

Sputum conversion among new smear positive pulmonary tuberculosis patients attending tb/dots clinics in Anambra state, Nigeria

Nwachukwu Obiora Ndubuisi^{1*}, Okoronkwo Christopher Uche¹, Onwuchekwa Chuks Elendu¹ and Valentine Nnacheta Unegbu²

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

²Department of Microbiology and Brewing, Nnamdi Azikiwe University Awka, Nigeria

Abstract

Objectives: Sputum conversion among smear-positive pulmonary tuberculosis patients was studied and its predictors evaluated in Anambra State Nigeria. The objectives were to estimate sputum conversion rates the end of 2 months following intensive treatment and also at 5th month.

Method: Nigeria National Tuberculosis Guidelines for diagnosis of pulmonary tuberculosis was used and Acid Fast Bacilli (AFB) were determined by Ziehl-Neelsen technique. All smears with ≥ 1 AFB/100 hpf were considered positive.

Results: A total of 183 pulmonary tuberculosis patients participated. Sputum smear conversion was observed in 159 (86.9%) patients at the end of the 2nd month. Conversion rates were 96.2% and 97.8% at end of 3rd and 5th months respectively. Sputum conversion rates was similar in males and females ($P > 0.05$) but age ≥ 45 years was significantly ($P < 0.05$) associated with delay in conversion. Patients with pre-treatment AFB smear grade of 3+ had the least conversion rate than the lower grades ($P < 0.05$). At the end of 5th month, 4 (2.2%) patients failed to convert.

Conclusion: Sputum smear conversion rates at end of 2nd, 3rd and 5th months was satisfactory. Older age and initial high bacillary load were associated with delayed smear conversion.

Introduction

Pulmonary Tuberculosis (PTB) is an infectious, air-borne disease caused by various strains of *Mycobacteria*, especially *Mycobacterium tuberculosis*. It usually attacks the lungs [1]. Pulmonary tuberculosis still presents a major threat to the health of the Nigerian population. It is one of the top ten leading causes of morbidity and mortality in adult Nigerians [2].

Sputum smear examination for acid fast bacilli (AFB) during the course of treatment is an essential component of follow up studies in new smear positive pulmonary tuberculosis patients. It has been shown that regular sputum smear and culture monitoring during anti-tubercular treatment allows assessment of sputum conversion, an important issue of therapeutic planning and counseling of pulmonary tuberculosis patients [3].

When sputum smear positive tuberculosis patients are initiated on multi-drug anti-tubercular treatment, there is a multifold reduction in bacillary load expelled in sputum [4].

Examination of sputum of patients with pulmonary tuberculosis at regular intervals until conversion occurs is important for several reasons. It provides objective evidence of the patient's response to therapy.

A delayed or absent response may result from patient's non-compliance, drug resistant organisms, prescription errors, immune-suppression or mal-absorption of drugs [5].

The failure to detect these problems early and to adjust chemotherapy regimen accordingly may lead to treatment failure and potential transmission of the tubercle bacilli to others in the community [6].

The disappearance of acid fast bacilli from smears and cultures is the most widely accepted determinant for treatment of patients with pulmonary tuberculosis [7]. Patients undergo three follow-up examinations following chemotherapy in the Nigerian Tuberculosis Control Programme. It is at 2nd or 3rd, 5th and 6th months respectively. The 3rd month examination is performed in the case of a positive result at the end of 2nd month.

It is based on the high predictive value of sputum conversion on treatment that we conducted this study to estimate smear conversion at end of 2 months following intensive phase treatment and also at 5th month afterwards.

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

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Materials and methods

Study areas

The study was carried out at two locations in Anambra State, viz Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi and St Charles Borromeo Hospital (SCBH), Onitsha. The former is a territory hospital while the latter is a foremost modern missionary hospital owned by Roman Catholic Mission. The TB/directly observed treatment clinics of both hospitals handles thousands of presumptive tuberculosis cases monthly and offers free treatment to tuberculosis patients. Nnewi (located at latitude 6.03°N and latitude 6.92°E) and Onitsha (located at latitude 6.16°N and longitude 6.46°E) are the major industrial belts of Anambra State.

Study participants

This was a cross-sectional study involving 183 newly diagnosed pulmonary tuberculosis patients (120 patients at NAUTH, Nnewi and 63 patients at SCBH, Onitsha). Age of the patients ranged from 15 years and older.

Methods

Diagnosis of new smear-positive pulmonary tuberculosis was based on the National Tuberculosis Guidelines. All presumptive TB cases submitted two 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 (WHO 2010a). New smear - positive pulmonary tuberculosis patients were followed up at the 2nd and 5th months following chemotherapy. For follow up studies, each patient submitted one sample. Data generated were analyzed using SPSS statistical software. A P-value of <0.05 was considered significant. The study was approved by ethical committees of both hospitals. All patients consented to participate in the study

Results

Sputum smear conversion among new smear positive pulmonary tuberculosis patients at the end of 2nd months therapy was observed in 159(86.9%) patients. Sputum conversion rate was 87.6% in males and 85.7% in females. There was no significant difference ($P>0.05$) in smear conversion rates between males and females. Sputum smear conversion rate declined with older age. It was 25% in the 65years age group but 100% in 15-25years class. Age was associated with delayed in sputum conversion (Table 1).

Patients with an initial pre-treatment AFB smear grade of 3+ had the lowest conversion rate (74.6%) compared to the other smear gradings of 2+ (89.8%) and 1+(100%). A significant difference ($P<0.05$) existed between initial AFB smear grading and sputum conversion. (Table 2). The sputum smear conversion at 2nd, 3rd and 5th months post therapy showed that 104(87%), 115(96%) and 117(98%) patients respectively converted at Nnamdi Azikiwe Teaching Hospital, Nnewi while 55(87%), 61(97%) patients respectively converted at St Charles Borromeo Hospital, Onitsha. At the end of the 5th month, however a total of 4 patients failed to convert (Figure 1).

Discussion

The best way to monitor treatment result of new smear positive pulmonary tuberculosis patient is to check for conversion of sputum from smear positive to smear negative.

In this study, sputum conversion rate among new smear positive pulmonary tuberculosis patients at the end of 2 months post therapy was 86.9%. This was similar to 86.6% recorded in Cameroon [8]. Our finding was however higher than 82% observed in Rwanda [9] but lower than 98.6% observed in studies in Tanzania [10].

Sputum conversion at 2months is associated with treatment outcome. Our result confirms that the possibility of reaching a cure was higher among patients whose sputum had converted than among those whose sputum remained positive at 2months. In spite of the intensive treatment for 2 months, 24(13.1%) patients remained sputum AFB positive. Epidemiological study indicated that the proportion of pulmonary tuberculosis patients who remain smear-positive after 2months of treatment can be greater than 20% [11]. These persistently positive cases after 2months of treatment are a predictor of patient infectivity and treatment failure [11].

Gender was not associated with sputum conversion in this study. It was a supervised treatment (directly observed treatment) and provision of free cost treatment could also be responsible for the insignificant difference observed. This finding was however different from a study among a Portuguese population [6] where male gender was associated with longer conversion time. Habits such as smoking and alcohol intake common with males might be the reason for the difference.

Delayed sputum smear conversion was observed with age older than 45years. A previous study [12] have shown that lack of smear conversion was more common in older patients. With advancing age, there may be increased delay in clearing the bacilli. This may probably be due to delay in seeking care and diagnosis which might lead to progression of the disease.

Patients with high pre-treatment grade of 3+ had significantly lower sputum conversion. A study in Morocco [13] on factors influencing sputum conversion among sputum smear-positive pulmonary tuberculosis patients had similarly reported that high sputum AFB grades were associated with persistent AFB smear 2months after chemotherapy. Similar results were also reported in Pakistan [14]. These patients could continue to transmit tuberculosis on the community.

The sputum conversion rates in this study at 2nd, 3rd and 5th months was 86.9%, 96.2% and 97.8% respectively. This was satisfactory and similar to 84% at the end of 2nd month and 92% at the end of 3rd month observed in India [15]. Follow-up studies thus identify cases that will benefit from a prolongation of the 2nd month intensive treatment.

Treatment failed in only 4 patients (i.e. they failed to convert after 5 months of chemotherapy). These four patients are presumptive multi-drug resistant TB cases. They were referred to GeneXpert MTB/RIF test and culture. However, the use of treatment supporters at home would help tuberculosis patients to adhere to treatment.

In conclusion, sputum conversion among new smear positive pulmonary tuberculosis patients at the end of 2months treatment was 86.9%. Older age (≥ 45 years) and higher bacillary load were associated with delayed smear conversion while gender was not.

Limitation

Smear microscopy was the only diagnostic procedure employed in the study. It is not sensitive in patients with low bacterial load. The gold standard - Mycobacterial culture was not available.

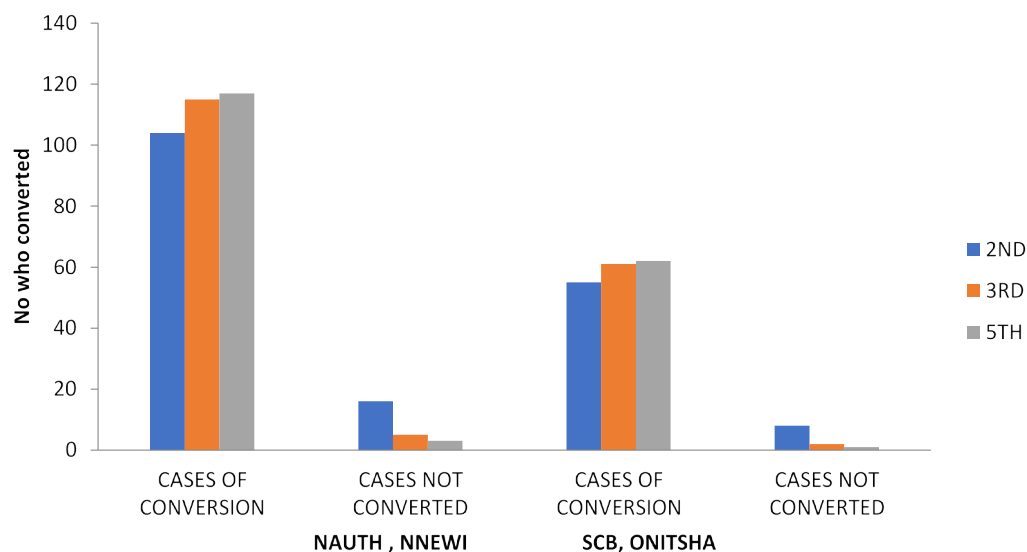


Figure 1. Sputum smear conversion at 2nd, 3rd and 5th months at NAUTH, Nnewi and SCB, Onitsha.

Table 1. Sputum conversion among new smear positive PTB patients at the end of 2 months treatment at NAUTH, Nnewi and SCBH, Onitsha

Age group (yr)	M+	F+	T+	MC (%)	FC (%)	TC (%)	TNC (%)
15-24	17	8	25	17(100)	8(100)	25(100)	0(0)
25-34	41	30	71	40(97.6)	29(96.7)	69(97.2)	2(2.8)
35-44	26	21	47	25(96.2)	19(90.3)	44(93.6)	4(6.4)
45-54	17	6	23	12(70.6)	3(50.0)	15(65.2)	8(34.8)
55-64	9	4	13	4(44.4)	1(25.0)	5(38.5)	8(61.5)
65 & above	3	1	4	1(33.3)	0(0)	1(25.0)	3(75.0)
Total	113	70	183	99(87.6)	60(85.7)	159(86.9)	24(13.1)

M+: Males AFB positive; F+: Female AFB positive; T+: Total AFB Positive; MC: Males who converted; FC: Females who converted; TC: Total conversion; TNC: Total non conversion

Table 2. Sputum smear conversion according to bacillary load at end of 2 months treatment at NAUTH, Nnewi and SCBH, Onitsha

Pre-treatment AFB grading	No positive of cases (n=183)	Cases who converted (%)	Cases not converted (%)
3+	71	53(74.6)	18(25.4)
2+	59	53(89.9)	6(10.2)
1+	30	30(100)	0(0)
Scanty	23	23(100)	0(0)
Total	183	159(86.9)	24(13.1)

P>0.05 (two-way ANOVA)

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