

Prevalence of Pulmonary Tuberculosis in Bida, North Central Nigeria: A five-Year Retrospective Study

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ABSTRACT

Background: Tuberculosis is an ancient infection which still poses grave challenge in this contemporary age globally. **Aim:** the study was conducted to look at the quantum of the disease in Bida, North Central Nigeria. **Method:** A retrospective study of presumptive tuberculosis patients referred for Laboratory diagnosis during the period from January 2014 to December 2018. XpertMTB/RIF assay was employed for the analysis of the samples. The data was analyzed using Spss version 16 software. Statistical correlation of comparisons was put at $p < 0.05$. **Result:** Five thousand and eight (5008) presumptive tuberculosis patients (aged between 0 – 80 years) were included in this study out of which 558 were diagnosed to have PTB (11.1%). Highest number of cases (60.6%) was found among the age group 21-40 years. A greater prevalence was established in males (62.4%) than females (37.6%) with a ratio of 1.7-1.0. **Conclusion:** The burden of TB in Bida is still high. Pulmonary tuberculosis prevalence is considerably more among males than females, probably indicating that females poorly seek and access Tuberculosis care. Gender and age are statistically strong risk factors in developing pulmonary tuberculosis. This study revealed that gender has a significant association ($X^2 = 29.964$ and $P = 0.000$) with prevalence of tuberculosis. A significant correlation was also observed between age and prevalence of tuberculosis ($X^2 = 71.735$ and $P = 0.000$). This indicates that gender and age are statistically strong risk factors in developing pulmonary tuberculosis.

Keyword: Sputum, Pulmonary Tuberculosis, Xpert/MTB/RIF

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INTRODUCTION

Tuberculosis (TB) is an airborne infectious disease caused by *Mycobacterium tuberculosis*, a bacterium discovered over one hundred years ago with effective drugs available for its treatment. In spite of the fact that it is treatable, it persists as a main cause of ill health globally with 10 million cases estimated in 2018 and it is a foremost cause of mortality [1]. According to the World Health Organization (WHO) 2019 report, TB burden differs hugely amidst nation states and 30 high burden countries in terms of tuberculosis incidence rate had been identified. Two thirds of the global TB cases were reported to be in eight countries; South Africa (3%), Nigeria (4%), Bangladesh (4%), Pakistan (6%), the Philippines (6%), Indonesia (8%), China (9%) and India (27%) [1]. Tuberculosis, (TB) can affect virtually all parts of the human body. Extra-pulmonary tuberculosis (ETB) occurs when sites other than the lungs are affected [2, 3]. WHO reports that 10 – 20% total cases of global TB are extra-pulmonary. The most common and highly contagious form of tuberculosis is Pulmonary Tuberculosis (PTB) representing 80 to 85% of total Tuberculosis cases. The first signs of PTB are respiratory signs such as cough with or devoid of hemoptysis, chest pain and other indicators such as loss of weight, sweating at night, weakness and occasionally persistent fever [4,5]. While coughing, sneezing or speaking, infected individuals discharge the causative agent, *Mycobacterium Tuberculosis* and it is transmitted in aerosols from an individual to the others through inhalation. Initial infection of the tubercle bacilli often lacks clinical significance and it is unnoticed. The infection becomes latent in most individuals [6]. Subjects in contact with the infective aerosols will then develop a progressive immune response and some (between 5 –

10% of those who are exposed) will develop Tuberculosis disease within their life time. This progression from infection to disease will depend on several factors such as age, sex, immune status, smoking, drug treatment and nutritional status. In the United States of American (USA), TB has been reported to frequently infect more nonnative persons than the native persons, Human immunodeficiency Virus (HIV) infected individuals and the homeless people [7]. In addition, abuse of substance (such as alcohol) is a frequently reported behavioral risk factor amongst Tuberculosis patients [8,9]. Rapid diagnoses of TB infected people with prompt commencement of right treatment are crucial to ending TB [10]. Direct sputum microscopy is the most frequently used conventional diagnosis technique of Tuberculosis in combination with sputum culture. Microscopy technique is low in sensitivity with just about 60% [11]. Procedures involving amplification of mycobacterial nucleic acid had been technologically advanced to accelerate TB diagnosis [12]. Conventional culture methods for cultivating the slow growing *Mycobacterium tuberculosis* (MTB) do not require less than a month for adequate isolation in clinical samples. Consequent upon this, reducing the processing time is the main focus of recent diagnostic techniques [13]. Several methods involving amplification of nucleic acid are being technologically advanced for the prompt confirmation of *Mycobacterium tuberculosis* in sputum samples [14,15]. XpertMTB/RIF which is a real-time Polymerase Chain Reaction (PCR) assay had facilitated prompt diagnosis of Pulmonary Tuberculosis with proven effects [16–19]. The World Health Organization recommended XpertMTB assay which had demonstrated more sensitivity and specificity than smear microscopy regarding *Mycobacterium tuberculosis* detection in specimens [20].

The aim of this study is to access the quantum of PTB cases in Bida and determine the distribution on the basis of age and gender over a period of five years

MATERIALS AND METHODS

Study design

The current work is a retrospective study carried out from January 2014 to December 2018 in Bida, Nigeria.

Patient registration and samples assay.

A total of 5008 presumptive cases were included in the study. Two thousand five hundred and sixty-two (51.2%) were males and 2446 (48.8%) were females. Of the total 5008 presumptive cases, 558 (11.1%) were PTB positive.

Laboratory results was retrieved from sputum samples processed using Genexpert at the Tuberculosis laboratory of the Federal Medical Centre, Bida.

Data Collection

Data were retrieved from the Xpert instrument. Demographic information of all assayed samples from presumptive cases was taken. The data obtained were analyzed using Spss 16 statistical package to check the association of PTB with gender, age and year. X^2 test was used for comparison.

RESULTS

A total of 5008 presumptive Pulmonary Tuberculosis cases were attended to at the Genexpert laboratory during the years under review (2014 – 2018). Two thousand five hundred and sixty-two (51.2%) were males and 2446 (48.8%) were females (Table 1).

Five hundred and fifty-eight were confirmed to have Pulmonary tuberculosis from the laboratory result by Genexpert technology out of the total presumptive patients of 5008 with the overall prevalence of PTB found to be 11.1% (558/5008). (Table 1 and Figure 1).

Highest number of presumptive cases 2104 out of the 5008 (42.0%) were attended to in the year 2018 while the lowest 109 out of the 5008 overall presumptive cases (2.2%) were attended to in 2014. The highest percentage PTB positivity 25 out of 109 (22.9%) was found in the year 2014 while very similar PTB positivity percentages, 14.9% (104/700) and 14.7% (127/865) were recorded in the years 2015 and 2017 respectively (table 1).

Gender Distribution of PTB Cases.

Of the total 11.1% prevalence, 6.9% (348/5008) were males and 4.2% (210/5008) were females. Males were found to account for 62.4% overall sum of Pulmonary tuberculosis cases and the females 37.2% with a ratio of 1.7:1.0 (Male : Female) and a *P* value of 0.000

PTB Distribution by Age.

Data analysis by age shows that the highest figure of PTB cases 338 out of 558 (60.6%) were seen among the age group 21 – 40 years, followed by 128/558 (22.9%) found among age group 41 – 60 years. The least 30/558 (5.4%) were found among age group >60 years with a *P* value of 0.000 (Table 2 and Figure 2).

Table 1: Distribution of PTB Cases by Gender at Bida (2014 – 2018)

Frequency distribution of MTB cases						
Year	Total Presumptive Cases			MTB Detected		
	Total	Male	Female	Total	Male	Female
	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)
2014	109	45 (41.3)	64 (58.7)	25 (22.9)	13 (52.0)	12 (48.0)
2015	700	358 (51.1)	342 (48.9)	104 (14.9)	75 (72.1)	29 (27.9)
2016	1230	619 (50.3)	611 (49.7)	135 (11.0)	73 (54.1)	62 (45.9)
2017	865	454 (52.5)	411 (47.5)	127 (14.7)	80 (63.0)	47 (37.0)
2018	2104	1086 (51.6)	1018 (48.4)	167 (7.9)	107 (64.1)	60 (35.9)
	5008	2562 (51.2)	2446 (48.8)	558 (11.1)	348 (62.4)	210 (37.6)

Table 2: The Distribution of PTB Cases by Age in Bida (2014 – 2018)

Year	Total cases	Age groups (Years)			
		0 – 20 No (%)	21 – 40 No (%)	41 – 60 No (%)	>61 No (%)
2014	25	1 (4.0)	20 (80.0)	3 (12.0)	1 (4.0)
2015	104	1 (15.4)	60 (57.7)	23 (22.1)	5 (4.8)
2016	135	18 (13.3)	83 (61.5)	30 (22.2)	4 (3.0)
2017	127	7 (5.5)	83 (65.4)	30 (23.6)	7 (5.5)
2018	167	20 (12.0)	92 (55.1)	42 (25.2)	13 (7.8)
	558	62 (11.1)	338 (60.6)	128 (22.9)	30 (5.4)

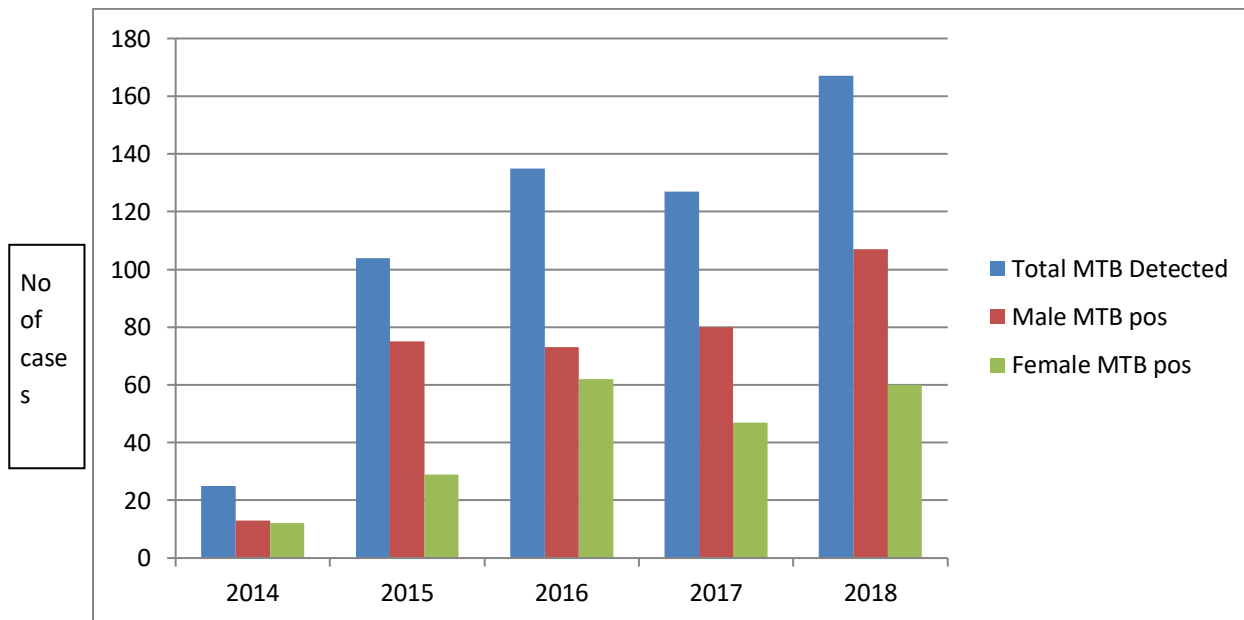


Figure 1: Showing the Distribution of MTB Detected Patients by Gender in Bida (2014 – 2018)

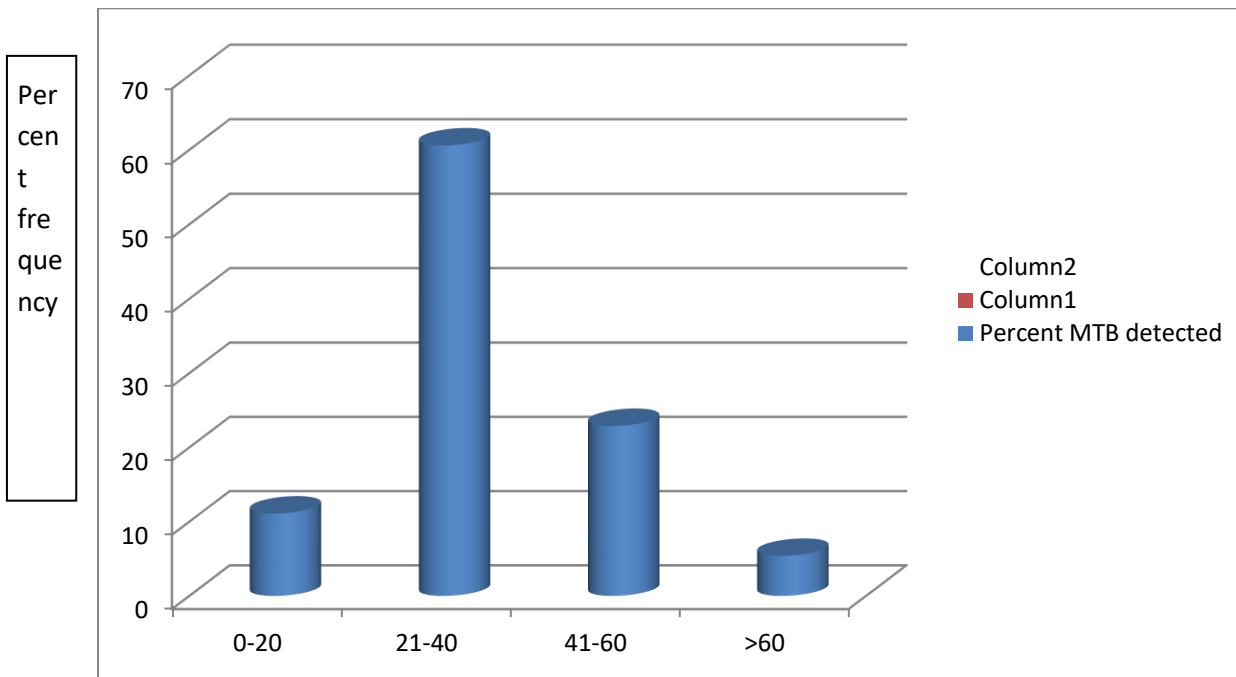


Figure 2: Showing Percentage Frequency of PTB by Age in Bida (2014-2018)

DISCUSSION

Nigeria is one of the 30 high Tuberculosis burdened nations. The estimated incidence of TB in Nigeria was 418 per 100,000 population with notification of only 20% in 2017 [21]. For a Tuberculosis control program to be effective, adequate information on prevalence is required.

Prevalence of Pulmonary Tuberculosis was accessed for the period of five years (2014 – 2018) to provide baseline information of TB for the population living in Bida. The Prevalence of Tuberculosis for the period being studied was found to be 11.1%. This is similar to the report of Narang *et al.*, in 2015 who found a prevalence of 13.9% PTB cases (86 out of 620) eligible participants in a survey carried out in Wardha district of Maharashtra, Central India [22]. It is however lower than that reported by Ogbudebe *et al.*, (2015) who found 18.3% cases in southeastern Nigeria [36].

In this study, Pulmonary Tuberculosis was observed to be more common in males than

females. Over the five years period, from 2014 to 2018, we found consistently that prevalence of Tuberculosis is considerably higher among males than females. This may probably indicate that women poorly seek and access Tuberculosis care, making female gender a strong risk factor in PTB development. This result is consistent with the research conducted in Indonesia by Alisjahbana *et al.*, (2006) [23], in China by Mi, et al (2013) [24], and in Australia, Dobler *et al.*, (2012) [25]. Many other researchers also discovered PTB patients with male gender to be higher when compared with females [26-29]. We observed a gender ratio of 1.7:1.0 (Male: Female) among all the TB cases found. This is similar to the observation in several other countries [30]. Biological mechanism, social and ethnic factors that lead to differences in access to health services have been implicated as possible reasons for variances in gender susceptibility to Tuberculosis [31].

The distribution of TB by age showed that TB was most common in the 21-40 years age group in this study. Consistently all through the years (2014 – 2018), TB was found preponderantly among the economically active age group 21 – 40 years. Overall, 60.1% of the TB cases were found among this age group 21 – 40 years in this study. This finding is in support of other findings in Nigeria, Kenya and India [32-34]. In contrast, in Cambodia, China, and Vietnam, the age group most affected was 65 years and older, followed by 45 – 54 years age whereas in this study, 60 years and older were the least affected year by year from 2014 to 2018 followed by the children between 0 – 20 years age group [35]. The reason for these differences is unclear. It may be due to differing levels of economic, immunity and spread of TB occurring in these nation states, also dynamism in the different age group, staying in crowded community and very mobile age group, this factors can increase the rate of community transfer to the individuals in this age group. Age distribution in this study indicates that TB increased with age to a peak at about 40 years and then declined also as age advanced which is in support of the work of Ogbudebe *et al.*, [36].

This study revealed that gender has a significant association ($X^2 = 29.964$ and $P=0.000$) with prevalence of tuberculosis. A significant correlation was also observed between age and prevalence of tuberculosis ($X^2 = 71.735$ and $P=0.00$). This indicates that gender and age are statistically strong risk factors in developing pulmonary tuberculosis.

CONCLUSION AND RECOMMENDATION

Overall, this study has demonstrated that TB is a major problem in Bida, North Central Nigeria and requiring further strategies of TB central efforts for control and

prevention. Tuberculosis is affecting all ages in Bida with the most economically active age group being the highest. Pulmonary tuberculosis prevalence is considerably higher among males than females, probably indicating that women poorly seek and access TB care.

National Tuberculosis programs and worldwide policies should employ it as a duty to see men as less served high risk individuals and then increase the access of women to TB diagnostic services to mitigate the burden of TB more efficiently and make sure there is gender equity in Tuberculosis care. Efforts should also be stepped up toward discovery of vaccines that will be effective in TB prevention if breakthrough to end TB epidemics must be realized.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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