(6.5)	2(4.3)	5(16.1)	2(4.3)	0(0)	1(2.1)
Total	415(46.4)	480(53.6)	24(5.8)	68(14.2)	75(18.1)	48(10)	5(1.2)	9(1.9)

DISCUSSIONS

The results of this study showed that more females (53.6%) were screened for both HIV and TB compared with males (46.4%). This is in agreement with a similar study earlier reported from Nnewi, Nigeria [4]. Another similar study in the Niger-Delta region of Nigeria revealed that females (64%) participated more in the study than their male (36%) counterpart [13]. Naturally, females tend to seek medical attention much earlier than males who in keeping with their stronger-sex and bread winner tendencies would not go to hospital until later during the course of their illness[4].

A non-significant rate of HIV infection was found to be higher among females (14.2%) than males (5.8%), a finding contrary to that from Gombe, Nigeria[14] where males had a higher prevalence. This rising trend in female HIV prevalence is not unexpected due to the fact that the penile-vaginal transmission by an infected individual in a single sexual exposure is as low as one in 1000 from woman to man and as high as one in 300 from man to woman [15]. In addition, early exposure to sexual activities, the poor economic status and the pressure on women to provide for their families as well as the lack of ability to negotiate safer sex [16, 17, and 18] might have contributed to the increase in the risk of HIV acquisition among women. A relative reason for the disparity could be the high health-seeking behavior of women. Furthermore, the age group with the highest HIV infection is 30-39 (17.8%). This is consistent with previous report in Nigeria [18 and 19]. Individuals in this age group make up a greater proportion of the workforce in the country thus the impact of HIV/TB co-infection on the economy of the country will certainly become over- whelming if not controlled with appropriate intervention measures such as provision of effective prevention education and early detection and treatment of both infections [18]. However, other report showed that the pattern of HIV infection in the general population is highest among individuals in the age group 20-29 [20]. The result of this study also showed that none of the subjects tested among age group 0-9 is HIV positive. This might be due to the fact that this age group are less vunerable to risk factors for HIV infections . The age group 10-19 (4.8%) has the lowest HIV infection rate among the studied population. This is consistent with earlier report [18] and with previous national data [21] and may indicate less HIV associated acquisition of TB in this age group.

This study showed that TB infection is correlated with gender, with males (18.1%) showing significant higher prevalence rate than females (10%) (p=0.046). Contrary to the findings of this study, Onubogu et al. [22] reported that TB infection rate was statistically higher in females than in males. According to them, the differences in the infection rate in females and males could be as a result of biological factors such as higher susceptibility to infection due to low immunity in women. However, this finding is in agreement with

previous studies [23, 24 and 25] which reported that TB infection was more in males than females. Obiora et al. [26] also reported higher TB infection rates among males in Benin and Irrua, Nigeria. Nnorom et al. [27] reported higher TB infection rates for TB among males in urban and rural communities in Nigeria. The reason for the gender difference in prevalence of TB and HIV is not known from our study. However, it seems probable that a combination of different factors such as biological differences in disease and disease presentation, together with gender related factors like access to health care may play a role. Biological and immunological factors might be contributory as to why evidence which suggest that men may have more infectious TB (smear-positive pulmonary TB) than women [28]. A theory that is often presented as an explanation to the gender differences is that men in general have a wider social network that leads to a greater exposure to the tubercle bacillus. A population study [29] among people with a cough for more than 3 weeks reported that although women did not start seeking health care later than men, they often sought health care from less qualified providers, took more health care actions, and had longer delay to hospital than men. In a study on TB patients by Matsushita et al. [30], in Japan, they observed that the stage and the extent of lung lesions are less advanced among female TB patients. So the prevalence of cough and sputum expectoration among female TB patients was significantly less common than among male patients. In many low-income countries, women often have a lower social position and poorer access to economic resources, education, and information than men. These gender differences influence both health risks among women and care-seeking behaviour [31]. Although our study showed that age group is not a risk factor with regard to TB infection, however, the age group 30-39 (17.8%) are more predisposed to TB infection. This is contrary to previous reports from Nigeria [32] and Turkey [33], but is consistent with a previous study reported from Tanzania [34].

The result of the co-infection rate among these populations showed that 14(1.6%) patients are co-infected with both TB and HIV. The HIV-TB co infection rate of 1.6% obtained in this study could be comparable to 1.42% reported from a tertiary care hospital in Nnewi, Nigeria [4] and 1.23% obtained in a rural tertiary care hospital in Punjab [35]. However, it was quite lower than those obtained from other states of Nigeria where rates ranging from 4.39% to 41.2% have been documented [17, 19, 22, 36-42]. Co-infection rates could vary between study populations and regions, probably due to differences in prominent occupation and other socio-economic factors [43] and differences in study designs [36]. The low prevalence of TB-HIV co-infection as observed in this study may not be unconnected with the increased awareness of HIV infection and increase in the number of free treatment centres, provided by the Government and NGO's in the country. It might also be due to the fact that all the subjects involved in this study are ignorant of their HIV or TB status until confirmed in the laboratory. Although the co-infection rate was higher in females 9(1.9%) than in males 5(1.2%), the result however, showed no statistically significant difference (p=0.450). This observation is in agreement with previous studies that reported 6.85% TB-HIV co-infection in females and 4.95% prevalence rate in males [37]. Contrary to the findings of this study, previous report showed that TB and HIV co-infection rate was also higher among females than males but the difference was statistically significant ([44, 22]. Difference in co-infection rate in males and females could be as a result of early exposure of females to sexual activity due to their economically disadvantaged position, high susceptibility to infection [45], delay in care seeking due to stigma associated with HIV infection [46]; less access to fund for transportation and personal health care [22], high incidence of HIV infection in females which predisposes them to TB as the former is known to activate dormant TB [47]. Other studies contrary to the findings of this study also revealed higher TB/HIV co-infection rates among males than females [48, 49]. This was attributed to the general attitude of males towards indiscriminate sex especially when they travel away from their families and visit sex tourist centres [48].

The rising cases of TB/HIV co-infection no doubt impacts negatively on AIDS and TB control programmes in many ways, this includes increased caseload of active TB attributable to HIV, HIV-related morbidity and mortality in TB patients, higher default rates and low cure rates, high rate of adverse drug reactions, increased risk of TB transmission and delay of access to health services for TB suspects due to the stigma of HIV/AIDS [50].

CONCLUSION

There are genders and age differences in the HIV prevalence and HIV-TB co infection rates among the study subjects. However, the study also demonstrates that gender rather than age group is a risk factor for TB infection with males' preponderance. Therefore it is strongly recommended that Patients with newly diagnosed TB should be tested for HIV infection and patients with newly diagnosed HIV be tested for TB infection.

CONTRIBUTION BY AUTHORS

The study was conceptualized, data was collated and manuscript written by both authors.

REFERENCE

1. World health science tuberculosis worldwide statistics and infectious rate. http://www.worldhealthsciences.com/tuberculosis tb.html
2. Egah TE, Okoli CU. Tuberculosis in Jos Nigeria: A 9 year Review of Laboratory Report at Jos University Teaching Hospital (JUTH). Nigeria Med Pract. 2004; 46: 36-46
3. United States Agency for International Development (USAIDS 2012) .Infectious Disease: TB/HIV, MDR-TB, and other Challenges.
4. Glynn JR. Resurgence of Tuberculosis and the impact of HIV infection. British Medical Bulletin, 1998; 54(3): 579-593.
5. Okonkwo RC, Anyabolu AE, Ifeanyichukwu M, Kalu SO, Onwunzo MC, Chukwuka C. Prevalence of HIV Infection in Pulmonary Tuberculosis Suspects; Assessing the Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria. Advances in Life Science and Technology, 2013; 14: 87-91.
6. MacDougall DS: TB & HIV: the deadly intersection. J. Int. Assoc. Physicians AIDS Care 1999, 5(5):20-27.
7. WHO (2012) WHO policy on collaborative TB/HIV activities: guidelines for national programmes and other stakeholders. Geneva: WHO Press 2012.
8. Baltussen R, Dye C, Floyd K. Cost effectiveness analysis of strategies for tuberculosis control in developing countries, 2005; Brit. Med. J. 10: 1136.
9. De Cock Kevin. CMA's Career Center for Physicians. Canadian Medical Association Journal. HIV/TB Co-infection Rising, 2006; 175(7): 725.
10. United States Embassy Nigeria. Nigeria Tuberculosis Fact Sheet, 2012. http://nigeria.usembassy.org.
11. WHO. TDR for research on disease of poverty. Unicef-undp-world bank. 2011. WHO: http://apps,who.int/tdr/svc/research/evidence-treatment-tb.
12. WHO TB/HIV Working Group. Priority research questions for TB: HIV in HIV-prevalent and resource-limited settings. Geneva: WHO Press. 2010.
13. Cheesebrough M. District Laboratory Practice in Tropical Countries, part 1. University Press, Cambridge, 2006; 239-258.
14. Nwabuko CO, Ejele OA, Chuku A, Nnonli MA, Chuhwunonye II. Prevalence of Tuberculosis-HIV Co-infection and relationship between Tuberculosis and CD4+ Count/ESR in HIV patients in Niger Delta Region of Nigeria. IOSR Journals of Dent. and Med. 2012; Sci; 2(4): 01-04.
15. Njepuome N, and Odume B . The impact of HIV syndromes on the treatment of TB cases in Gombe State, Nigeria. Mera: African Journal of Respiratory Medicine, 2009; 16-20.
16. Isiramen CO. Women in Nigeria: Religion, Culture and AIDS, International Humanist News and Ethical Union, 2003. http://iheu.org/content/women-nigeria-religion-culture-and-aids
17. Jogunosimi T. The HIV/AIDS pandemic among youth in Sub-Saharan Africa. Advocates for Youths. 2001.
18. Iliyasu Z, Babashani M. Prevalence and Predictors of Tuberculosis Co-infection among HIV seropositive Patients Attending the Amino Kano Teaching Hospital, Northern Nigeria. Journal of epidemiology, 2009; (19): 81-87.
19. Odaibo GN, Okonkwo P, Lawal OM, Olaleye DO. HIV Infection among Newly Diagnosed TB Patients in Southwestern Nigeria: A Multi-DOTS Center Study. World Journal of AIDS, 2013, 3, 154-159.
20. Erhabor O, Jeremiah ZA, Adias AC, Okere CE. The Prevalence of Human Immunodeficiency Virus In- fection among TB Patients in Port Harcourt Nigeria, HIV/AIDS—Research and Palliative Care, 2010; 2:1-5.
21. FMOH, National HIV Sero-Prevalence Sentinel Survey among Pregnant Women Attending Antenatal Clinics in Nigeria, Technical Report, 2010:1-96.
22. Odaibo GN, Gboun MF, Ekanem EE, Gwarzo SN, Saliu I, Egbewunmi SA, et al. HIV Infection among Patients with PTB in Nigeria. African Journal of Medicine and Medical Sciences, 2006; 35:93-98.
23. Onubogu CC, Kunle-Ope CN, Onyejepu N, Nwokoye NN, Raheem TY, Igbasi UT, et al. Prevalence of tuberculosis and human immunodeficiency virus (TB/HIV) co-infections amongst patients with bronchopulmonary disorders in Lagos. African Journal of Microbiology Research. 2010; 4(18):1904-1908.
24. Mota P, Diogo N, Pina J. Multidrug-resistant tuberculosis in a tuberculosis unit–result of five years. Epidemiology of susceptible, resistant and multidrug-

resistant tuberculosis (MDR-TB), P2244. Monday, September 4th 2006.
25. Akpaka PE, Tulloch-Reid M, Justiz-Vaillant A, Smikle MF. Prevalence of human immunodeficiency virus infection in patients with pulmonary tuberculosis at the National Chest Hospital in Jamaica. Rev Panam Salud Publication, 2006; 19(1): 38–43.
26. Okonko IO, Soleye FA, Adeniji FO, Okerentugba PO. HIV and TB co-infection among patients on directly observed treatment of short course in Abeokuta, Ogun State, Nigeria.Nature and Science, 2012; 10(6):10-14.
27. Nwobu OG, Okodua MA, Tatfeng YM. Comparative Study Of HIV Associated Pulmonary Tuberculosis In Chest Clinics from two Regions Of Edo State, Nigeria. Online Journal of Health and Allied Sciences, 2004; 3: 4.
28. Nnorom JA, Esu-Williams E, Tilley-Gyado A. HIV, tuberculosis and syphilis in Nigeria: a descriptive study. International Conference on AIDS. Int Conf AIDS. 1996; Jul 7-12; 11: 138 .
29. Diwan K, Thorson A. Sex and Gender and Tuberculosis. Lancet, 1999; 353: 1000-1001.
30. Thorson A, Hoa NP, Long NH. Health-seeking behaviour of individuals with a cough for more than 3 weeks Lancet, 2000; 356:1823-24.
31. Matsushita Y, Ikeda N, Kurasawa T, Sato A, Nakatani K, Inoue T, et al. The characteristics of clinical features of pulmonary tuberculosis in female (in Japanese). Kekkaku 1996; 71: 391–398.
32. Paolisso M, Leslie J. Meeting the changing health needs of women in developing countries. Soc Sci Med. 1995; 40(1):55-65.
33. Ige OM, Sogaolu OM, Ogunlade OA. Pattern of presentation of tuberculosis and the hospital prevalence of tuberculosis and HIV co-infection in University College Hospital, Ibadan: a review of five years (1998-2002). African Journal of Medicine and Medical Sciences, 2005; 34:329-333.
34. Ilgazli A, Boyaci H, Basyigit I, Yildiz F. Extrapulmonary tuberculosis: clinical and epidemiologic spectrum of 636 cases. Archives of Medical Research, 2004; 35, 435-441.
35. Kamenju P, Aboud S. Tuberculosis-HIV co-infection among patients admitted at Muhimbili National Hospital in Dar es salaam, Tanzania. Tanzania Journal of Health Research, 2011; 13(1): 25-31.
36. Kaur P, Sharma P, Aqqarwal A. HIV positivity in TB suspects: an observational, non randomized study, Indian Journal of Tuberculosis, 2013; 60(1):59-60.
37. Pondei K, Ebidor Lawani E. Human immunodeficiency virus and pulmonary tuberculosis co-infection: Need for co-ordinated collaborative detection and treatment services. Journal of Medicine and Medical Sciences, 2013; 4(3):107-111.
38. Nwabuko CO, Ejele OA, Chuku A, Nnoli MA, Chukwuonye II. Prevalence of Tuberculosis-HIV Coinfection and Relationship between Tuberculosis and CD4/ESR in HIV Patients in Niger Delta Region of Nigeria. IOSR Journal of Dental and Medical Sciences (JDMS). 2012; 2(4): 01-04.
39. Okoh A, Omuemu V. Prevalence of HIV /AIDS and TB Co-infection among patients in Benin City, Nigeria. Geneva Health Forum 12. 2012.
40. Okoror LE, Esumeh FI, Umolu PI, Eraigbe R, Akpe HA, Obiazi F et al. Prevalence of HIV in Suspected Patients Attending Clinics in Benin City, Nigeria. The Open Tropical Medicine Journal, 2008; 1: 8-12.
41. Salami AK, Katibi IA. Human Immunodeficiency Virus-associated tuberculosis: pattern and trend in the University of Ilorin Teaching Hospital. African Journal of Med. Science, 2006; 35(4): 437-460.
42. Azuonwu O, Putheti R, Amadi F, Obire O. Prevalence of Tuberculosis in HIV infected patients. J. Advanced Pharm. Educ. Res. 2011; 1:1-11.
43. Pennap GR, Makpa S, Ogbu S. Prevalence of HIV/AIDS among tuberculosis patients seen in a rural clinic in Nigeria. Trakia J. Sci. 2011; 9(2): 40-44.
44. Antionucci G, Girardi E, Raviglione MC. Risk factor of TB in HIV- infected persons .A prospective cohort study. JAMA, 1995; 274: 143- 148.
45. Umeh EU, Ishaleku D, Hieukwuemere CC. HIV/TB co-infection among patients attending a referral chest clinic in Nasarawa State, Nigeria. J. Appl. Sci., 2007; 7: 933-935.
46. Jumbo J, Daniel OO, Peter OI. Tuberculosis and gender parity in a TB Referral Centre, South –South Nigeria. Greener Journal of Medical Sciences, 2013; 3 (7): 270-275.
47. Nsubuga P, Johnson JL, Okwera A, Mugerwa RD, Ellner JJ, Whalen CC. Gender and HIV-associated pulmonary

tuberculosis: Presentation and outcome at one year after beginning antituberculosis treatment in Uganda. Pulmonary Med., 2002; 2: 4.
48. Tadesse S, Tadesse T. HIV co-infection among tuberculosis patients in Dabat, northwest Ethiopia. Journal of Infectious Diseases and Immunity, 2013; 5(3): 29-32.
49. Olaniran O, Hassan-Olajokun RE, Oyovwevotu MA, Agunlejika RA. Prevalence of Tuberculosis among HIV/AIDS Patients In Obafemi Awolowo University Teaching Hospital Complex Oauthc, ILE –IFE. Int J Biol Med Res. 2011; 2(4): 874 -877.
50. Abeld F H. Stop TB flight poverty. The Newsletter of the global partnership movement to stop. 2002. TB: 6.
51. World Health Organization. Interim policy on collaborative TB/ HIV Activities. Geneva: WHO, 2004. http://www.who.int/tb/ publication/tvhiv-interim-policy/en/index.html. Accessed 10/11/08.