



PREVALENCE OF PULMONARY TUBERCULOSIS AND ITS ASSOCIATED RISK FACTORS IN ANAMBRA STATE, NIGERIA



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Abstract: Pulmonary tuberculosis (PTB) remains a major public health problem in Nigeria. The prevalence of PTB and its associated risk factors among presumptive TB cases in Anambra State were studied. A total of 1487 individuals with presumptive pulmonary TB participated in the study. Participant's age ranged from 15 years and above. Two sputum specimens were submitted on-the-spot (S-S) within an hour interval. The sputum smears were stained using the Ziehl-Neelsen technique. Pretested questionnaire was employed to identify risk factors associated with pulmonary tuberculosis infection. The prevalence of smear positive pulmonary tuberculosis was 12.3%. Males in the age bracket of 25 – 34 years had the highest prevalence of smear positive PTB. The major risk factors associated with PTB in Nnewi and Onitsha were HIV infection, immunosuppressive therapy, alcohol intake and cigarette smoking. No PTB patient was registered with organ transplant or renal failure as a risk for PTB. Our findings demonstrate that the prevalence of smear positive PTB was high in Anambra State. We therefore suggest intensified case finding and health education of the populace in order to reduce associated risk factors.

Keywords: Prevalence, Smear positive, pulmonary tuberculosis, Risk factors, Anambra State

Introduction

Over twenty years after the World Health Organization's (WHO's) declaration of tuberculosis as a global emergency, the global burden of tuberculosis remains enormous (WHO, 2013). More than two billion people are currently infected by this disease, of which one in ten people with tuberculosis develop active tuberculosis (Shafee *et al.*, 2014). Tuberculosis (TB) is ranked the second leading cause of death from an infectious disease worldwide, after the Human Immunodeficiency Virus (HIV) (WHO, 2013). Although it is a global epidemic, TB predominantly affects developing countries, where 98% of worldwide TB deaths occurs (WHO, 2012).

In Nigeria, despite the efforts of the National Tuberculosis and Leprosy Control Programme (NTBLCP), pulmonary tuberculosis (PTB) has remained a major public health problem. The first ever National Tuberculosis Prevalence survey in Nigeria conducted in November, 2012, revealed higher burden of tuberculosis in the country than had previously been estimated, with a prevalence of 322/100,000 population and an incidence of 338/100,000 population of all forms of tuberculosis (FMOH, 2010). Based on these estimates, Nigeria has been ranked as one of the top 22 high TB burden countries in the world. In high TB endemic (>100/100,000 population) countries, the WHO recommends periodic disease prevalence surveys to measure the effect of TB control measures (Glaziou *et al.*, 2008). Prevalence surveys also help to evaluate the burden of disease in the community and accurately estimate the prevalence of smear and culture positive PTB.

Various risk factors for PTB development have been identified. These factors differ in developed and developing countries. Studies have shown that HIV/AIDS, diabetes, cancer, malnutrition, alcoholism, cigarette smoking, active TB contact, extreme poverty, homelessness, overcrowding and being in prison were among the commonly identified risk factors associated with tuberculosis in most developing countries including Nigeria. (Nwachukwu *et al.*, 2016b; Baskaran *et al.*, 2015; Begna *et al.*, 2014; Amare *et al.*, 2013)

The purpose of this study therefore was to determine the prevalence of smear positive PTB and its associated risk factors in Anambra state, Nigeria

Materials and Methods

Study areas

This prospective study was carried out at two locations in Anambra State, Nigeria: Nnamdi Azikiwe University Teaching Hospital (NAUTH) Nnewi, and Saint Charles Borromeo Hospital (SCBH), Onitsha. NAUTH is a tertiary hospital with specialist care and a referral centre for other hospitals, whereas SCBH is a foremost Roman Catholic hospital with modern state-of-the-art equipment. Both facilities are integrated with the NTBLCP and provide free anti-TB medicines and services to the public

Study participants

Individuals aged 15 years and older who were presumptive pulmonary TB cases (had cough ≥ 2 weeks), who either self-presented to the TB/directly observed treatment, short course clinic, or referred from peripheral health centres for assessment were invited to participate and enrolled at the time of presentation to the clinic.

Methods

Diagnosis of PTB was based on the National TB Guidelines. Presumptive Pulmonary TB cases submitted two sputum specimens: on the spot (S – S) within an hour interval. Sputum smears appropriately labeled were made on clean, grease-free slides (2 cm X 1 cm) and stained using the Ziehl-Neelsen technique. The stained smears were read at X1000 magnification and graded according to the WHO/IUATLD System (2001). As a quality control method, the entire positive and fifty per cent of negative slides were re-read by experienced laboratory scientists blind for smear confirmation. PTB was diagnosed if at least one smear result was positive. Pretested questionnaire was used to collect information on socio-demographic characteristics and other associated risk factors. The data from questionnaires and laboratory results were analyzed using Chi-square test and $P < 0.05$ was considered as significant. The study was approved by ethical committees

of both hospitals. All patients consented to participate in the study.

Results and Discussion

A total of 1487 presumptive tuberculosis cases participated in the study (987 presumptive TB cases at NAUTH, Nnewi and 500 presumptive TB cases at SCBH, Onitsha). Of these, 661 (44.5%) were males and 826 (55.5%) females. The prevalence of smear positive PTB was 12.3% (Table 1). This shows that PTB is one of the major public health concerns in the study areas. Similar studies conducted in Rwanda reported 17.3% (Muvunyi *et al.*, 2010), and in Kano, Nigeria 14.7% (Imam and Oyeyi, 2008) which was higher compared to our finding. The low prevalence observed in our study could be as a result of better awareness of patients and the recent house to house TB search leading to active detection in those who had symptoms of tuberculosis. Gender and age distribution of PTB patients revealed that greater prevalence was observed in males (7.6%) than females (4.7%). There was high rate of positive cases (17.8%) in the 25 – 34 years old age group followed by the age group 35-44 (11%) and least in the age group ≥65 years 9(4%) as presented in Table 2.

Table 1: Gender distribution of study subjects in Anambra State, Nigeria

Gender	No examined (%)	No AFB+ (%)
Males	661(44.5)	113 (61.7)
Females	826(55.5)	70(38.3)
Total	1487	183(12.3)

Table 2: Gender and age distribution of PTB patients at Anambra State, Nigeria

Age group (Yr)	No screened	Males AFB(%)	Females AFB (%)	Total AFB +(%)
15-24	205	17(8.2)	8(3.9)	25(12)
25-34	599	41(10.3)	30(7.5)	71(17)
35-44	412	26(6.3)	21(5.1)	47(11)
45-54	255	17(6.7)	6(2.4)	23(9)
55-64	122	9(7.4)	4(3.3)	13(10)
≥65	94	3(3.2)	1(1.1)	4(4)
Total	1487	113(7)	70(4)	183(12.3)

P-value 0.200 (Chi-square) (P>0.05); NAUTH = NnamdiAzikiwe University Teaching Hospital; SCBH = St Charles Borromeo Hospital; AFB+ = Acid Fast Bacilli Positive

Similar studies conducted in VietNam (Hoa *et al.*, 2010), Myanmar (MOH, 2010) and Ethiopia (Deribew *et al.*, 2012) reported that smear positive PTB was more common among men than women. Globally too, the number of male PTB cases exceed that among women in all age groups except children (WHO, 2013). The study areas; Ontisha and Nnewiharbours have more male traders than females. The trading in these areas is often conducted in overcrowded environments which could aid tuberculosis transmission. However our result on gender prevalence of PTB differed from that observed by Shafee *et al.* (2014) who reported highprevalence in females than males. The difference in the observation was that Shafee and colleagues worked in Quetta, Pakistan, a predominantly Muslim country. Women there are mostly confined to be housewives and have less access to hospitals and health diagnostic facilities. Thus, maximizing the chances of more contacts with infected carriers.

In this study, there was a high rate of smear positive PTB cases in the age group 25 -34 years old. This observation has serious implications as labour force in the country will

be adversely affected and various sectors of our economy will suffer. This agegroup constitutes the most productive age range of any society (The World’s Youth 2006 Data Sheet). Similar studies in Ethiopia, Rwanda and other countries have reported that smear positive PTB affects mostly adults in the economically productive age groups (Muvunyi *et al.*, 2010; Deribew *et al.*, 2012; WHO, 2012). We observed a low prevalence of smear positive PTB amongst those aged ≥65 years. It is likely that older patients with active PTB may not be diagnosed by direct sputum smear examination, which is the main tool used under NTBLCP. Baskaran *et al.* (2015) made similar observations in a metropolitan city of south India. As those ≥65 years of age are less mobile, one could speculate that these patients could be contributing to disease transmission in their homes. Hence, the National Programme should develop information, Education and Communication (IEC) strategies focusing specially on this group to create awareness and encourage people to undergo TB screening. The major risk factors associated with PTB in our study areas were HIV (88%), immunosuppressive therapy (70%), alcohol intake (45%) and cigarette smoking (43%).The less common factors were previous history of PTB treatment, family history of PTB, diabetes and occupational exposure. No PTB patient was registered with organ transplant or renal failure as a risk for PTB (Fig. 1). It has been documented that HIV infection is the most important risk factor for the development of PTB in individuals infected with *Mycobacterium tuberculosis* (Pawloski *et al.*, 2012; Saad *et al.*, 2014; Begna *et al.*, 2014). The age group 25 -34 years were mostly infected with PTB. These are sexually active young people who are also co-infected with HIV. HIV has profound effect on the immune system by progressively decreasing the CD4 cells, eroding cell-mediated immunity, thus exacerbating the severity of TB disease.

Alcohol intake was a risk factor for *Mycobacterium tuberculosis* in the study area. This finding is similar to the study of Kolappan *et al.* (2007) who found alcoholics to have a 1.5-times higher risk of developing tuberculosis than non-alcoholics. Alcohol hasbeen found to inhibit tumor necrosis factor (TNF) response which may prevent the destruction of mycobacteria (Saad *et al.*, 2014). The role of active smoking in the development of PTB is well known (WHO, 2012; Padmanesan *et al.*, 2013; Begna *et al.*, 2014), the same is true in this study in which active smoking was a major risk factor associated with smear positive PTB. Nicotine in cigarette is shown to inhibit the production of tumor necrosis factor-alpha by lung macrophages, thereby rendering tobacco smokers more susceptible to progression from latent TB infection to active disease (Davis *et al.*, 2006). Majority of the males in this study were smokers. Restrictions on smoking in public places and institutions and campaigns against smoking, for example “smokers are liable to die young” coupled with high tobacco prices are likely to contribute to decrease in the prevalence of smoking.

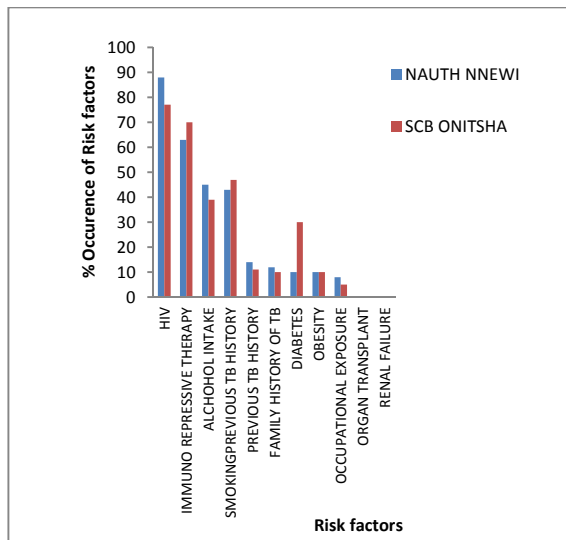


Fig 1: Percentage occurrence of the risk factors for development of PTB

The occurrence of PTB in patients on immunosuppressive therapy (70%) in our study is explained by a weakened immune system due to the primary disease and influence of other co-morbidities such as HIV and diabetes. Similar studies have reported such association (Pawloski *et al.*, 2012). It is noteworthy that organ transplantation and renal failure were not confirmed risk factors for PTB in this study. In contrast, Saad *et al.* (2014) found renal disease as an independent risk factor for development of TB. The difference from our finding was probably due to the fact that these disease conditions are not highly prevalent in Nnewi and Onitsha. A history of previous PTB treatment, diabetes and occupational exposure were less common risk factors that were associated with PTB in our study. This is consistent with WHO report (WHO, 2012).

Conclusion

The prevalence of PTB in Anambra state was 12.3%. Smear positive PTB was frequently reported among males and the age group 25-34 years. Major risk factors for PTB were HIV, immunosuppressive therapy, alcohol intake and cigarette smoking. It is therefore confirmed that PTB is a major public health problem in Anambra State. The National TB Programme should urgently develop information, education and communication (IEC) strategies to create awareness of PTB and its risk factors

Conflict of Interest

We do not have any conflict of interest

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