



Tuberculosis and HIV/AIDS co-infection Rate among Tuberculosis patients in Sokoto TB Centre, North Western Nigeria

Isaac, I.Z.,^{1*} John, R.T.,² Udomah, F.P.¹ and Erhabor, O.¹

¹ Department of Haematology and Blood Transfusion Science, Faculty of Medical Laboratory Science, Usmanu Danfodiyo University, Sokoto. Nigeria.

² Department of Obstetric and Gynaecology, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria.

*Corresponding author; isaaczama@yahoo.co.uk.

Abstract

Background: The resurgence of TB infection after many decades of decline has been reported in recent times, and has been attributed to the high rate of HIV infection. The paucity of information on the prevalence of tuberculosis and HIV/AIDS co-infection in Sokoto has motivated this study.

Methodology: The study was a cross-sectional descriptive study to determine the occurrence of tuberculosis and HIV/AIDS co-infection among ninety samples positive for sputum acid fast bacilli (AFB) attending DOTS point centre in Sokoto. The patients were counseled and consented patients were tested for presence of HIV antibodies using HIV 1/2 Determine®, Unigold® and Stat-Pak® rapid test kits in a serial algorithm.

Results: The prevalence of HIV co-infection among TB patients obtained from this study was 5.6% (2.2% female and 3.3% male), the female to male ratio of TB patients was 1:2.9, while the ratio of co-infection of HIV among TB patients for female to male was 1:1.5. 100% of co-infected patients were married and 80.4% of co-infected patients were illiterates while 58.9% of them were business men and the remaining 19.6% were farmers and unemployed. No co-infection was found among patients that were civil servants and the socio-demographic factors indicates a no statistical significant differences (p -value > 0.05). The result also revealed co-infection occurred in age range of 21-40 years only, with age group 31 – 40 years having the highest prevalence of co-infection.

Conclusion: We conclude from this study that the occurrence of HIV/AIDS among tuberculosis patients is high 5(5.6%) and does not correlate with the increase in HIV prevalence for Sokoto state in recent times.

Introduction

The World Health Organization (WHO) declared Tuberculosis (TB) a global emergency in 1993 and it remains one of the world's major causes of illness and death (Nigeria Tuberculosis Fact Sheet, 2012). It was estimated that one third of the world's population, two billion people, carry the TB bacteria and more than nine million of these become sick each year with active TB that can be spread to others (Nigeria Tuberculosis Fact Sheet, 2012). TB poses significant challenges to developing

economies as it primarily affects young people. Annually the risk of Tuberculosis in Nigeria each year was estimated as 2% (Daniel *et al.*, 2006).

The World Health Organization (WHO) estimated that 4.4 million people have dual infections with the tubercle bacillus and HIV in the world (Markewitz *et al.*, 1991; WHO, 2005) and almost 80% of these people reside in Africa (Kochl, 1991; WHO, 2005). A person with HIV is up to thirty times more likely to develop active TB than a person with healthy immune system.

Citation: Isaac, I.Z., John, R.T., Udomah, F.P. and Erhabor, O. (2016): Tuberculosis and HIV/AIDS co-infection Rate among Tuberculosis patients in Sokoto TB Centre, North Western Nigeria. *BJMLS*, 1(1): 40 - 46

Tuberculosis and HIV/AIDS co-infection

HIV infection is the highest risk factor so far identified which increase the chance of latent infection with tubercle bacilli progressing to active TB (Selwyn *et al.*, 1980; WHO, 2005; Jawetz *et al.*, 2001) and the risk of active TB in a co-infected person is estimated to be 7-10% per year (Selwyn *et al.*, 1980). The resurgence of TB infection after many decades of decline has been reported in recent times, and has been attributed to the high rate of HIV infection (UNAID, 2004). The global estimate of the rate of new TB infection is put at 9% but higher values as 31% can be obtained in regions and countries with high rate of HIV infection (Shama *et al.*, 2005).

Report has indicated that about 70% of co-infection with tuberculosis and HIV/AIDS live in Africa (UNAID, 2004). Nigeria, Ethiopia, and South Africa have reported to have an annual increasing rate of 7% (Eno and Edem, 2008; UNAID, 2004). The paucity of information on the prevalence of tuberculosis and HIV/AIDS co-infection in Sokoto has motivated this study.

Materials and methods

The study was a cross-sectional descriptive study to determine the prevalence of tuberculosis and HIV/AIDS co-infection among ninety positive sputum smear acid fast bacilli (AFB) positive patients attending DOTS point centre in Sokoto. The patients were counselled and consented patients were tested for presence of HIV antibodies using HIV 1/2 Determine®, Unigold® and Stat-Pak® rapid test kits in a serial algorithm.

Selection criteria

Ethical clearance was obtained from the ethical committee of the Specialist hospitals, Sokoto. While informed consent was sought from all participants in this study.

Sample size determination:

The sample size was calculated using G*Power 3.0.10 software as shown below.

χ^2 tests - Goodness-of-fit tests: Contingency tables

Analysis: A priori: Compute required sample size

Input:

Effect size w	=	0.5
α err prob	=	0.05
Power (1- β err prob)	=	0.95
Df	=	5

Output:

Noncentrality parameter λ	=	20.000000
Critical χ^2	=	11.070498
Total sample size	=	80
Actual power	=	0.952339

Data analysis

The data obtained were presented in tabular forms and in proportions as the case may be, and Hypothesis was tested with statistical software (SPSS version 20) at 0.05 significant levels and 95% confidence using the Person Chi-square test.

Results: The occurrence of HIV co-infection among TB patients obtained from this study was 5.6% (2.2% female and 3.3% male), the female to male ratio of TB patients was 1:2.9, while the ratio of co-infection of HIV among TB patients for female to male was 1:1.5. 100% of co-infected patients were married and 80.4% of co-infected patients were illiterates while 58.9% of them were business men and the remaining 19.6% were farmers and unemployed. No co-infection was found among patients that were civil servants and the socio-demographic factors indicates a no statistical significant differences (p -value > 0.05). The result also revealed co-infection occurred in age range of 21-40 years only, with age group 31 – 40 years having the highest prevalence of co-infection.

Table 1 below showed Pearson's chi-square tests for sociodemographic factors and HIV status among TB patients, the prevalence of HIV co-infection among TB patients was found to be 5.6% (2.2% female and 3.3% male), the female to male ratio of TB patients was 1:2.91, while the ratio of co-infection of HIV among TB patients for female to male was 1:1.5. 100% of co-infected patients were married and from the Hausa tribe.

A 4.5% out of the 5.6% co-infected patients were illiterates and majority of them are business people (3.3%) while farmers and unemployed had 1.15% each. No co-

infection was found among patients that are civil servant. The sociodemographic factors indicates (p -value > 0.05), a no statistical significant differences.

Table 1: Pearson’s chi-square tests for sociodemographic factors and HIV status among TB patients

	HIV status			χ^2	df	<i>p</i> -value
	Neg. n(%)	Pos. n(%)	Total n(%)			
Gender						
Female	27(30.0)	2(2.2)	29(32.2)			
Male	56(64.4)	3(3.3)	59(67.8)			
Total	85(94.4)	5(5.6)	90(100.0)	0.147	1	0.702
Marital status						
Single	26(28.9)	0(0.0)	26(28.9)			
Married	56(60.0)	5(5.6)	61(65.6)			
Divorced	2(2.2)	0(0.0)	2(2.2)			
Widowed	3(3.3)	0(0.0)	3(3.3)			
Total	85(94.4)	5(5.6)	90(100.0)	2.782	3	0.427
Ethnicity						
Hausa	69(76.7)	5(5.6)	74(82.2)			
Fulani	14(15.6)	0(0.0)	14(15.6)			
Others	2(2.2)	0(0.0)	2(2.2)			
Total	85(94.4)	5(5.6)	90(100.0)	1.145	2	0.564
Educational status						
Illiterate	61(67.7)	4(4.5)	65(72.2)			
Literate	24(26.7)	1(1.1)	25(27.8)			
Total	85(94.4)	5(5.6)	90(100.0)	1.339	1	0.720
Occupation						
Unemployed	21(23.3)	1(1.1)	22(24.4)			
Farmer	18(20.0)	1(1.1)	19(21.1)			
Business	45(50.0)	3(3.3)	48(53.3)			
Civil servant	1(1.1)	0(0.0)	1(1.1)			
Total	85(94.4)	5(5.6)	90(100.0)	0.149	3	0.985

Table 2 below showed that only age groups 21-30 and 31-40 years had co-infections with prevalence of 2.2% and 3.3% respectively. Statistically, the relationship

between age groups and HIV co-infection among TB patients was insignificant ($P = 0.510$).

Table 2. HIV status among TB patients based on age groups.

Age groups	HIV Status			χ^2	df	<i>p</i> -value
	Neg. n(%)	Pos. n(%)	Total (%)			
≤ 20 years	5(5.6)	0(0.0)	5(5.6)			
21-30 years	34(37.8)	2(2.2)	36(40.0)			
31-40 years	20(22.2)	3(3.3)	23(25.6)			
41-50 years	15(16.7)	0(0.0)	15(16.7)			
51-60 years	6(6.7)	0(0.0)	6(6.7)			
≥ 61 years	5(5.6)	5(0.0)	5(5.6)			
Total	85(94.4)	5(5.6)	90(100)	4.281	5	0.510

Discussion

The occurrence of HIV co-infection among TB patients in this study was 5.6% (2.2% female and 3.3% male), the ratio of co-infection of HIV among TB patients for female to male was 1:1.5. Georgina *et al.*, (2013), reported a 12.3% positive for HIV antibodies in a cohort of 13,109 patients in 43 DOT centres in Oyo state in Nigeria. Mukhtar, (2010), found a 38.4% in Kano, North western, Nigeria. Another study in Nigeria showed a median HIV prevalence of 17.0% (range 4.2% - 35.1%) among the TB patients. The highest prevalence was recorded in the north central state of Benue and the least was at the South-West state of Oyo (Ekanem *et al.*, 2004). Kano state was reported to have recorded 12.4% (WHO, 2004). This ranks the state as one of the vulnerable TB /HIV regions in Africa (Ravinglion *et al.*, 1997). A similar study carried out in Jos, Nigeria reported a 12.6% rate of HIV/TB co-infection (Idoko *et al.*, 1994). HIV infection has been reported to compromise the immune system thereby increasing the rate of acquiring tuberculosis (Idoko *et al.*, 1994 and Ravinglion *et al.*, 1997). The rate of 5.6% found in this study differs greatly from the rates found in studies from other regions of the country with higher HIV prevalence rates in the general population. For example Pennap *et al.* (2010) reported a co-infection rate of 44.2% from Nasarawa in the north central and 25% co-infection was reported from Port Harcourt in the south-south region of the country by Erhabor *et al.* (2010).

The difference in the rate of co-infection in various regions reflected the correlation between HIV infection rates in the general population and the development of TB following exposure. That is the higher the rate of HIV infection, the greater the risk of acquiring established TB infection and hence a higher rate of HIV/TB co-infection. It was reported that in Oyo state Nigeria, an increased rate of HIV/TB co-infection was reported to be due to an increase in the rate of HIV infection from 0.1% in 1991 to 3.9 in the 2003 and 2.2 in 2008 among the general

population (FMOH, 2001 and FMOH, 2008). In the most recent report by NACA, (2016), Oyo states was ranked 5.6% prevalence of HIV while Sokoto and Akwa Ibom states had 6.4% and 6.5% respectively. There appears to be an increase in the rate of HIV infection in Sokoto state from 6.0% in 2008 to 6.4% in 2016 (FMOH, 2008 and NACA, 2016). This increase may not be unrelated to the common practices which include: marital practices of divorce and remarriage; multiple wives; marriages without pre-marriage HIV screening and unprotected sex. Our findings however, does not seem to correlate with the HIV prevalence rate. The reason for the uncorrelation may be because of the sample size used in this study.

The prevalence of HIV infection among TB patients was also reported to vary from country to country, the highest rates have been reported in areas where HIV prevalence is high in the general population. For example a high co-infection rate of 44% - 52% has been reported in Kenya (CDC, 2011), while a lower co-infection rate of 8.8% was obtained in Southern California, USA (Rodwellet. *al.*, 2010). The 2010 National sentinel survey as indicated that the rate of HIV infection has declined to 3.4% from the previously higher rates of 0.6% in 1987 to 5.8% in 2003 (FMOH, 2010), the prevalence also was reported to vary by location; 2.1% was reported in the north central, 2.9% in the south western zone and 7.5% in the north central zone (FMOH, 2001 and Igeet. *al.*, 2005). HIV infection compromises the immune system which in turn increases the risk of acquiring TB. On the other hand, the course of HIV infection was reported as often accelerated subsequent to infection with TB (Mahajan and Tadon, 2007). Hence, the risk of death and development of other opportunistic infections is higher in HIV-TB co-infection and high case fatality rates are observed among tuberculosis patients with HIV infection (Kang'ombe *et al.*, 2004 and Pontorringet. *al.*, 2010).

The age distribution reveals the highest prevalence in this study to be in the age group 31-40yrs (43.7%) followed by 21-30yrs (28.8%). The higher prevalence of HIV co-infection among TB patients observed among younger age group of sexually active age group in this study is consistent with the findings of other studies (Pennapet. *al.*, 2010 and Olaniranet. *al.*, 2014). However, Georgina *et al.*, (2013) reported a higher rate among children of less than ten years of age and found 18.0% in the 40 - 49 years age group. This age prevalence of TB coinfection among HIV patients may reflect the age-specific prevalence of HIV in the community.

This study also observed that the age group bracket most affected with the tuberculosis disease were 21 - 40 years constituting about 65.6% of TB patients. This result agrees with the work of Ige *et al.* (2005) in Nigeria who reported that 81.7% of the patients were in the age range between 20 and 40 years. Similar findings was reported also by Aktogu *et al.* (1998) in Turkey reported that pulmonary tuberculosis was common among patients of age 20 - 39 years and in India, Atul *et al.* (2004) also reported that about 80% of tuberculosis cases occurred in age group of 15 - 49 years. This shows that in the developing countries, the economically productive age groups are affected by TB and implies that tuberculosis constitutes a strong economic burden, which could cripple the work force of the country. This is in contrast to what is obtained in the developed countries like the United States of America where high risk of *M. tuberculosis* reflected more among the elderly (above 62 years) and less among those below 50 years of age (Cantwell *et al.*, 1994).

This study revealed that the male to female ratio of tuberculosis infection was 1.5:1

(67.8% males and 32.2% females). Similar findings of males to females ratio of TB patients was reported (64% males and 36%) in Ibadan, Nigeria by Kehinde *et al.*, (2006). 59.3% males and 40.7% females were reported in California by Morisky *et al.* (1998).

Many studies have reported a higher co-infections rate of TB/HIV among females than males (Nwabukoet. *al.*, 2012, Tadesse and Tadesse, 2013, Erulkaret. *al.*, 2009 and Georgina *et al.*, 2013). Our report however, is in contrast, we obtained 2.2% female and 3.3% male co-infection rates and the ratio of co-infection of HIV among TB patients for female to male was 1:1.5. We attributed this finding to the fact that the study area is predominantly Islamic, in which the female practice pudan and are often times kept at home and have little or no social interactions. This is also proven to be the case as all the co-infected in this study were married couples, suggesting the likelihood that the females got infected by their husbands. In this area too and among the indigenous people, the Hausa/Fulanis, the participation of the females in businesses is low and generally, illiteracy level is on the high side. Our findings indicated that 4.5% out of the 5.6% co-infected patients were illiterates and majority of them were business people (3.3%) while farmers and unemployed make up the remaining 2.3%. No co-infection was found among patients that were civil servants, and sociodemographic factors indicates a no statistical significant differences (p -value > 0.05).

Conclusion: We conclude from this study that the occurrence of HIV/AIDS among tuberculosis patients is high 5(5.6%) and does not correlate with the increase in HIV prevalence for Sokoto state in recent times.

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