Original Research Article

DETERMINANTS OF SUCCESSFUL TUBERCULOSIS TREATMENT OUTCOME IN A STATE UNIVERSITY TEACHING HOSPITAL IN SOUTH EAST, NIGERIA: A 5 YEAR RETROSPECTIVE STUDY.

Abstract

Aim: The 2018 World Health Organization Global Tuberculosis Report enlisted Nigeria as one of the seven countries worldwide that accounted for 64% of all new cases of tuberculosis. The aim of this study was to assess the magnitude and determinants of tuberculosis treatment outcomes at a Tertiary Hospital in South East, Nigeria.

Study design: Retrospective cohort

Place and Duration: The Enugu State University Teaching Hospital Directly Observed Treatment Center, between April 2009 and March 2013.

Methods: Completely filled data were extracted from tuberculosis treatment cards and registers of 445 clients (255 males, 190 females; age range 0-90 years) who assessed care at the DOTS clinic. Tuberculosis treatment success outcome is defined as cured or completed TB treatment.

Results: Of 445 registered patients, majority were males (57.3%), lived in urban areas (68.1%), and were newly diagnosed (97.8%). Of the 93.7% with pulmonary tuberculosis, 62% were smear negatives cases (62%). While the male to female ratio of the clients was 1.3:1, their mean age was 42 ± 16.7 years. About half (50.6%) had chest x-ray findings that were not diagnostic of Tuberculosis. While TB/HIV co-infection rate was 32.8%; 16% and 19.3% had commenced anti -retroviral and co-trimoxazole preventive treatment respectively.

Treatment success was reported in 67.9% of all clients and was associated with being older than 14 year (AOR=12.0, 95% CI: 2.5 – 58.0) and having positive chest findings (AOR = 2.6, 95% CI: 0.3-0.6).

Conclusions: The TB success rate in was 67.9% Being older than 14 years, having PTB and positive chest x ray findings were the predictors of good treatment outcome in this study. There is an urgent need to track and report the treatment outcome of patients who are lost to follow up since they constitute 20% of missed cases in this center.

Keywords: Tuberculosis, treatment outcomes, Nigeria, Tertiary hospital

Introduction

Tuberculosis (TB) is a preventable and curable air borne bacterial infection that primarily affects the lungs. [1] It is one of the top ten causes of death worldwide and a major killer of people living with HIV. [2] Over 95% of all deaths occur in Asia and Africa as a result of wide spread poverty, poor living conditions with high population density, and reduced immunity especially from HIV/AIDS. [3-4] It is among the top 5 causes of deaths among women aged 15- 44 years and children below 15 years. [5-6] In 2018, there were 10 million recorded cases of tuberculosis and 1.3 million deaths of which 0.3 million were attributable to HIV globally. [2] An estimated 54 million people were saved through diagnosis and treatment between 2000 and 2018. [2] It is therefore imperative that national notification and vital registration systems be strengthened towards the goal of direct measurement of TB incidence and mortality in all countries. [2]

Nigeria, with an estimated population of 180 million people, has a huge burden of tuberculosis. The 2018 World Health Organization Global Tuberculosis Report enlisted Nigeria as one of the seven countries worldwide that accounted for 64% of all new cases of tuberculosis with an estimated tuberculosis incidence and mortality rates of 219 and 63 cases per 100000. [2] While 14% of all TB patients were HIV positive, 85% were on antiretroviral therapy and 39% of all HIV positive people newly enrolled in care were on TB preventive treatment. [2] The treatment success rate for new and relapsed TB cases registered in 2017 were 86% and 77% in HIV positive TB cases. [7]

Tuberculosis treatment outcome varies significantly within countries, nearby localities and treatment centers. Factors that have been reported to influence successful treatment outcome in studies include sociodemographic, clinical, diagnostic, presence of co-morbidities, sputum smear results prior to treatment, delay in treatment, radiographic findings as well as hospitalizations. [8] Due to the highly infectious nature of TB there is need to screen all symptomatic patients and monitor their treatment at various DOTS centers in order to improve treatment outcomes. This study was aimed at accessing the pattern and determinants of TB treatment outcomes among patients that were seen at a DOTs facility at the Enugu State University Teaching Hospital between 2009-2013.

Definition of Terms

Treatment Outcome. The treatment outcome was divided into six categories according to Nigeria National Tuberculosis and Leprosy Control Programme (NTLCP) guideline.[9] These categories were as follows:

(i) *Cured*. Finishing treatment with negative bacteriology result at the end of treatment.

(ii) *Completed Treatment*. Finishing treatment but without bacteriology result at the end of treatment.

(iii) *Failure*. Remaining smear positive at five months despite correct intake of medication.

(iv) *Loss to Follow Up*. Patients who interrupted their treatment for two consecutive months or more after registration.

(v) *Died*. Patients who died from any cause during the course of treatment.

(vi) *Not evaluated*. Patients whose treatment outcomes were unassigned. This includes 'transferred out' when the result is unknown to the reporting unit.

(vii) *Moved to 2nd –line treatment register*. Patients whose clinical isolate became rifampicin resistant at any time during treatment and were moved to second line medications.

In line with WHO criteria, treatment outcomes were categorized into the following:

(i) Successful Treatment Outcome. If TB patients were cured (i.e., negative smear microscopy at the end of treatment) or completed treatment without a bacteriologically confirmed result.

(ii)Unsuccessful Treatment Outcome. If treatment of TB patients resulted in treatment failure (i.e., remaining smear positive after 5 months of treatment), loss to follow up (i.e., patients who interrupted their treatment for two consecutive months or more after registration), or death.

Materials and Methods:

The study was carried out at the Enugu State University Teaching Hospital Parklane Enugu (ESUTH) approved Directly Observed Treatment Center. ESUTH is a state owned health institution that evolved from a nursing home in 1930 for the colonial masters to a teaching hospital status in June 2006. [10] It is located in the capital of old Eastern region, and current Enugu state in south-east, Nigeria, with estimated population of 722, 664 people according to the 2006 National census. [11] ESUTH provides tuberculosis screening, treatment and support at its DOTS center. Diagnosis and treatment of TB patients at the site is in line with

the NTBLCP guidelines. The DOTS center treats both pulmonary and extra-pulmonary TB cases. All presumptive TB cases submit two sputum samples by using early morning and spot approach for sputum smear microscopy as well as HIV screening. In January 2017, gene-Xpert was introduced for diagnosis and is currently the first line of diagnosis.

Study Design

A retrospective cohort review was conducted at the DOTs center of the Enugu State University Teaching Hospital Parklane Enugu using TB registers and treatment cards of 500 patients who accessed TB services between April 2009 and March 2013. Only 445 patients (89%) who had complete records were included in the study, 55 patients were excluded.

Ethical Approval

Ethical approval was obtained from Health Research Ethics Committee of the Enugu State University Teaching Hospital (ESUTH), Enugu.

Data Analysis

Data collected from 445 TB patients was analyzed using IBM Statistical Package for Social Sciences (SPSS) version 22. For the purpose of this analysis, treatment outcome was categorized as favorable (cured and treatment completed) and non-favorable (lost to follow up, died, treatment failure and transferred out with no documented outcome). Descriptive and inferential analysis were carried out using SPSS. While, Bivariate analysis was used to assess the association between tuberculosis treatment outcomes and sociodemographic factors with a cut off p value of 0.05, multivariate analysis was carried out for associating factors with a p value of less than 0.2.

Results:

Table 1 shows the socio-demographic characteristics of the clients. The mean age of the respondents was 42.0 ±16.7years. Majority of the respondents were males (57.3%), lived in urban areas (68.1%) and had pulmonary tuberculosis (93.7%). About half (50.6%) had chest x-ray findings that were not diagnostic of Tuberculosis. While TB/HIV co-infection rate was 32.8%; 16% and 19.3% had commenced anti -retroviral and co-trimoxazole preventive treatment respectively. (Table 1).

Table 1: Characteristics of Tuberculosis Patients

Variables	Frequency (n= 455)	Percent
Gender		
Male	255	57.3
Female	190	42.7
Age of Clients (years)		
0-14	11	2.5
15-24	47	10.6
25-39	160	36.0
40-59	153	34.4
>60	74	16.6
Mean Age of Clients	42.01 ± 16.7	
Location		
Urban	303	68.1
Rural	142	31.9
Type of Patient		
New	435	97.8
Relapse	10	2.2
Site of Tuberculosis		
PTB	415	93.3
EP	30	6.7
Result of Smear test		
Positive	169	38.0
Negative	274	62.0
CXR findings		
Positive	220	49.4
Negative	225	50.6
HIV status		
Positive	146	32.8
Negative	266	59.8
Unknown	33	7.4

ART initiation for HIV positive TB patients	n= 146	
Yes	71	48.7
No	75	51.3
CPT initiation for HIV positive TB patients	n= 146	
Yes	86	59.0
No	60	41.0

CPT- cotmoxazole preventive treatment, ART – antiretroviral treatment, CXR – chest X ray

Table 2 shows that while a quarter of the registered clients (25.4%) had achieved a treatment cure based on bacteriological evidence 42.5% had completed treatment, but had no bacteriological evidence to confirm cure, 20% were lost to follow up, 8.8% had died, 2.9% had not been evaluated (transferred out of the facility) and 0.4% had been moved to 2nd line treatment register. When treatment outcomes were graded as successful or not according to WHO guidelines, about a third (32.1%) of all registered clients had not achieved a successful treatment outcome. (Table 2)

Table 2: Outcome of Tuberculosis Treatment

Variables	**Frequency (n= 455)**	**Percent**
Cure	113	25.4
Treatment completed	189	42.5
Treatment failure	2	0.4
Dead	39	8.8
Loss to follow up	89	20.0
Not evaluated	13	2.9
Treatment Outcome graded into success and non-success.		
Treatment success	302	67.9
Treatment non-success	143	32.1

Treatment success = treatment completed +cure.
Treatment non- success = others

Table 3 highlights the factors and predictors associated with successful tuberculosis treatment outcome. The respondents with positive radiographic chest findings were 2.6 times more likely to have a successful treatment outcome when compared to client's negative chest findings (AOR = 2.6, 95% CI: 0.25-0.58). Also, clients that were older than 14 years were 12 times more likely to have a successful treatment outcome when compared with pediatric clients (AOR=12.0, 95% CI: 2.5 – 58.0)

Table 3: Factors affecting tuberculosis treatment outcomes.

Variables	Tuberculosis Treatment Outcome (n = 455)		P value	AOR (95% CI) on multivariate analysis
	TB Success N (%)	TB non-success N (%)		
Gender				
Male	169(66.3)	86(33.7)	0.405	NA
Female	133(70.0)	57(30.0)		
Result of CXR findings				
Positive	171(77.7)	49(22.3)	<0.001	2.6(0.3 - 0.6)
Negative	131(58.2)	94(41.8)		1
Age of clients				
≥15	300(69.1)	134(30.9)	<0.001	12.0(2.5 – 58.0)
≤14	2(18.2)	9(81.8)		1
Site of Tuberculosis				
PTB (lungs)	278(67.0)	137(33.0)	0.141	1.4 (0.2 - 2.7)
EP (outside the lungs)	24(80.0)	6(20.0)		1
Type of Patient				
New	296(68.0)	139(32.0)	0.722	NA
Relapse	6(60.0)	4(40.0)		

NA means not applicable

Discussion

About 70.4% of all reported cases of TB in this study were more likely to be found in clients between 25-59 years old than other age categories. This is consistent with results from similar studies carried out in high burden countries like Bangladesh, Kenya and India but dissimilar to results from some Asian countries like China, Vietnam and Cambodia that reported more cases of TB among elderly patients.[12-15] Even though this finding is suggestive of a very high burden of TB among the economically productive segment of the population, this prevalence could be justified by the fact that this group is sexually, physiologically, socially and behaviorally active and may freely interact with other infectious individuals.

Less than half (38.0%) of all patients had a smear positive finding in this study. However, all smear positive patients in this study had a successful treatment outcome. This finding is in accordance with similar studies carried out by Ogbudebe et al in Abia State, but dissimilar to findings from a study carried out in Zaira where more smear negative patients were more likely to have better treatment outcomes. [16-17] This difference could be accounted for the high sero-conversion rates that occurs soon after commencement of anti- tuberculosis medications in these patients.

In this study, successful treatment outcome categorized as clients who were cured and or completed treatment was recorded as 67.9 %. This is lower than the National Tuberculosis Leprosy Control Program and the WHO target of 85%. The finding of this study is similar to results reported from Ethiopia with a treatment success rate of 60.1%.[18] Similar studies from countries like South Africa, Somalia, Zaira, and states in Nigeria like Oyo and Imo states with success rates of 80%, 81.8%, 80.2% 76.9% and 81.4% respectively, also did not achieve the WHO recommended treatment success rates. [19,3,17,20,8] However, studies from the USA, Afar State in Ethiopia and Abia State in Nigeria revealed that they achieved the WHO treatment success rate of 97.8%, 86.8% and 88.5%. [22,21,16] The high success treatment rate in these countries could be because health care workers were on hand to directly observe

clients taking their medications while the poor outcome in this study could have arisen from the exclusion of transfer-out patient since large numbers of transfer out patients could compromise the treatment success rate as this group was included in the denominator.

This study revealed that one third of all TB patients were HIV positive (32.8%). This is significantly greater than national results obtained from the WHO Global Report of 2018 with a rate of 14%.[2] While, this result is consistent with findings from Chad and Tanzania with co-infection rates of 33.2% and 43.6%, [23,24] it is dissimilar from findings from Maiduguri in Northern Nigeria, Thailand, Brazil, and Kelantan in Malaysia with co-infection rates of 19%,19%, 13%, and 12% respectively [17, 25,26,27,] This finding from this study could be related to immune reconstitution syndrome (IRIS), pill burden, increase in adverse events and drug- drug interactions.

Patients who were more than 14 years of age were about 12 times more likely to have successful treatment outcomes. While, this finding is collaborated by a hospital-based study carried out in Egypt and Pakistan whereby patients older than fifteen years of age had the favorable treatment outcome (p value <0.05), it is dissimilar to findings from other studies where the pediatric age category had better outcomes than the older population. [28, 29, 17] The poor treatment outcome observed in this study could be as a result of the developing immunity or nourishment status of this population.

Patients who presented with positive chest x ray findings were found to be about 2.6 times more likely to have a successful treatment outcome when compared with those with negative chest findings. This is similar to a study in Tanzania that found that patients with cavities on chest X ray had better treatment outcomes but dissimilar to a study in Egypt where patients with advanced disease on chest X ray had worse outcomes. A different study in Malaysia revealed no significant associations between patients with chest x ray findings and treatment

outcomes. [30,28,27] This finding could be as result of the different variations in chest X ray interpretation among radiologists and radiographers.

Limitations: Since the data for this study were retrieved from TB treatment cards and registers, this constrained us to using only the information found in the records. However, the Tuberculosis and leprosy (TBL) officers from the local council where the health facility is domiciled and the monitoring and evaluation TB officer at the State ministry of Health routinely cross-check the registers and make recommendations. The unavailability of gene X pert machine and drug susceptibility testing during the study period for definitive diagnosis and management of TB may have impacted on the available results. There was a high rate of clients who were lost to follow up in this study, this may be from poor tracking of cases by the DOTS center staff. Transfer-out patients should have had their results obtained and documented in our registers for future analysis and follow–up.

Conclusion and Recommendations

The TB success rate in this state-owned tertiary facility was 67.9%. This is below the 85% success rate set by WHO and Nigeria NTBLP. Being older than 14 years and having positive chest X ray findings were the only predictors of successful treatment outcome in this study. There is an urgent need to track and report the treatment outcome of patients who are lost to follow up since they constitute 20% of missed cases in this center. A need for yearly clinical audits in this facility is required in order to help the program to systematically improve treatment outcomes and implement appropriate recommendations.

Conflicting Interest

The authors hereby declare that there is no conflicting interest.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request and permission from the Enugu State University Teaching Hospital DOTS treatment center.

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