TUBERCULOSIS AND ASSOCIATED RISK FACTORS: A 5-YEAR REVIEW IN A TERTIARY HOSPITAL, KADUNA, NORTHWEST NIGERIA

Modupe Arinola Ogunsina

Department of Medicine, Barau Dikko Teaching Hospital, Kaduna State University

Email: arinolaprecious@yahoo.com

ABSTRACT

Background*: There has been different strategies in the eradication of tuberculosis worldwide and the different risk factors contributing to its occurrence need to be identified and corrected. This study set out to review and identify associated risk factors affecting the outcome of tuberculosis (TB) in a tertiary hospital in Kaduna, Nigeria.*

Method: *A retrospective study among patients treated for tuberculosis using the TB treatment national registers and patients' treatment cards between January 2015 and December 2019 in a tertiary hospital, Kaduna state, North- West Nigeria. The age, sex, marital status, occupation and clinical characteristics (category of patient, HIV status, TB diagnostic category, and treatment outcome (cured, treatment complete, died, defaulted, and treatment failure) were the variables of interest. Data were coded, cleaned, analyzed and summarized using frequencies and percentages; bivariate and multivariate analysis were done with statistical significance set at p <0.05 at 95% confidence level using SPSS IBM version 23.*

Result: *A total of 1573 cases were enrolled during this period consisting of 992 (63.1%) males and 581 (36.9%) females. Their mean age was 35.78 ± 15.49 years with the age group 21-40 years 815 (51.8%) being most affected. Majority 1421 (90.3%) were new with a treatment success rate of 88.1%. Bivariate analysis revealed that age >40years (p=0.00), positive HIV status (p=0.00) and extrapulmonary site (p=0.02) negatively affected treatment outcome.*

Conclusion: *The study showed that the treatment success rate was high in this facility and older patients, coinfection with HIV and extrapulmonary site of TB was associated with poor treatment outcome. Therefore, greater attention should be placed on these at-risk patients.*

Key Words*: Tuberculosis, drug sensitive tuberculosis (DST), human immunodeficiency virus (HIV), outcome, directly observed treatment short course (DOTs).*

INTRODUCTION

Tuberculosis (TB), a bacterial infection which constitutes a significant health issue among infectious diseases, results from the inhalation or ingestion of the tubercle bacilli, *mycobacterium tuberculosis* (MTB) and is the 9th leading cause of death worldwide[1,2,3]. It primarily affects the lungs to cause pulmonary TB (PTB) but could also affect other body organs (extrapulmonary - EPTB). Due to the global importance and efforts to stop the transmission of this disease, diagnosis needs to be prompt and accurate which can be done using the WHO recommended genexpert MTB/RIF test, a fully automated diagnostic molecular test employing the use of polymerase chain reaction. It has a high specificity and sensitivity in making the diagnosis[4]. Despite this recommendation, the Ziehl-Neelsen staining technique of sputum using the alcohol and acid-fast staining with microscopy method, is still the major diagnostic method in some resource poor settings[5]. Other ways of diagnosis are imaging study, biopsy of tissue specimen or a combination of these.

In 2016, 25% of global TB cases were found in Africa with Nigeria having an incidence of 219 per 100,000 population accounting for 4% of the global TB incidence[4,5]. Only 15% of the total burden of the disease in the country were notified though about 429,000 people were reported to have TB each year[5,6]. In 2013, 9 million incident cases worldwide were reported of which 13% had HIV with the highest TB/HIV coinfection rate of 34% seen in Africa[7]. By 2019, the cases had risen to about 10.0 million people though the WHO report of 2020 noted a decline[8,9]. By 2013, Nigeria had 3.4 million people with HIV, with an approximate 570,000 having TB/HIV co-infection[10]. She ranked first in Africa and sixth globally among the 30 high TB burden countries and is also among the 14 countries in the world with high burden of TB, TB/HIV and MDR-TB[8]. In 2016, TB was responsible for an estimated 1.3 million and 374,000 deaths among HIV-negative and HIV-infected people (PLHIV) [3]. By 2019, WHO noted a slight reduction in TB deaths to an estimated 1.2 million among HIV-negative people, though the developing region of the world like Nigeria still have challenges of effectively eradicating and stopping TB[7,11]. These challenges include poverty, overcrowding, lack of infrastructure like genexpert machines, trained man power, poor knowledge of the disease causing late presentation and therefore late diagnosis[8].

The HIV epidemic has had significant effects on the worldwide TB prevalence, and it increases the risk of developing TB 30 times in co- infected clients[9,12].

If detected early, TB is curable and transmission preventable using the WHO guideline of a 6-month drug regimen of four drugs which includes rifampicin, pyrazinamide, isoniazid and ethambutol for 2 months (intensive phase), and rifampicin, isoniazid with or without ethambutol for the continuation phase[3,9]. A treatment success rate of 85% or more could be achieved if the patients' compliance to treatment are closely monitored in the directly observed therapy (DOT) programme[7]. The DOT supervision is also important in preventing the emergence of resistant strain of the MTB organism from poor compliance to treatment plan. Hence, several cure rates have been documented worldwide, with WHO reporting a global rate of 85% among new cases and several authors in Nigeria had various rates ranging from 43.7% in Ilorin in the North central region to 81.4% in Imo in the Southeast[8,13,14,15]. Thus, the aim of this study is to assess the pattern of TB treatment outcome and factors influencing them among TB patients treated in a tertiary hospital in Kaduna State, Nigeria.

METHODOLOGY

A retrospective study of patients diagnosed with tuberculosis from January 2015 to December 2019 carried out in a tertiary hospital in Kaduna State, North-West Nigeria. The hospital is a major referral center with a directly observed treatment short-course (DOTs) TB clinic which provides services inclusive of counseling, diagnosis and treatment of self-reporting and referral patients and also outreach services to educate and diagnose TB in the community. The hospital laboratory has facilities that enable it carry out basic test for diagnosis of TB like microscopy for alcohol and acid fast bacilli (AAFB), chest x-rays, genexpert MTB/RIF assays and other ancillary tests. In addition, it offers HIV counselling and screening for all TB patients and treatment as needed.

The TB treatment national registers and patients' treatment cards were the sources of the data used. The background characteristics (age, sex, marital status, occupation and, clinical characteristics (category of patient, HIV status, TB diagnostic category, and treatment outcome (cured, treatment complete, died, defaulted, and treatment failure) were the variables of interest according to the WHO and National Tuberculosis and Leprosy Control Programme (NTBLCP) classifications of TB treatment outcome[16,17]. These were further grouped into successful (patients who were cured and completed treatment) and unsuccessful(patients who defaulted, failed treatment and died) treatments[13,14].

The abstraction forms were cross-checked for completion. Data were coded, entered, and cleaned using SPSS IBM version 23 statistical software for analysis.

Data were summarized using frequencies and percentages to describe background characteristics, clinical characteristics, and treatment outcomes. Bivariate and multivariate analysis were done with statistical significance set at p <0.05 at 95% confidence level.

Ethical approval was obtained from the ethical review committee of the hospital.

RESULT

There were 992 (63.1%) males and 581 (36.9%) females. Majority of the patients 815 (51.8%) were in the age group 21-40 and their mean age was 35.78 ± 15.49 years. Most of them 1274 (81.0%) were HIV negative, 1301 (82.7) with pulmonary TB and 1421 (90.3%) being new cases of the infection as shown in table 1.

Table 1: Sociodemographic characteristics of tuberculosis patients in Kaduna, 2015 -2019

Variables	(n-1573)	Percentage (%)
Gender		
Male	992	63.1%
Female	581	36.9%
Age (Years)		
≤20	262	16.7
21 - 40	815	51.8
41 - 60	392	24.9
61 - 80	97	6.2
81+	7	0.4
Mean age	Mean age 35.78 ± 15.49 years	
HIV		
Positive	299	19.0%
Negative	1274	81.0%
Site		
Pulmonary	1301	(82.7%)
Extrapulmonary	272	(17.3%)
Registration group		

New	1421	(90.3%)
Relapse	93	(5.9%)
Treatment after loss to follow-up	17	(1.1%)
Previous treatment	40	(2.9%)

More than half of the patients were cured 809 (51.4%), 577 (36.7%) completed their treatment making a total of 1386 (88.1%) having successful outcome (cure and completed treatment) while 42 (2.7%) failed treatment and 127 (7.9%) died as shown in table 2.

Table 2: Outcome of treatment of tuberculosis patients in Kaduna, 2015 -2019

Treatment outcome		
Cure	809	(51.4%)
Treatment completed	577	(36.7%)
Died	127	(8.1%)
Treatment failed	42	(2.7%)
Lost to follow	9	(0.6)
transfer	9	(0.6)
WHO treatment Guide		
Successful	1386	(88.1%)
Unsuccessful	187	(11.9%)
Infection by years		
2015	264	(16.8%)
2016	319	(20.3%)
2017	331	(21.0%)
2018	310	(19.7%)
2019	349	(22.2%)

As shown in Fig 1, there was a steady rise in the number of cases treated over the 5-year period except for 2018 where there appeared to be a little drop.

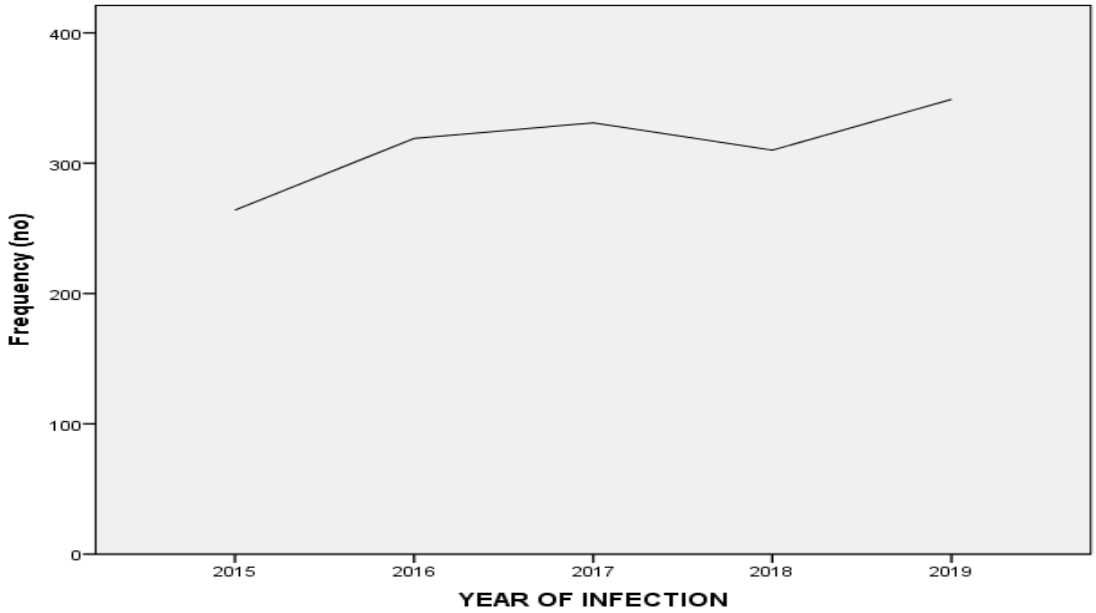

Fig. 1: Graph of number of cases per year in Kaduna, 2015 - 2019

In the bivariate analysis, the gender of the patients did not statistically affect their outcome as noted in table 3.

Table 3: Bivariate analysis of predictor variables of treatment outcome among tuberculosis patients in Kaduna, 2015-2019.

Variables	Successful	Unsuccessful	P-value	Odds ratio
Sex				
Male	871 (87.8%)	121 (12.2%)	0.748	0.94 (0.68 – 1.29)
Female	514 (88.5%)	67 (11.5%)		
Age				
<40	981 (91.1%)	96 (8.9%)	0.000	2.33 (1.71 – 3.17)

≥40	404 (81.5%)	92 (18.5%)		
HIV status				
Positive	243 (81.3%)	56 (18.7%)	0.000	0.50 (0.36 -0.71)
Negative	1142 (89.6%)	132 (10.4%)		
TB classification				
Pulmonary	1157 (88.9%)	144 (11.1%)	0.023	1.55 (1.08 -2.24)
Extrapulmonary	228 (83.8%)	44 (16.2%)		

Multiple logistics regression revealed that age, pulmonary site of infection and HIV status were significantly associated with treatment outcome (Table 4).

Table 4: Logistic regression analysis of predictor variables of treatment outcome among tuberculosis patients in Kaduna, 2015-2019.

Variables	Successful	Unsuccessful	AOR	95% CI	p-value
Age					
≤40	981	96	10.222	0.807-129.425	0.007
>40	404	92	Ref		
Sex					
Male	840	106	0.874	0.563-1.358	0.549
Female	495	61	Ref		
TB classification					
Pulmonary	1127	126	8.606	4.684-15.813	0.000
Extrapulmonary	208	41	Ref		
HIV co-infection					
Positive	234	53	0.290	0.181-0.464	0.000
Negative	1097	110	Ref		

The odd of successful treatment was 10 times as great in patients below 40years than in those 40 years above (AOR; 10.2, 95%CI 0.8-129.4, P<0.01), likewise, PTB patients had 8.6 times higher chance of

favorable treatment outcome compared to extrapulmonary TB patients (AOR; 8.6, 95% CI 4.6-15.8, P=0.00).

DISCUSSION

This study showed that there were more males than females which supports what had been noticed of patients treated for TB in Nigeria and also worldwide as documented in the WHO report of 2020 where 56% of the adults with TB were men and 32% women[8,18,19].

However, 1207 (76.7%) were in the age groups 21-60 years which is the economically active and productive age range. This was also noted by Duru et al. in Imo and some other authors[8,12,15]. This calls for active surveillance and early detection since they are more likely to interact with several other people at work, in the community and during socialization thereby spreading the disease and hindering the end TB target.

Moreover, 1274 (81.0%) were noted to be HIV negative and 299 (19%) HIV positive. This was exactly as noted in Zaria (19.1%) a different local government in the same state[20]. Similar co-infection rate was reported in Maiduguri (19%) and as high as 42.7% in Abuja where significant negative effects of HIV were demonstrated in their outcome[19,21]. Several reports have noted TB to be a cause of high mortality and morbidity among HIV clients therefore, efforts must be put in place to identify this group of patients for early commencement of treatment of both diseases.

Among those treated during this period, 1421 (90.3%) were new cases as was noticed also in Ethiopia and globally and majority of the cases 1301 (82.7%) were those with PTB[22,23,24].

There was a very low rate of default 9 (0.6%) noted among them similar to that in Northwest Ethiopia where a rate of 0.5% was reported[25] as against several rates noted earlier in Nnewi (28.2%)[26] even as high as 44.2% in Ilorin though this was a much older research (2003)[14]. The low default might be as a result of effective follow up under the DOTS programme wherein tracking and tracing of patients that have missed their appointments are swiftly done. Improvement in patient education of the disease, which is part of the objectives of DOTS, could also be responsible for this low default rate[27].

Though the cure rate was 51.4%, the overall success rate (cure plus completed treatment) was 88.1%. Various success rates have been reported from Nigeria with Ekiti reporting 93.0%[28], Duru in Imo (81.4%)[14], Oyefabi in Zaria (80.2%)[19], Rasaq in Ibadan (79%)[29]. Other parts of the world like India had (84.6%)[30], Addis Ababa (82.7%)[31] and in some other developing countries ranging from 34 to 85% [32,33]. These high success rates noted might be attributed to the effective monitoring via the DOTS

programmes which is in line with the WHO defined target of 85% for new cases[7,8]. This can be made even better with improvement of monitoring, adequate education of patients and monitoring of side effects among many other things.

The death rate of 8.1% (127 patients) was similar to that noticed in Northeast Ethiopia (8.1%) and Zimbabwe (8.7%)[34,35] but lower rates were seen in Imo (6.5%), Ethiopia (2.9%) and Addis Ababa (4%)[15,22]. The high death rate might be due to the late presentation, co-infection with HIV and advanced age of some of the patients which are significant causes of mortality.

It was noticed that there was a steady rise in the number of cases over the years studied except for 2018 where there was a slight drop. The increase in the cases of TB was also noted by WHO though the report of 2020 noted a slight drop in the cases. This rise might be multifactorial including an increase in rate of infection in the community or increase awareness and diagnosis of the disease and several other causes. All effort must be put in place to increase awareness of the disease in the community, its mode of transmission and free treatment in other to increase the early detection rate and thereby reducing the transmission to other individuals.

This study found that age more than 40years and site of infection (extrapulmonary) ($p<0.00$ and $p<0.02$ respectively) were predictors of a poorer treatment outcome for the disease. This underscores the need for adequate attention to the elderly especially in the face of other comorbidities and medications they might have and extrapulmonary cases since it is also more difficult to declare them bacteriologically cured.

Importantly also was co- infection with HIV significantly affecting the success rate of treatment negatively as earlier documented ($p<0.00$)[8,13]. A study in Abuja showed that TB patients that were coinfected with HIV had higher risk of treatment failure and default as was also seen in Brazil[19,36].

There was no significant difference noted in the outcome between males and females ($p=0.75$) in this study.

LIMITATION

The study was limited by some few missing records and some incomplete demographic variables for analysis being a retrospective study.

CONCLUSION

The study showed that there was a high treatment success rate during the period of study and low mortality. The older age groups, those coinfected with HIV and extrapulmonary TB had significantly poorer outcomes but the gender of the patients did not significantly affect the treatment outcome. Efforts should be made to increase awareness of TB, early diagnosis and treatment and more attention should be put on patients at higher risk of poor treatment outcomes.

Conflict of Interest: The author declares that there is no competing interest.

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