

Treatment outcomes of new smear positive pulmonary tuberculosis patients under directly observed treatment in Anambra State, Nigeria

Nwachukwu Obiora Ndubuisi^{1*}, Onyeagba Reginald Azu¹, Nwaugo Victor Oluoha¹ and Okafor Anthony²

¹Department of Microbiology, Abia State University, P.M.B 2000, Uturu

²Department of Animal and Environmental Biology, Abia State University, Uturu, P.M.B 2000, Uturu

Abstract

Objectives: Successful treatment of pulmonary tuberculosis patients is the key to tuberculosis control. This study aimed to assess treatment outcomes of newly diagnosed sputum smear-positive pulmonary tuberculosis patients under directly observed treatment, short course (DOTS) in Anambra State, Nigeria and determine factors associated with unsuccessful treatment outcome.

Methods: The prospective observational study was carried out at 3 TB/DOTS centres. A total of 213 newly diagnosed sputum smear-positive pulmonary tuberculosis patients were enrolled into the study. Diagnosis of pulmonary tuberculosis was based on Xpert MTB/RIF test and microscopy. Each patient was treated daily using a 6-month regimen recommended by WHO. For intensive phase, RHZE (150/75/400/275 mg) tablets were given for 2 months. RHZE contains the drugs rifampicin(R), isoniazid(H), pyrazinamide(Z) and ethambutol(E). For continuation phase, RH (150/75mg) tablets were given for 4 months. The patients were followed up till completion of treatment and treatment outcomes recorded as per WHO guidelines.

Results: Out of 213 patients, 181(85%) were cured, treatment completed in 3(1.4%) patients. Overall, treatment success rate was 86.4%. Exactly 24 (11.3%) patients were lost to follow up, treatment failed in 4(1.9%) and 1(0.5%) patient died. Treatment success rate decreased with aging as younger patients (15-24 years old) showed better treatment outcomes (90%) than older patients (≥ 65 years) at 71.4%. Unsuccessful treatment outcomes were more prevalent among unemployed patients (18.8%), with no formal education (17.6%) and married ones (12.6%).

Conclusion: Treatment success rate in Anambra State was 86.4%. Lost to follow up (default rate) was high (11.3%). Aging, occupation and level of education were associated with unsuccessful treatment outcomes. It is therefore important to reduce default in treatment through proper counseling of pulmonary tuberculosis patients at TB/DOTS centres.

Introduction

The global burden of tuberculosis remains enormous as more than two billion people are currently infected by this disease, of which one in ten people with tuberculosis develop active tuberculosis [1]. The incidence rate of tuberculosis in Nigeria was 388 per 100,000 people in 2012 and more than half of them were smear-positive pulmonary tuberculosis [2]. Effective treatment is therefore essential to meet the goals of tuberculosis control and elimination [3].

It is important to achieve acceptable levels of treatment success among tuberculosis patients. Treatment success, therefore, has been measured by the number of patients being "cured" and those having "treatment completed" [4]. The treatment success rate among all new tuberculosis cases was 86% globally [5]. However, a new International target of 90% treatment success has been set for the period 2015-2035 [6].

Tuberculosis control in Nigeria is based on directly observed treatment, short course strategy (DOTS). DOTS is the most widely accepted global health intervention for tuberculosis [9]. Treatment success rate in Nigeria has gradually increased over the last ten years to 86% in 2012, reaching the National target for 2015 [8]. Loss to follow up (default rate) decreased from 13% to 7% and death rate remained relatively low but constant around 5% [8].

Assessing treatment of newly diagnosed smear-positive pulmonary tuberculosis patients is a useful indicator to evaluate effectiveness of interventions [9]. Unfortunately performance of four states in Nigeria is inadequate. These are Kwara, Lagos, Ogun and Anambra States [8]. In Kwara State, treatment success declined to 62% in 2012 while loss to follow up increased to 29%. Lagos, Ogun and Anambra have unacceptably high rate of loss to follow up at 16%, 15% and 21% respectively.

Successful treatment of pulmonary tuberculosis has obvious benefits both to the individual patient and community but poor treatment outcomes has serious consequences of continuing infectivity on the community, development of multi-drug resistant tuberculosis and increased mortality [10,11].

Some factors such as aging, drug abuse, alcohol abuse, HIV/AIDS,

Correspondence to: Dr. Nwachukwu Obiora Ndubuisi, Department of Microbiology, Abia State University, Uturu, P.M.B. 2000 Uturu. Tel: +2348033561693, Email: nwachukwundubuisi82@yahoo.com

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ignorance of what tuberculosis is and poor qualities of medical services affect treatment of outcomes [3,12].

The objectives of this study therefore were to assess treatment outcomes of new sputum smear-positive pulmonary tuberculosis patients at different TB/DOTS centres in Anambra State, Nigeria and determine factors associated with unsuccessful treatment outcomes.

Materials and methods

Study areas

This prospective observational study was conducted at three locations namely Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, Saint Charles Borromeo Hospital (SCBH), Onitsha and Endies Medical Laboratory (EML), Onitsha. NAUTH is a tertiary hospital with specialist care and a referral centre for other peripheral hospital; SCBH is a mission hospital with modern state-of-the art equipment whereas EML is a privately-owned laboratory located at a semi-urban area of Onitsha. All three facilities are integrated with National Tuberculosis and Leprosy Control Programme (NTBLCP) and provide free anti-tuberculosis medicines and services to the public.

Study participants

The study comprises 213 newly diagnosed sputum smear-positive pulmonary tuberculosis patients registered for directly observed treatment at the three TB/DOTS centres viz: NAUTH 113, SCBH 70 and EML 30 patients. Age of the patients ranged from 15 years to 76 years.

We included all newly diagnosed sputum smear-positive pulmonary tuberculosis patients who consented to participate in the study and were aged 15 years and older at the time of data collection. However, patients not willing to participate as well as terminally-ill ones were excluded.

Methods

Diagnosis of new smear-positive pulmonary tuberculosis was based on the National Tuberculosis Guidelines. At NAUTH and SCBH, presumptive TB cases submitted only one sputum sample which was processed directly from Xpert MTB/RIF test according to manufacturer's protocol. Interpretation of data from Xpert MTB/RIF test was software based [13]. At EML, presumptive TB cases submitted 2 sputum samples on the spot, within an hour interval. Smears were stained using Ziehl-Neelsen technique and Acid Fast Bacilli graded according to the recent WHO policy change [14].

All the new smear positive pulmonary tuberculosis patients were followed up at 2nd, 5th and 6th months following chemotherapy. For follow up studies, each patient submitted only one sample.

Pulmonary tuberculosis treatment and outcomes

Each patient was treated daily using a 6-month regimen in line with WHO guidelines [15]. It consists of an intensive phase treatment for 2 months and a continuation phase for 4 months. For the Intensive Phase, RHZE (150/75/400/275 mg) tablets were given for 2 months. RHZE contains the drugs rifampicin (R), isoniazid (H), pyrazinamide (Z) and ethambutol (E). For Continuation Phase, RH(150/75 mg) tablets were given for 4 months. RH contains the drugs rifampicin (R) and isoniazid (H). The number of tablets per dose was given according to a patient's weight (<39 kg: 2 tablets, 40-54 kg: 3 tablets; 55-70 kg: 4 tablets; >70 kg: 5 tablets [16]. A nurse at the TB/DOTS clinics observed patient intake of the medications.

Treatment outcomes were defined in accordance with standard WHO and National Tuberculosis definitions as follows: cured (a pulmonary tuberculosis patient with bacteriological confirmed TB at the beginning of treatment who was smear-or culture-negative in the last month of treatment and on at least on previous occasion), treatment completed (a TB patient who completed treatment without evidence of failure BUT with no record to show that sputum smear or culture results in the last month of treatment and on at least one previous occasion were negative, either because tests were not done or because results were unavailable), treatment failed (a TB patient whose sputum smear or culture is positive at month 5 or later during treatment), died (a TB patient who dies for any reason before starting or during the course of treatment, lost to follow up (a TB patient who did not start treatment or whose treatment was interrupted for 2 consecutive months or more), not evaluated (a TB patient for whom no treatment outcome is assigned [16,17]. This includes cases "transferred out" to another treatment unit as well as cases for whom the treatment outcome is unknown to the reporting unit), treatment success (the sum of cured and treatment completed). Treatment failed, died, lost to follow up, and not evaluated were categorized as unsuccessful treatment.

Data generated were analyzed using descriptive statistics including frequency tables and percentages. Chi-square test was used to compare study groups and $P < 0.05$ was considered significant.

Ethical clearance was obtained from ethical committees of both hospitals. A support letter was obtained from Abia State University to Endie's Medical Laboratories. All patients consented to participate in the study.

Results

A total of 213 new sputum smear-positive pulmonary tuberculosis patients, whose age ranged from 15 years to 76 years enrolled in the study. Majority of the patients (60%) were males, traders (70%) and married (55.9%). More than half (53%) of the patients were enrolled at NAUTH, Nnewi. The age group 25-34 years had more (37.6%) pulmonary tuberculosis patients whereas the least infected (3.3%) were in the age group of ≥ 65 years (Table 1).

The treatment outcomes of the new smear-positive pulmonary tuberculosis patients in this study is presented in table 2. The overall treatment success rate was 86.4%. The summary of the treatment outcomes were as follows: cured (85%), treatment completed (1.4%), lost to follow up (11.3%), treatment failed (1.9%), died (0.5%) and not evaluated (0%).

There was no difference in treatment success rates (86.7 vs. 85.9%) between males and female patients ($p > 0.05$). However, the proportion of treatment success differed at TB/DOTS centres: 87.6% at NAUTH, Nnewi and 80.0% at EML, Onitsha. This difference was not significant ($p > 0.05$).

Treatment success rate decreased with age as younger patients (15-24 years old) showed better outcomes (90%) than older patients (>65 years old) at 71.4%. Unsuccessful outcomes were more prevalent in unemployed patients (81.8%), with no formal education (17.6%) and married (12.6%) as shown in table 3.

Discussion

Successful treatment of new sputum smear-positive pulmonary tuberculosis patients is the hallmark of any intervention. In this study, treatment success rate was 86.4%, which was closer to 87% target among all new sputum smear-positive pulmonary tuberculosis patients

globally in 2013 [5]. But slightly lower than the new International target of 90% set for the period 2015-2035 by the WHO [6]. The treatment success rate in our study was however higher than the rate obtained in other parts of Nigeria: 78.5% in Abuja 77.1% in Ebonyi state [18,19]. Our finding was similar to 84.4% at Debre Berham Hospital Ethiopia [20]. This implies that the quality of DOTS services in Anambra state has improved through time.

The cure rate was 85%, meeting the WHO cure rate of 85% set in 2005 [5]. Our result was higher than 76.6% obtained in similar studies in Ibadan and 61.4% in Abuja Nigeria [11,18]. The care received at this TB/DOTS centres is thought to be superior, given that two of the TB/DOTS centres are tertiary health institutions. The result was also higher than cure rate of 18% in Addis Ababa, Ethiopia and 15.9% at Debre Berham Hospital, Northern Ethiopia [20,22]. The difference was that the participants in the Ethiopian study included both pulmonary and extrapulmonary cases which might have affected the cure rate.

Table 1. Sociodemographic characteristics of new smear- positive pulmonary tuberculosis patients from 3 TB/DOTS centres in Anambra State, Nigeria.

n=213		
Characteristic	MTB/AFB+	%
Gender		
Males	128	60
Females	85	40
TB/DOTS centre		
NAUTH, Nnewi	113	53.0
SCBH, Onitsha	70	32.9
Endie's Lab, Onitsha	30	14.1
Age group (years)		
15-24	30	14.1
25-34	80	37.6
35-44	55	25.8
45-54	27	12.7
55-64	14	6.6
>65	7	3.3
Level of education		
No formal	102	47.9
Primary	64	30.0
Secondary	26	12.2
Tertiary	21	9.9
Marital status		
Single	73	34.3
Married	119	55.9
Divorced/widowed	21	9.9
Occupation		
Trading/Business people	149	70.0
Civil servants	17	8.0
Students	36	16.9
Unemployed	11	5.2

Table 2. Treatment outcomes of new smear-positive pulmonary tuberculosis patients on DOTS treatment in Anambra State, Nigeria.

n=213		
Treatment outcome	No of patients	%
Treatment success	184	86.4
Lost to follow up (default)	24	11.3
Treatment failed	4	1.9
Died	1	0.5
Transferred out	0	0
Cured	181	85
Treatment completed	3	1.4

Table 3. Distribution of treatment outcome by sociodemographic characteristics.

n=213			
Variable	Successful outcome (%)	Unsuccessful outcome (%)	Total
Gender			
Males	111(86.7)	17(13.3)	128
Females	73(85.9)	12(14.1)	85
TB/DOTS centre			
NAUTH, Nnewi	99(87.6)	14(12.4)	113
SCBH, Onitsha	61(87.1)	9(12.9)	70
EML, Onitsha	24(80.0)	6(20.0)	30
Age group (years)			
15-24	27(90)	3(10.0)	30
25-34	73(91.3)	7(8.75)	80
35-44	46(83.6)	9(16.4)	55
45-54	22(81.5)	5(18.5)	27
55-64	11(78.6)	3(21.4)	14
>65	5(71.4)	2(28.6)	7
Level of Education			
No formal	84(82.4)	18(17.6)	102
Primary	56(87.5)	8(12.5)	64
Secondary	56(92.3)	2(7.7)	26
Tertiary	20(95.2)	1(4.8)	21
Marital status			
Single	67(91.8)	6(8.2)	73
Married	104(87.4)	15(12.6)	119
Divorced/widowed	19(90.5)	2(9.5)	21
Occupation			
Trading/Business people	128(85.9)	21(14.1)	149
Civil servants	15(88.2)	2(11.8)	17
Students	32(88.9)	4(11.1)	36
Unemployed	9(81.2)	2(18.8)	11

Lost to follow up (default rate) was 11.3% in Anambra state. This was higher than 8% observed in Ethiopia [20]. The National default rate decreased from 13% to 7% in 2012 but lost to follow up in Anambra state remained unacceptably high at 21% [8]. This finding however, has shown some improvement over time in Anambra State. The high rate of default in the state may be due to poor counseling of patients at DOTS clinics, poor knowledge and attitude towards DOTS. An earlier study in Anambra State identified reason for default in diagnosis as belief in the efficacy of prayer house healing for pulmonary tuberculosis [3]. This reason could also be true for treatment thus contributing to default. To reduce lost to follow up in the state, the authorities should resort to community engagement and proper motivation of staff at DOTS centres.

In this study, treatment failed in only 4(1.9%) patients. This was an improvement in a study in Abuja, Nigeria where treatment failure was 4% but higher than 0.5% in North West Ethiopia [18,21]. There is a natural tendency for patients to quit treatment as soon as they felt better [23]. To reduce treatment failure in new smear-positive pulmonary tuberculosis patients, the use of treatment supporters at health facilities and at home would help ensure proper treatment adherence [24].

Only one patient (0.5%) died in the course of this study. This could be attributed to exclusion of terminally-ill patients from the study and/or low population size of study participants. The low death rate could also highlight DOTS as an effective intervention.

Unsuccessful treatment outcomes in this study was mainly associated with aging, occupation and educational status of the patients. In this regard, a higher proportion of unsuccessful treatment

outcome was seen in patients older than 65 years. This is in agreement with those of other studies [19,25,26]. The higher rate of unsuccessful treatment outcome observed among elderly patients may be due to multi-morbidity of pulmonary tuberculosis with diabetes mellitus and cardiovascular diseases. This study, did not however, evaluate multi-morbidity among these newly diagnosed smear-positive patients.

Patients who were unemployed showed higher unsuccessful treatment outcome (18.8%) than other occupational classes. The reason for this finding could be a result of higher risk of TB infection in this class, coupled with low self-esteem and health seeking behavior [27].

Patients with no formal education had a higher rate (17.6%) of unsuccessful treatment outcome. This is consistent with the report of Akintola *et al.* that non-compliance are associated with poor education of patients on TB therapy [11]. It is also similar to the finding of Ukwaja *et al.* that low knowledge of TB and therapy is a predictive factor of adverse treatment outcome among tuberculosis patients [27]. Enhanced patient counseling and education on tuberculosis will help reduce unsuccessful treatment outcomes.

In conclusion, the treatment success rate in Anambra State was 86.4%. Lost to follow up was high at 11.3%. Aging, occupation and level of education of the patients were associated with unsuccessful treatment outcomes. It is therefore important to reduce default in treatment through proper counseling of new smear-positive pulmonary tuberculosis patients at TB/DOTS centres.

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