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Research Article

Prevalence of Tuberculosis and HIV Among Pulmonary Tuberculosis Suspects in Benin City, Nigeria- A Three Year Review

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ABSTRACT

Tuberculosis is an infectious disease whose global burden is fueled by HIV and several socio-economic factors, with worse outcomes in low and middle-income countries. This retrospective study was carried out to ascertain the prevalence of TB and HIV among TB suspected patients in a tuberculosis clinic in Benin, Nigeria between 2nd January, 2015 and 31st December, 2017. Clinical records of patients who had registered under the DOTS program, University of Benin Teaching Hospital, Benin City during the study period were deployed. This included information on demographic data, medical history, laboratory results and treatment access. Statistical analysis was carried out on available data. A total of 667 patients were enrolled during the study period. The highest TB prevalence was observed in 2015 (44.3%) while the lowest was in 2017 (32.1%). There was no significant difference in the prevalence of TB in relation to gender ($p = 0.2760$). The age group 21-30 yrs showed the highest TB prevalence (47.9%) while the least prevalence was observed for the age group ≤ 10 yrs (11.1%); this finding was statistically significant ($p < 0.0001$). There was no statistically significant relationship between year of TB infection and HIV sero-status ($p > 0.05$), although 8.4% of patients had HIV/TB co-infection. The prevalence of TB during this 3-year study review was 38.4%. Although a significant yearly decline in prevalence of TB was observed, the study draws attention on the need to address other socio-economic factors that play key roles in fueling the disease in Nigeria.

Keywords: *Tuberculosis, Human immunodeficiency virus, co-infection*

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INTRODUCTION

Mycobacterium tuberculosis is the etiologic agent of tuberculosis, a leading cause of mortality and morbidity due to bacterial infections in the world and ranks second of all infectious agents due to microorganisms (Erah and Ojieabu, 2009). Nigeria is one of the countries in sub-Saharan Africa where the disease is prevalent and has an unenviable place among the high burden countries in the world, where drug resistant TB and HIV/TB co-infection is prevalent (WHO, 2017).

HIV/AIDS is another public health concern and is thought to have awakened the TB epidemic (Baltussen *et al*., 2005). Infected individuals are immune-compromised and susceptible to various microbial infections. Co-infection of TB and HIV has been considered to be a major obstacle for the global efforts in reaching the goals for the prevention of HIV and TB infections (Erah and Ojieabu, 2009). HIV infection is therefore an established risk factor predisposing to *Mycobacterium tuberculosis* infection and progression to active disease (Wood *et al*., 2011; Oladeinde *et al*., 2014).

Tuberculosis prevalence is linked with low socio-economic living conditions as the incidence rate is 150-300 per 100,000 in low income countries when compared to 10 per 100,000 in high income countries (WHO, 2016; WHO, 2017). According to the WHO, the estimated incidence of TB in Nigeria is 322 per 100 000 population with only 15% of the total burden of the disease in the country being notified in 2015 (WHO, 2016). The risk of developing tuberculosis is estimated to be between 16-27 times greater in people living with HIV than among those without HIV infection, while the likelihood of progressing to full blown AIDS increases by 100 folds in HIV/TB co infected patients (WHO, 2017; Baltussen *et al*., 2005).

Several TB control programmes have been initiated in developing countries notably Nigeria, where the TB burden is high. They include the direct observed treatment short course (DOTS) program-instituted in the 1990's by WHO, DOTS plus and Stop TB with the mandate of executing strategies aimed at reducing the global TB burden (WHO, 2016, Ibadin *et al*., 2018).

Previous studies in Benin city, Nigeria looked at various facets of TB disease among various groups; a six-year study on the prevalence of TB among HIV positive patients in a rural community in Edo state showed a prevalence of 32.8% (Oladeinde *et al*., 2014). Among smokers, a prevalence of 48% was shown and among HIV patients attending dermatology clinic, a prevalence of 20% was shown (Ekrakene and Igeleke, 2010; Okoh and Omuemu, 2012). It is therefore imperative that a study evaluating the yearly prevalence of the disease among suspected TB patients attending DOTS clinic is carried out so as to access the impact of the program on the local burden of tuberculosis. It is against this background that this retrospective study was carried out to ascertain the prevalence of tuberculosis and HIV among patients attending DOTS clinic from 2015 to 2017.

MATERIALS AND METHODS

Study Population: The study was conducted at the University of Benin Teaching Hospital (UBTH) in Benin City, Nigeria. New cases of TB patients that attended National Tuberculosis and Leprosy Control Programme (NTBLCP), UBTH centre for treatment of TB between 2nd January, 2015 and 31st December 2017 constituted the sample population.

Data Sources: The study was retrospective and clinical records and laboratory test results of patients who had registered under the DOTS program during the study period were deployed. Ethical approval was sought from the Ethical Committee of University of Benin Teaching Hospital. This was approved with Number: ADM/E 22/A/VOL. VII/1489**.**

Sputum Processing: Triplicate sputum specimens were collected from patients in sterile wide-mouth containers and properly labeled. A loopful of sputum was thereafter spread on a clean glass slide uniformly in oval shape by smearing repeatedly in coil-like patterns, approximately 2-3 cm in size. The slide was air-dried and flame-fixed by passing through the flame carefully. The smear was then stained for presence of acid and alcohol fast bacilli using Ziehl-Nelseen staining as previously described (WHO, 2000). The tests were carried out by laboratory staff of tuberculosis laboratory, UBTH.

HIV screening: All patients were subjected to HIV counseling after which venous blood was obtained from all participants. Five milliliters of blood sample was collected into properly labeled plain containers, samples were sent to the laboratory and HIV serological tests were carried out on the centrifuged blood samples. For the detection of HIV-1 and HIV-2 antibodies in the blood, Determine® HIV-1/2 Test cards (Inverness Medical, Japan), Unigold™ Kit (Trinity Biotec, Ireland) and HIV - 1/2 Stat- Pak® Assay (Chembio Diagnostic Systems, USA) according to the national algorithm (Mbachu *et al*., 2015). These methods are immunochromatographic and detect the presence of antibodies to HIV-1 and HIV-2 in human blood and are read in-vitro having more than 99.9% sensitivity and 99.75% specificity.

Statistical analysis

The data obtained were analyzed with statistical tools namely chi square as appropriate using the statistical software INSTAT® (GraphPad Software Inc, La Jolla, CA, USA).

RESULTS

A total of 667 patients were enrolled during the study period. Of this number, sputum samples of 256 (38.4%) patients were AAFB positive, with the highest prevalence observed in 2015 (44.3%) and the lowest in 2017 (32.1%). In relation to yearly prevalence, the decline was statistically significant (p = 0.0314). Three patients showed TB treatment failure during the study period with the year 2015 showing the highest prevalence (2.0%). The findings were not statistically significant (p = 0.4822) (Table 1).

Table 1:
Prevalence of tuberculosis in relation to various years

Year	No of patients screened	No of AAFB positive patients (%)†	Number of Patients with treatment failure*
2015	**221**	**98 (44.3)**	**2 (2.0)**
2016	**231**	**89 (38.1)**	**1 (1.1)**
2017	**215**	**69 (32.1)**	**0**
Total	**667**	**256 (38.4)**	**3 (1.2)**

†p = 0.0314; *p = 0.4822

There was no significant difference in the prevalence of TB in relation to gender although females showed higher prevalence (p = 0.2760). In relation to age, the highest prevalence was observed for the age group 21-30 years, while the least prevalence was observed for the age group ≤ 10 years. The finding was statistically significant (p < 0.0001) (Table 2).

Table 2:
Prevalence of tuberculosis in relation to age and gender

		No of Patients screened	**No of Patients infected with TB**	**p**
Gender	Male	350	127 (36.3)	0.2760
	Female	317	129 (40.7)	
Age	≤ 10	27	3 (11.1)	< 0.0001
	11-20	60	27 (45.0)	
	21-30	146	70 (47.9)	
	31-40	167	79 (47.3)	
	41-50	104	36 (34.6)	
	51-60	76	25 (32.9)	
	≥ 61	87	16 (18.4)	

Table 3:
Prevalence of tuberculosis in relation to HIV status from 2015-2017

Year	HIV sero-positive patients		HIV sero-negative patients		
	Number tested	No infected with TB	Number tested	No infected with TB	p
2015	67	25 (37.3)	154	72 (46.8)	0.2492
2016	57	19 (33.3)	174	70 (40.2)	0.4403
2017	49	12 (24.5)	166	56 (33.7)	0.2946
Total	173	56 (32.4)	494	198 (40.1)	0.0879

Of 173 patients that were sero-positive for HIV during the study period, 56 (32.4%) were AAFB positive. Also, of the 494 patients that were HIV sero-negative, 198 (40.1%) were AAFB positive. There was no statistically significant relationship between year of TB infection and HIV sero-status ($p > 0.05$), although 8.4% of patients had HIV/TB co-infection (Table 3).

DISCUSSION

In the current study, the prevalence of tuberculosis among TB suspected patients was 38.4% with a yearly decline in prevalence that was statistically significant. This finding underscores the relative success in TB intervention schemes aimed at reducing the burden of the disease. The strategy is summed up in the Direct observation treatment short course (DOTS) program which has a five pronged approach that includes; political commitment from stakeholders, case detection through quality-assured bacteriology, standardized treatment with supervision and patient support, effective drug supply and management system, monitoring and impact measurement (WHO, 2013). It must however be noted that Nigeria is still among the high burden countries and remains a flashpoint for tuberculosis studies as several precipitating factors abound namely HIV burden, malnutrition, overcrowding and low-level development of health infrastructures (Erah and Ojieabu, 2009). Also, treatment failure was observed in 1.2% of AAFB positive patients. The commonest cause of treatment failure is drug resistance and multi-drug resistant TB (MDR-TB) is caused by strains of *M. tuberculosis* that is resistant to both isoniazid and rifampicin (Kaur *et al*., 2013). These patients require prolonged and expensive treatment using second-line medications that are less effective and more toxic (WHO, 2016). Definitive and timely detection of MDR-TB can be done using the Gene-Xpert diagnostic platform from a single specimen in comparison to culture which is time consuming, laborious and requires technical experience. This study therefore emphasizes the need for most DOTS TB testing centres to have the Gene-Xpert diagnostic platform so as to facilitate detection, tracking of patients and monitoring of therapy.

Although the global male:female (M:F) ratio for TB notification is 1.7 (WHO, 2017), gender did not play a significant contributory role to the local TB burden in this study. This observation is in accordance with several studies though females had a slightly higher prevalence in this study (40.7%) (Okonkwo *et al*., 2015; Oladeinde *et al*., 2014). However, age significantly affected TB prevalence as patients in the age group 21-30 yrs showed the highest prevalence while patients less than 10 yrs had the lowest prevalence. This age group constitutes the most active and mobile group and are more prone to predisposing factors for TB such as drug abuse, alcoholism, smoking, and poor living conditions occasioned by unemployment and poverty (Kochi, 1991). In previous studies in Okada and Benin, Edo state respectively, patients in the age group 21-30 had the highest prevalence (Egbagbe *et al*., 2011; Oladeinde *et al*., 2014).

HIV is thought to have reawakened the tuberculosis scourge and patients who are HIV positive and infected with TB have been previously shown to be 17 times more likely to develop active TB than people not infected with HIV (Wood *et al*., 2011). In this study, there was no statistically significant relationship between TB infection and HIV sero-status. This finding does not downplay the role of HIV in the resurgence of TB, rather, it draws attention to other contributory factors to the burden of TB in our locality. Prevailing social factors such as poor socio-economic status of the people, malnutrition, crowded living conditions due to urban drive and high population growth rate are rife in Benin and most other cities in Nigeria (Oladeinde *et al*., 2014). These factors have been strongly linked with the global burden of tuberculosis in high burden countries and must be tackled alongside HIV/AIDS so as to mitigate the negative impact on the health of the teeming population.

The rate of HIV/TB co-infection among patients attending DOTS clinic in this study was 8.4%. This value represents a significant rise from previous studies in South-East Nigeria and Punjab, India which reported 6.4% and 1.32% respectively (Okonkwo *et al*., 2015; Kaur *et al*., 2013). It is however lower than a previous study in a facility (Central Hospital) in Benin which reported 20% and another in Lagos which reported 18.4% prevalence (Okoh and Omuemu, 2012; Onubogu *et al*., 2010). In Okoh and Omuemu's study in Benin however, the study population comprised HIV positive subjects. The differences in prevalence in the other cited studies may be due to differences in the prevailing socio-economic factors earlier highlighted that fuel the disease entity.

In conclusion, the prevalence of TB during this 3-year study review was 38.4%. Age was a risk factor for TB with the age group 21-30 yrs showing the highest prevalence. Co-infection of TB/HIV was 8.4%. Although a significant decline in prevalence of TB was observed, the study draws attention on the need to address other socio-economic factors that play key roles in fueling the disease in Nigeria.

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