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ORIGINAL ARTICLE

TREATMENT OUTCOMES OF TUBERCULOSIS PATIENTS AT EKITI STATE UNIVERSITY TEACHING HOSPITAL, NIGERIA

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ABSTRACT

Introduction: *Tuberculosis (TB) is a major public health challenge in developing countries. Clinical audit of treatment outcome is a major indicator of the performance of the TB control programme.*
Objectives: *The aim of this study was to evaluate tuberculosis treatment outcomes and associated factors among patients attending the directly observed tuberculosis short-course (DOTS) facility in a tertiary healthcare center in Nigeria.*
Methods: *An eight-year retrospective study of registered TB patients from October 2008 to November 2016. The treatment outcome of patients was categorized using the national TB Control programme guideline.*
Results: *A total of 592 complete patients' records were reviewed. There was a slight male preponderance (322, 54.4%) and their mean (SD) age of registered patients was 38 (± 0.6) years. Most of the TB cases were newly diagnosed (537, 90.7%) and four hundred and three patients (68.1%) had successful treatment outcome. Pulmonary tuberculosis (520, 87.8%) and (72, 12.2%) extra-pulmonary TB (EPTB) were as reported. More than half of the PTB patients (339, 65.1%) had smear-positive PTB, while (181, 34.8%) smear-negative PTB. Predictors of unsuccessful TB treatment outcome were EPTB (OR 11.4 CI 2.30-57.5 p-value=.003) and TB/HIV co-infection (OR 0.08 CI 0.025-0.24 p = .0005). TB/HIV co-infection accounted for 13% of patients and this was found to be associated with female gender (OR 2.5 CI 1.48-4.22, p-value≤.0001) and EPTB (OR 0.2 CI 0.27-12.90, p-value=.032).*
Conclusion*: An unsatisfactory treatment success rate was observed in this study. There is an urgent need to address cases lost to follow-up and properly collaborate in the TB/HIV programme.*

INTRODUCTION

Tuberculosis (TB) is a major public health challenge, with high incidence in the developing countries including Nigeria (1,2). Following the TB global emergency declared in 1993 by the World Health Organization (WHO), it has become one of the top ten leading cause of mortality and morbidity globally (3-5). The global tuberculosis report of 2019 estimated 10 million new tuberculosis cases and 1.5 million TB-related deaths (5,6). Nigeria has the highest TB incidences in Africa and contributes to the major new cases of TB diagnosed globally (6).

The re-emergence of TB has resulted in the implementation of the standardized directly observed treatment, short-course (DOTS) in the Stop TB Strategy to scale up TB prevention and control in 1993 [7]. This was reviewed as the goal to achieve 85% successful treatment outcomes in TB patients was set by the WHO in 2008 using strategies such as ensuring drug adherence and completion of anti-TB drugs by patients under the supervision of healthcare worker or treatment supporters (8,9).

Favourable reports on the DOTS programme have been recorded in many countries including poor-resource settings, however, there has been variable successes in some African countries including Nigeria (10,11). Despite the implementation of the DOTS programme in Nigeria since 2001, with over 3000 DOTS centers across the nation, approximately 460,000 new cases of TB are still been reported annually. Hence, there is a need for an evaluation of the treatment outcome in every facility (12,13).

The current initiative by the WHO is the END TB strategy, aimed at reducing the death rate in TB patients by 90% by the year 2030 (14). According to the WHO in the 2019 global reports on tuberculosis; the estimated incidence of TB in Nigeria was 219 per 100 000 population with only 24% of the total burden of the disease in the country being notified in 2018 (6). Several studies conducted in different regions of Nigeria have evaluated the effectiveness of the DOTS programme but only a few focused on the treatment outcome of the disease. (9,11,15).

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Moreover, the TB/HIV co-infection rate and its association with TB treatment outcomes have not been assessed at our DOTS center as a part of the auditing service. Thus, this study was conducted to evaluate TB treatment outcomes, determine the prevalence of TB/HIV co-infection and the predictors of treatment outcome at the Ekiti State University Teaching Hospital (EKSUTH), Ado-Ekiti, Nigeria.

PATIENTS AND METHOD

Study design: This is a cross-sectional study with data collected retrospectively on all registered TB patients from October 2008 to November 2016.

Study setting: The study was conducted in EKSUTH, a tertiary health center located in Ado-Ekiti, south western, Nigeria. The DOTS center at the hospital operates in agreement with National TB and leprosy programme of Nigeria. Sputum specimen of patients that was positive to acid-fast bacilli and/or Xpert MTB/RIF assay was referred to as smear positive PTB patients. Smear negative PTB patients were diagnosed based on clinical features and chest radiographic findings suggestive of tuberculosis. Histopathological test of extra-pulmonary tissues and Xpert MTB/RIF of specimen was used to diagnose EPTB.

Data collection: Patients' treatment outcomes were evaluated according to the six outcome categories recommended by WHO and IUATLD (International Union Against Tuberculosis and Lung Disease). These categories are the cured, treatment completed, treatment failure, loss to follow-up, died, and not evaluated (16).

Data were retrieved from the TB register using extraction sheet designed by the study investigators to capture the study variables which included socio-demographic status, microbiological, radiological and clinical data. The socio-demographic variables included the age, gender, body weight at baseline and monthly follow-up visits. Information on sputum smear microscopy of acid fast bacilli (AFB) and Xpert MTB/RIF (Cepheid., New Jersey, USA) results at baseline as well as completion of treatment were also recorded. Clinical data consisted of the category of TB at the start (new, relapse, lost to follow-up, failure), types of TB (pulmonary or extra-pulmonary), treatment outcome and radiological findings of chest X-ray (CXR).

Statistical analysis

All data were entered, cleared, and analyzed using the SPSS Statistics software package version 25.0 (IBM SPSS). Descriptive data were expressed in proportion, mean and standard deviation. value was set at .05 to indicate a statistically significant difference.

Ethical Consideration

Ethical approval was obtained from the institutional ethical committee of the Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria. Consent waiver was also granted as the study was retrospective which entailed document review. To ensure confidentiality, the data were extracted without any personal identifier.

RESULTS

Socio-demographics of TB patients

A total of 592 tuberculosis patients' record were reviewed. The gender distribution of the patients as presented in Table 1, indicated a slight male preponderance (322, 54.4%) and the mean age of 38 ± 0.6 years. Likewise, the majority of the patients were newly diagnosed of tuberculosis (537, 90.7%) cases. The data distribution based on the site of tuberculosis as presented in Table 1, shows that the majority of the patients (520, 87.8%) had pulmonary tuberculosis while (72, 12.2%) were extra-pulmonary tuberculosis. More than half of the PTB patients (339, 65.2%) had PTB smear positive, while the remaining were (181, 34.8%) smear negative. TB/HIV co-infection cases were 77 (13%).

Table 1: Demographics of TB patients

Variable		Frequency	Percentage (%)
Sex	Male	322	54.4
	Female	270	45.6
Age group (years)	>20	31	5.2
	20-39	328	55.5
	40-59	155	26.2
	60-79	66	11.2
	≥ 80	11	1.9
TB registration status	New	537	90.7
	Relapse	16	2.7
	Failed	4	0.7
	Transferred in	6	1.0
	others	29	4.9
Chest x-ray	Suggestive	208	35.6
	Not suggestive	374	64.4
Site of TB	Pulmonary	520	87.8
	Extra-pulmonary	72	12.2
Type of PTB	Smear+	339	65.1
	Smear-	181	34.8
HIV status	Positive	77	13.0
	Negative	515	87.0
Duration of treatment (months)	≤ 6	314	53.2
	≥ 6	276	46.8

Treatment outcomes

The treatments were in two categories, the first category involved new tuberculosis cases (559, 96.4%) in which oral anti-tuberculosis drugs were administered while the second category involved patients administered anti-tuberculosis drugs and injection due to a relapse or the failure of previous treatments (21, 3.6%). The majority of the cases 580 (98%) were sensitive to the first-line anti-TB treatment drug while 12 (2%) were resistant (rifampicin resistant from Gene Xpert MTB/RIF test).

The mean treatment success rate (TSR) of the 8 years period was 68.1% (403/592) while the cases of treatment failure; loss to follow-up and death were excluded. As presented in Table 2, about half of the cases recorded completed treatments 281 (47.5%), 122 (20.6%) were cured, 140 (23.6%) were lost to follow-up, 10 (1.7%) treatment failed, 37 (6.3%) patients died and 2 (0.3%) were not evaluated.

Table 2: TB treatment outcomes of study participants

Treatment outcomes	Frequency	Total
Successful		403 (68.1)
Cured	122 (20.7)	
Treatment completed	281 (47.5)	
Unsuccessful		186 (31.4)
Loss to follow-up	137 (23.1)	
Treatment failure	10 (1.7)	
Died	37 (6.3)	
Not evaluated	2 (0.3)	

Table 3: Logistic regression analysis showing potential predictors of treatment outcomes

Variables	Treatment outcomes		OR (95%CI)	p-value
	Unsuccessful n (%)	Successful n (%)		
Sex				
Male	2 (9.6)	208 (90.4)	Ref	
Female	17 (8.0)	195 (92.0)	0.6(0.23 – 1.15)	0.276
Age groups (years)				
>20	0	26(100.0)	Ref	0.998
20-39	26(10.0)	234(90.0)	0.000	0.998
40-59	11(10.2)	97(89.8)	0.000	0.998
60-79	7(15.2)	39(84.8)	0.000	0.998
≥ 80	1(12.5)	7(87.5)	0.000	0.998
TB Registration status				
New	32(8.1)	364(87.1)	Ref	
Relapse	1(8.3)	11(87.7)	0.000	0.998
Failed	0	3(100.0)	0.000	0.997
Transferred in	0	6(100.0)	0.000	0.999
Resistant	6(54.5)	5(45.5)	0.000	0.006
Others	0	15(100.0)	0.000	1.000
Type of PTB				
Smear+	19(5.6)	320(94.4)	Ref	
Smear-	22(12.2)	159(87.8)	1.4(0.3 – 6.127)	0.690
Site of TB				
Pulmonary	40(7.7)	480(92.3)	Ref	
Extra-pulmonary	17(23.6)	55(76.4)	11.4(2.30 – 57.5)	0.003
Treatment category				
I	32(7.60)	388(92.1)	Ref	
II	1(9.1)	10(90.9)	0.000	0.998
Duration of treatment				
≤6	19(7.9)	223(92.1)	Ref	
≥6	18(9.1)	180(90.9)	1.3(0.55 – 3.38)	0.5000
Chest x-ray				
Suggestive	19(13.4)	123(86.6)	Ref	
Not suggestive	18(5.8)	293(94.2)	0.5(0.12 – 1.92)	0.299
HIV status				
Negative	31(7.5)	384(92.5)	Ref	
Positive	16(20.7)	61(79.2)	0.08(0.025 – 0.24)	0.0005

NB: the calculations excluded unknown cases

Treatment success rate, TB/HIV co-infection and associated factors

Multiple logistic regression analysis in Table 3, shows the associated predictive factors for unsuccessful treatment outcomes as extra pulmonary TB (OR 11.4; 95% CI 2.3 -57.5, p = 0.003), and TB/HIV co-infection (OR 0.08; 95% CI 0.025 -0.24, p = 0.0005).

NB: the calculations excluded unknown cases

As shown in Table 4, findings from this study indicated a significant association between TB/HIV co -infection; female gender (OR 2.5; 95% CI 1.4 - 4.22, p = 0.01) and EPTB (OR 0.2; 95% CI 0.04-12.90, p = 0.032).

Table 4: Logistic regression analysis showing the association between TB/HIV co-infection cases and patients' sex, age and types of TB

Variables		TB/HIV co-infection		OR (95% Cl)	p-value
		Yes n (%)	No n (%)		
Sex	Male	29 (10.9)	237 (89.1)	Ref	
	Female	48 (21.6)	178 (78.9)	2.5 (1.48 – 4.22)	0.001
Age	>20	0	25 (100)	Ref	
	20-39	49 (17.7)	228 (82.2)	0.000	0.999
	40-59	26 (19.7)	106 (80.3)	0.4 (0.41 –3.00)	0.340
	60-79	1 (2.1)	47 (97.9)	0.3 (0.27 -2.7)	0.299
	≥ 80	1 (10)	9 (90)	4.9 (0.27 –89.0)	0.279
Site of TB	Pulmonary	55 (10.6)	465 (89.4)	0.2(0.27 -12.90)	0.032
	Extra-pulmonary	12(25.5)	35 (74.5)	Ref	
Type of PTB	PTB+	43 (12.7)	296 (87.3)	Ref	
	PTB-	34 (18.7)	149 (82.3)	3.4(0.49-23.26)	0.211

DISCUSSION

In this study, the treatment success rate was suboptimal (68.1%), predominantly males and new TB cases who were mostly young adults between the ages 20 and 39 years. The predictive factors for unsuccessful treatment outcomes were TB/HIV co-infection and extra-pulmonary TB site. TB/HIV co-infection accounted for 13% of cases and was particularly associated with female gender and EPTB.

The documented TB cases in our study cuts across all age groups but the highest percentage in the young adults of productive age. Also, these cases were more prevalent amongst the male gender which is similar to findings in other regions in Nigeria (17,18). The energetic and active role of young adults could also explain their exposure to TB which could account for most cases found in this age group.

However, the gender difference in tuberculosis could be due to the involvement of the X-linked genes in the innate and adaptive immune system as well as the protective effects of female sex hormones and the variations in metabolic activities in the defense mechanism (19,20).

In our study, high proportion of new cases (90.7%) were documented which was similar to other related studies (90.4% to 98.5%) of new TB cases in Nigeria (18,21). This might be due to the increase awareness on the symptomatology and manifestation of TB on the media and high index finding in the medical facilities. Also, patients seeking alternative treatment modalities before presenting at the medical facility and those lost to follow up after slight improvement in their clinical state could responsible for the spread of TB among susceptible individuals (15).

Furthermore, the rise in the prevalence of non-communicable diseases like diabetes mellitus and chronic kidney disease in Nigeria as well as poor socio-economic status, overcrowding, malnutrition, poor ventilation could account for the new cases of TB (12,22).

The TSR from our study of 68.1% was lower than the WHO target set for the Millennium Development Goal (MDG) of 85% and the milestone target set globally for 2025 of > 90% (23, 24). Likewise, it is also lower than the national report and some previous studies in Nigeria which treatment success rate ranges between 75.7% and 80.2% (5,22-25). Similarly, numerous African studies have also reported suboptimal TSR in South Africa (80%-82.2%) [25, 26]; Uganda (39%) (27); Zimbabwe (70%) (28); and Nigeria (57.7%) (29).

This sub-optimal treatment success rate is due to the high cases of loss to follow-up observed in our study. Although, the sparse distribution of housing scheme with few occupancies could reduce the transmission of this airborne disease within our locality, the need to complete the treatment would further improve the treatment outcome.

The prevalence of HIV amongst the TB patients was 13% in our study. However, the global tuberculosis report of 2019 reported prevalence of TB/HIV co-infection of 24.7% in Africa (6). The lower prevalence in our study could be explained by the reason of our center is situated in a region with lowest prevalence of HIV/AIDS (0.7%) in the country as HIV is a major risk factor for the development of TB (30).

Furthermore, patients with EPTB also had higher probability of unsuccessful treatment outcomes when compared with pulmonary TB cases. This difference in the treatment outcomes could be due to the comorbidities like HIV which often coexist with EPTB and issues with medication adherence due to the prolonged duration of treatment and the resultant unfavourable outcome (31,32).

Conclusion

The treatment success rate in the study was lower than the national and global target. This indicates a need for proper follow-up and integration of TB/ HIV control programmes with proactive measures in the intensified screening process towards improving the treatment outcome of tuberculosis.

Limitation

This study has a limitation of being based on retrospectively collected data. However the audit of the control programme would help improve our practice and intensify efforts on the lost patients with the aim of reducing the disease burden.

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Competing Interest

The authors declare that this manuscript was approved by all authors in its current form and that no competing interest exists.

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