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EC PULMONOLOGY AND RESPIRATORY MEDICINE

Research Article

# Patient Profiles and Treatment Outcomes at Tuberculosis Directly Observed Therapy Short-Course Clinic: Prospects for Closing Potential Gaps

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**Received:** March 07, 2018; **Published:** May 09, 2018

## Abstract

**Introduction:** Tuberculosis is the most important cause of mortality from a distinct singular infective agent decimating more people than human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS). Numerous interventions such as STOP TB and END TB have been developed in order to check the upward drift of the global burden of tuberculosis however an increase in the incidence still persists in Africa.

**Objectives:** This study described the profiles and treatment outcomes of patients who received treatment for tuberculosis at a DOTS clinic in a tertiary hospital in Southern Nigeria.

**Methodology:** In this cohort study, information for a serial 146 cases of tuberculosis seen between January, 2012 and December, 2015 at the DOTS centre of a tertiary hospital in Delta State was analysed using SPSS version 22 and Program for Epidemiologists (PEPI). Inferences were drawn using Fishers exact, chi square, and student's t test; all at $\alpha < 0.05$.

**Results:** The mean age of patients was 30.8 ± 19.4 years and male to female ratio was 3:2. Pulmonary tuberculosis was seen in 74.7% of patients while Pott's disease, being the most common form of extra-pulmonary TB, was the diagnosis in 44.5% of extra-pulmonary cases. There was no association between sex of patient and type of tuberculosis. Most patients (88.4%) were new cases, the majority (77.4%) had chest X-rays and it was the most common investigation used for decision making as three-quarters (75.3%) of patients had results suggestive of TB compared to AFB which 73.3% of patients did but only 32.9% had positive results. Less than a fifth (17.2%) of the entire tuberculosis patients tested positive for HIV: its prevalence was higher in female patients (27.6%) than in males (10.2%). Both sexes achieved significant weight gains during the course of treatment: the mean increase being greater in males than in females (3.61 kg vs. 2.21 kg); $p < 0.001$. Death rate among patients, during the course of treatment, was 12.7%, while cure rate at completion among those with complete data was 68.3%. Loss to follow was 4.8%. Outcome measures were estimated on only available data which was incomplete for over half of all patients, 83 (56.8%).

**Conclusion:** The majority of patients treated were new cases of tuberculosis, and pulmonary tuberculosis was the predominant type among patients. The smear positive detection and cure rates were below those stipulated by the STOP TB Programme. Completeness of data was however a great limitation to these conclusions.

***Keywords:*** *Tuberculosis; STOP TB; HIV/AIDS*

## Introduction

**Background:** Tuberculosis (TB) though identified very many years ago, still remains one of the major devastating diseases and a global health concern for both developing and developed countries [1,2]. It is the leading cause of mortality from a distinct singular infective agent decimating more people than human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS). Rated among the ten topmost killer diseases in the world tuberculosis affects more men than women with peak incidence and mortality in those older than 14 years [3]. Tuberculosis tends to thrive in the milieu of weak health systems and poor socio-economic as well as infrastructural development that are often conventional in developing countries.

In a developing country like Nigeria, tuberculosis is one of the foremost threats to public health particularly as Nigeria ranks among the highest TB-plagued countries globally [4]. There were 100,443 TB notified cases with an incidence rate of 219 per 100,000 and a multi-drug resistant rate of 6.4 to 15 cases per 100,000 in 2016. Despite these abnormally high figures, tuberculosis treatment coverage was only 24% of the estimated incidence with a mortality rate of 21 per 100,000 for this same year in Nigeria [5]. With an increase in the national treatment success rate to 84% in 2015 there is a glimmer of hope in winning the fight against this scourge nonetheless, in 2016 over a million HIV-free persons died of tuberculosis globally, in addition to about half a million deaths among people living with HIV, over 80% of which were recorded in Africa.

Numerous interventions such as STOP TB and END TB have been developed in order to check the upward drift of the global burden of tuberculosis however the estimated new cases increased by 18.2% over a 6-year period, Africa and South-Asia bearing the major brunt [3,4]. Thus, these approaches employed over the years to stem the mounting incidence of tuberculosis have not yielded much accomplishment owing to the duo of human immunodeficiency virus (HIV) co-existence and the emergence of multi-drug resistant strains of *Mycobacterium tuberculosis* [6].

Notable among the schemes exploited to control tuberculosis is the directly observed treatment, short course (DOTS). DOTS is a 'cost-effective and efficient internationally recognized strategy for the control of tuberculosis' and requires a daily observation of each sputum smear-positive patient as they ingest anti-tuberculosis drugs [7]. The National Tuberculosis Control Programme in Nigeria has adopted DOTS strategy to ensure that all patients are treated at no cost for a minimum of half a year for pulmonary TB and a longer period for extra-pulmonary TB. Many centres in the nation as well as others in neighbouring countries still practise the use AFB for diagnosis of Koch's disease though GeneXpert is becoming more readily available in some settings [8,9].

The conduct of DOTS has long been entrenched in the National Tuberculosis Control Programme in Nigeria and is similarly operated at our centre - one of the many DOTS sites distributed all over the country. With already established programme goals we envisaged that ascertaining the contribution of our centre to the overall attainment of national success would facilitate recognition of opportunities to leverage on and areas requiring improvement. The fallouts of this study could provide policy makers with valuable data to augment the effectiveness of tuberculosis control programme in Nigeria. Therefore, this study was conducted to describe the profiles of patients who received DOTS for tuberculosis, and to assess treatment outcomes including cure rates, weight gained in the course of treatment and death rates from tuberculosis among patients managed at DOTS centre over a four–year period.

## Methodology

This was a cohort study of 146 patients seen at DOTS centre of a tertiary facility in Delta state from January, 2012 to December, 2015. The cases were reviewed using information from medical records. The diagnosis of tuberculosis was made on the basis of positive sputum smear microscopy to detect acid fast bacilli (AFB), and/or clinical decision with radiological support as evidence of the disease. The following data was obtained from the case files of patients: socio-demographic characteristics (age sex, employment status, and educational status), site of tuberculosis (pulmonary or extra-pulmonary), patient treatment category, weight (entry and completion), bacteriological (Sputum microscopy for AFB) and radiological investigations (Chest x-ray), and HIV status.

Sputum conversion determined at the end of initiation phase ($2^{nd}$ month) was defined as having smear negative sputum after initial smear positive sputum.

Anti-tuberculosis treatment was categorized as follows:

- **Regimen 1** – four of the first line drugs: Rifampicin, Isoniazid, Pyrazinamide, Ethambutol (all new cases who had not been treated for up to 8 weeks at any time in the past).
- **Regimen 2**– at least three of first line drugs and Streptomycin (all retreatment cases had regimen 2; these were patients with pulmonary tuberculosis who had already had a full course of treatment with regimen 1 but remained or returned as sputum smear positive).

### Data analysis

Data collected from patient files were entered into the spreadsheet of Statistical Package for Social Sciences version 22 (IBM Corp., Armonk NY, USA) for analysis. Categorical variables were expressed as percentages and continuous variable as means ± SD and inferences made using chi-square and student *t* tests respectively. Level of statistical significance was set at 0.05.

## Results

A total of 146 patients were seen between January, 2012 and December, 2015 - the period under review. The male to female ratio was 3:2 and mean age of patients was 30.8 ± 19.4 years although ages ranged from 4 to 87 years. Tuberculosis was well distributed among all age groups represented. There was no significant difference between the mean ages of males and females (p = 0.308). There was no significant association between gender and age-groups of patients who presented for treatment. The proportion of unemployed females was greater than that of males although the association was not statistically significant; $p = 0.160$.

The majority of the male patients were Urhobos whereas females dominated in the Itsekiri/Ijaw group; sex and tribe were significantly associated with each other. A higher proportion of females had attained secondary and tertiary education but the association between education and sex of patient was not statistically significant (Table 1).

| Variables | Categories | Frequency (%) | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| | | n=88 | n=58 | N=146 |
| **Age- group** | ≤ 10 | 13 (14.8) | 6 (10.3) | 19 (13.0) |
| | 11 - 20 | 13 (14.8) | 11 (19.0) | 24 (16.4) |
| | 21 - 30 | 17 (19.3) | 10 (17.2) | 27 (18.5) |
| | 31 - 40 | 14 (15.9) | 10 (17.2) | 24 (16.4) |
| | 41 - 50 | 15 (17.0) | 5 (8.6) | 20 (13.7) |
| | 51 - 60 | 8 (9.1) | 7 (12.1) | 15 (10.3) |
| | > 60 | 4 (4.5) | 4 (6.9) | 8 (5.5) |
| | | $_{m}$ = 31.11± 18.12 | $_{f}$ = 30.07 ± 20.95 | = 30.8 ± 19.4 |
| | | t = 0.308 | $p$= 0.759 | |
| | | $X^2$= 7.34; | $p$=0.083 | |
| | N/A | 4 (4.5) | 5 (8.6) | 9 (6.2) |
| **Employment Status** | Unemployed | 35 (39.8) | 25 (43.1) | 60 (41.1) |
| | Employed | 53 (61.2) | 33 (56.9) | 86 (58.9) |
| | | $X^2$ = 0.689; $p$= 0.160 | | |
| **Marital Status** | Never married | 44 (50.0) | 29 (50.0) | 73 (50.0) |
| | Cohabiting | 10 (11.4) | 9 (15.5) | 19 (13.0) |
| | Married | 34 (38.6) | 20 (34.5) | 54 (37.0) |
| | | $X^2$= 0.627; $p$ = 0.731 | | |
| **Tribe** | Urhobo | 63 (71.6) | 30 (51.7) | 93 (63.7) |
| | Itsekiri/Ijaw | 6 (6.8) | 10 (17.3) | 16 (11.0) |
| | Ibo | 10 (11.4) | 5 (8.6) | 15 (10.2) |
| | Yoruba/Edo | 9 (10.2) | 13 (22.4) | 22 (15.1) |
| | | $X^2$ = 9.333; $p$ =0.025 | | |
| **Education** | None | 4 (4.5) | 7 (12.1) | 11 (7.5) |
| | Primary | 36 (40.9) | 17 (29.3) | 53 (36.3) |
| | Secondary | 22 (25.0) | 18 (31.0) | 40 (27.4) |
| | Tertiary | 18 (20.5) | 14 (24.2) | 32 (21.9) |
| | | $X^2$ = 4.432 p = 0.218 | | |
| | N/A | 8 (9.1) | 2 (3.4) | 10 (6.9) |

***Table 1:*** *Socio-demographic Characteristics of Patients.*

*= mean; N/A – Not Available, Others , ¥= Yates corrected*

Three-quarters of all patients presented with pulmonary TB. Tuberculosis of the spine was the most common form of extra-pulmonary TB seen. There was also no association between sex and type of extra-pulmonary TB.

Most of the patients catered for were new patients. Retreatment patients were a higher proportion among males; the difference however was not statistically significant (Table 2).

| Variables | Categories | Frequency (%) | | |
|---|---|---|---|---|
| | | **Male** | **Female** | **Total** |
| | | **n = 88** | **n = 58** | **N = 146** |
| **Tuberculosis type** | Pulmonary | 65 (73.9) | 44 (75.8) | 109 (74.7) |
| | Extra-pulmonary | 20 (22.7) | 7 (12.1) | 27 (18.4) |
| | | $X^2$ = 1.925 | $p$= 0.189 | |
| | N/A | 3 (3.4) | 7 (12.1) | 10 (6.9) |
| | | **n = 20** | **n = 7** | **N = 27** |
| **Extra-pulmonary** | Spine | 9 (45.0) | 3 (42.8) | 12 (44.5) |
| | Lymph node | 7 (35.0) | 2 (28.6) | 9 (33.3) |
| | Abdomen | 4 (20.0) | 2 (28.6) | 6 (22.2) |
| | | $X^2$= 0.056 | $p$ = 1.000 | |

***Table 2:*** *Distribution of Pulmonary and Extra-pulmonary Tuberculosis among Patients.*

*N/A: Not Available*

The highest proportion of patients were referred to the DOTS clinic from the Out-Patient Department (OPD) but this did not differ significantly from the proportion of patients referred from other sources (Table 3).

| Variables | Categories | Frequency (%) | | |
|---|---|---|---|---|
| | | **Male** | **Female** | **Total** |
| | | **n = 88** | **n = 58** | **N = 146** |
| **Patient class** | New | 74 (84.1) | 55 (94.8) | 129 (88.4) |
| | Re-treatment | 14 (15.9) | 3 (5.2) | 17 (11.6) |
| | | $X^2$= 2.943¥ ; $p$ = 0.086 | | |
| **Treatment regimen** | Regimen 1 | 74 (84.1) | 55 (94.8) | 129 (88.4) |
| | Regimen 2 | 14 (15.9) | 3 (5.2) | 17 (11.6) |
| | | $X^2$= 2.943¥ ; $p$ = 0.086 | | |
| **Source of Referral** | Out-Patient Dept. | 28 (31.8) | 19 (32.8) | 47(32.2) |
| | Internal medicine | 20 (22.7) | 12 (20.6) | 32 (21.9) |
| | Paediatrics | 14 (15.9) | 11 (19.0) | 25 (17.1) |
| | Other health facility | 15 (17.1) | 8 (13.8) | 23 (15.8) |
| | | $X^2$= 0.496 | $p$ = 0.920 | |
| | N/A | 11 (12.5) | 8 (13.8) | 19 (13.0) |

***Table 3:*** *Tuberculosis Treatment Categories and Source of Referral.*

*Retreatment cases include relapse, failure, and transferred-in with status unknown; ¥Yates corrected; N/A: Not Available*

Less than three-quarters of all patients did the initial sputum smear microscopy for AFB and only about a third of all patients were positive. At the end of 2 months of treatment 29.5% had sero-converted. At 5 months, no patient sent for AFB was still positive. Over a quarter of patients did not do the AFB test at all. There was no significant difference in conversion rates between males and females (Table 4).

| Variables | Categories | Frequency (%) | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| | | n = 88 | n = 58 | N = 146 |
| **Initial AFB** | Positive | 25 (28.4) | 23 (39.6) | 48 (32.9) |
| | Negative | 35 (39.8) | 24 (41.4) | 59 (40.4) |
| | | $X^2$= 0.563 | $p$ =0.453 | |
| | N/A | 28 (31.8) | 11 (19.0) | 39 (26.7) |
| **AFB at 2nd month** | Positive | 3 (3.4) | 2 (3.5) | 5 (3.4) |
| | Negative | 31 (35.2) | 18 (31.0) | 49 (33.6) |
| | | $X^2$= 0.021 | $p$ =1.000 | |
| | N/A | 54 (61.4) | 38 (65.5) | 92 (63.0) |
| **AFB at 5th month** | Positive | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| | Negative | 12 (13.6) | 9 (15.5) | 21 (14.4) |
| | N/A | 76 (86.4) | 49 (84.5) | 125 (85.6) |
| **AFB at Completion** | Positive | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| | Negative | 7 (8.0) | 6 (10.0) | 13 (8.1) |
| | N/A | 81 (92.0) | 52 (90.0) | 133 (91.9) |
| **Sputum Conversion at 2nd Month** | Yes | 22 (25.0) | 21 (36.2) | 43 (29.5) |
| | No | 3 (3.4) | 2 (3.4) | 5 (3.4) |
| | | $X^2$= 0.140 | p = 1.000* | |
| | N/A | 63 (71.6) | 35 (60.4) | 98 (67.1) |

***Table 4:*** *Periodic AFB Results of Patients over the Course of Treatment.*

*N/A: Not Available *Fishers exact*

More than three-quarters of the patients had a chest X-ray as part of ancillary investigations to confirm the diagnosis of tuberculosis. About three-quarters of all patients had Chest X-ray results and were started on DOTS therapy based on those findings. Only about a tenth of patients had Mantoux testing and two-thirds of them were positive to the test (Table 5).

| Variables | Categories | Frequency (%) | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| | | n = 88 | n = 58 | N = 146 |
| **Chest Radiograph** | Suggestive | 62 (70.4) | 48 (82.8 | 110 (75.3) |
| | Non-suggestive | 2 (2.3) | 1 (1.7) | 3 (2.1) |
| | | $X^2$ = 0.126 | $p$ = 1.000* | |
| | N/A | 24 (27.3) | 9 (15.5) | 33 (22.6) |
| **Mantoux** | Positive | 6 (6.9) | 4 (6.9) | 10 (6.9) |
| | Negative | 1 (1.1) | 0 (0.0) | 1 (0.7) |
| | Indeterminate | 3 (3.4) | 1 (1.7) | 4 (2.7) |
| | | $X^2$ = 0.825 | $p$ = 1.000* | |
| | N/A | 78 (88.6) | 53 (91.4) | 131(89.7) |

***Table 5:*** *Ancillary Investigations for Confirmation of Tuberculosis.*

*N/A: Not Available*

A little over half of the patients did both CXR and sputum AFB tests. Other patients did CXR without sputum AFB. More patients did CXR than sputum AFB. Seven patients did neither sputum AFB nor CXR investigations (Table 6).

| Variables | Categories | Chest Radiograph Frequency (%) | | |
|---|---|---|---|---|
| | | Suggestive | Non-suggestive | N/A |
| Initial Sputum AFB | Positive | 35 (31.8) | 0 (0.0) | 13 (39.4) |
| | Negative | 44 (40.0) | 2 (66.7) | 13 (39.4) |
| | N/A | 31 (28.2) | 1(33.3) | 7 (21.2) |

***Table 6:*** *Chest X-Rays versus Sputum AFB Results.*

The prevalence of HIV among the patients was 17.2%. A higher proportion of female patients tested positive. Almost all patients who had retroviral screening had pre-test counselling; over a quarter of patients were not tested for HIV (Table 7).

| Variables | Categories | Frequency (%) | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| | | n = 88 | n = 58 | N = 146 |
| **RVS** | Positive | 9 (10.2) | 16 (27.6) | 25 (17.2) |
| | Negative | 50 (56.8) | 33(56.9) | 83 (56.8) |
| | | $X^2$ =4.555 | $p$ = 0.04* | |
| | N/A | 29 (33.0) | 9 (15.5) | 38 (26.0) |
| **Pre-test HIV Counselling** | Yes | 57 (64.8) | 46 (79.3) | 103 (70.6) |
| | No | 2 (2.3) | 3 (5.2) | 5 (3.4) |
| | | $X^2$ = 0.453 | $p$ = 0.657* | |
| | N/A | 29 (32.9) | 9 (15.5) | 38 (26.0) |

***Table 7:*** *Retroviral Status of Tuberculosis Patients at DOTS Centre.*

Patients achieved significant weight gain during the course of DOTS. There was more significant improvement in weight among males; p = 0.001. Nearly a third of patients did not have sufficient records of their weight trends during the course of treatment (Table 8).

| Category | n | Mean weight (Completion) | Mean weight (Entry) | Mean diff. | t-test | P value | 95% *CI |
|---|---|---|---|---|---|---|---|
| Male | 61 | 54.75 ±16.63 | 51.14 ±16.31 | 3.61 | 4.901 | < 0.001 | 5.09 - 2.14 |
| Females | 40 | 48.87 ±19.70 | 46.66 ±19.18 | 2.21 | 3.651 | 0.001 | 3.44 - 0.98 |
| **Mean** | | 51.86 ± 18.36 | 48.82 ± 17.82 | 3.04 | 6.128 | < 0.001 | 4.02 - 2.05 |

***Table 8:*** *Weight gain following treatment.*

Over half of the TB patients treated at this centre has no records of treatment outcome but of those documented were cured, treatment failure occurred in only one person (1.6%), 12.7% died of various causes, 7.9% were transferred out, while 4.8% were lost to follow-up. Treatment outcomes did not differ significantly between the sexes (Table 9).

| Variables | Categories | Frequency (%) | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| | | n = 88 | n = 58 | N=146 |
| **Treatment Outcomes** | N/A | 52 (62.6) | 31 (53.5) | 83 (56.8) |
| | | n = 36 | n = 27 | N = 63 |
| | Cured | 23 (63.9) | 20 (74.1) | 43 (68.3) |
| | Failure | 1 (2.8) | 0 (0.0) | 1 (1.6) |
| | Transferred-out | 4 (11.1) | 1 (3.7) | 5 (7.9) |
| | Loss to follow-up | 2 (5.6) | 1 (3.7) | 3 (4.8) |
| | Dead | 3 (8.3) | 5 (18.5) | 8 (12.7) |
| | | $X^2$ = 9.415¥ | $p$ = 0.667 | |

***Table 9****: Treatment Outcomes of Patients.*

*N/A: Not Available, ¥Yates corrected*

## Discussion

The DOTS centre at this teaching hospital in southern Nigeria was established in 2012 as one of the treatment centres to cater for the healthcare needs of patients with tuberculosis under the National Tuberculosis and Leprosy Control Programme (NTBLCP). It receives and treats for free, patients from the various local governments of Delta State and other states in the Niger Delta region especially. These patients were mostly referred from departments within the hospital; Out-patients, Internal Medicine and Paediatrics - in that order, while a small proportion come from other sources. A greater proportion of the patients with tuberculosis seen during the period under review were males, a finding which is consonant with that from other studies from within and outside Nigeria where male predominance was observed [10-13]. The mean age of the patients, 30.8 ± 19.4 years though not significantly dissimilar between males and females, is similar to those observed for patients enrolled at the national tuberculosis programme in south-western Nigeria and also India where mean ages were 33.0 ± 14 years and 29.8 ± 13.8 years [11,14]. At this centre the majority of patients were new patients and similar findings were seen in India and Pakistan; 75.4% and 83.9% respectively [13,15].

The reason for the significant divide between gender and ethnic groups is not immediately visible but it is possible that patients prefer to receive treatment at a separate facility from their spouses/partners. A study in Vietnam showed gender related to stigma, with females being more sensitive and therefore taking up tuberculosis treatments later than their male counterparts who were more concerned about costs, and so more readily took up tuberculosis treatment which is largely free of charge [16].

A predominance of pulmonary tuberculosis, as seen in this study, was also reported by studies of patients treated at DOTS centres in south-west Nigeria where 98.4% and 87.2% of the patients had pulmonary tuberculosis, but extra-pulmonary TB was more prevalent at our study site (18.4%) compared to theirs which was 1.6% and 12.8% respectively [10,15]. However, another study assessing treatment outcomes in India reported higher proportions of extra-pulmonary tuberculosis (31.9%) [17]. Pott's disease which was the most prevalent form of extra-pulmonary tuberculosis in this study, has also been documented to be the most common musculoskeletal form of tuberculosis [18].

Initial sputum AFB result was positive in about a third of all patients although only about three-quarters of all patients performed that test. This positive detection rate falls far short of the 75% target of the STOP programme [19]. Perhaps most of the diagnoses were made using chest radiographs in which over three-quarters (77.4%) were suggestive of pulmonary tuberculosis. This is not the gold standard of the STOP TB programme but appears to persist as common practice in lots of centres [20]. Even cases of extra-pulmonary tuberculosis tend to have an initial focus in the lungs which is evident on chest radiographs [21]. Some patients who received treatment had neither a positive CXR nor an AFB positive sputum smear. This suggests clinical judgements and drug trials were also used frequently for decision making at this centre – maybe in cases that had shown poor response to common antibiotics, as that alone could explain the treatment for TB in patients with neither CXR nor AFB positive results. The fact that there was a cure rate of over two-thirds in patients with documented evidence of treatment outcome, suggests that there must have been some sound clinical judgements among attending physicians. Although this may have produced apparently good results, it is fraught with the dangers of treating persons who do not have tuberculosis with the potentially toxic anti-tuberculosis drugs and putting them through all the hassles, including possible stigmatization, associated with the TB/DOTS treatment. Enforcement of, and adherence to the codes of tuberculosis treatment is highly advised in these circumstances; and upgrading to the newer and more sensitive and prescribed GeneXpert testing needs to be solicited from funding agencies and taken delivery of. Currently the coverage of GeneXpert machines is too scanty for reliability. Training and retraining of health workers in giving out instructions for sample collection would also be a worthwhile venture, given the vagaries in accuracy of result associated with poor sample collection. It is important therefore to improve the technique for collection of sputum and transportation conditions to increase the yield from samples. Advocating for same day two sputum – one hour apart sample collection may be prove useful as sample collection is done under strict supervision of health workers [9].

HIV sero-positivity rate (17.2%) in this study is similar to the 20% reported in a study among TB patients in South-West, Nigeria, although lower than 28.12% in another study in south-west Nigeria [22,23]. However, studies in India showed much lower rates of TB/

HIV confection, 5.5% and 2.7% [13,15]. This is not unexpected as the national prevalence of HIV in Nigeria is 3.2% compared to India where it is 0.3% [24,25]. India may also have a better coordinated and proactive care for patients with TB and HIV, including those with a co-infection unlike the case at this study site.

The generally incomplete data in this review tells conclusively that documentation is very poor at the TB/DOTS site where this review took place. This is a major limitation of this report as that data would have been useful for drawing firmer conclusions on the treatment completion, default, failure and other rates among TB patients. This great limitation is being communicated with the management of the study site to improve data management and the accuracy of routine reports to the Delta State TB control programme. However, a cure rate above two-thirds (68.3%) for patients with documented treatment outcomes at this centre, although quite below the recommended 90% [26], suggests there is a system which may respond well to simple performance improvement strategies. Several studies from India, Pakistan, Iraq and Mexico reported varying cure rates; 42.9%, 55%, 63.5%, 69.6% and 82.7% respectively [13,15,17,27,28]. A sputum conversion rate of 95.5% at the end of initiation phase, among those who had a sputum smear, also lends credence to the picture of a system which may not have lots of drug-resistant TB. A mortality rate of 5.5% among patients during the period under review is similar to mortality rates of 3%, 2.7%, and 3.6% recorded from previous studies in Mexico and India although, their figures indicate a likely generally better outcome of treatment for patients in those countries [15,17,21]. However, the treatment failure rate of 1.6% in this study is similar to 1.1% reported from a study in Northern India [14]. A higher failure rate of 3.8% was reported from a study in south-western Nigeria [11]. Lost to follow-up/default rate was 3 (4.8%) among those with complete data. This value is likely incorrect as it is lower than estimates for African countries in a systematic review by WHO [29] and may make it difficult to draw conclusions as the grossly incomplete data may actually have been ridden with lots of patients who were lost to follow-up.

Weight gain during treatment of tuberculosis can be used as a measure of improvement because untreated tuberculosis commonly results in significant weight loss. In this review, the mean weight at entry differed significantly from mean weight at completion of treatment for both males and females. Males showed more significant improvement in their weight. This observation is reassuring and suggestive of recovery from the effect of tuberculosis. The average weight gain among patients treated for tuberculosis using DOTS strategy in this study was 3.04 kg, and similar to an average weight gain of 3.22 kg reported from a study conducted in India [30].

This study was based on secondary data from case files and TB registers therefore poor and incomplete recording of data could not be excluded entirely from the results presented. Data on sputum microscopy was not complete, perhaps not all patients, especially children, could produce sputum, therefore clinical diagnosis and radiographic findings were relied on to make a decision to commence on anti-tuberculosis therapy which is not in conformity with the standards of WHO [31]. It is quite likely that proper documentation of investigations and progress with treatment for tuberculosis as well as expanding the use of the recently introduced e-TB manager to include more health facilities would undoubtedly enhance the ease of appraisal of the performance TB care at various centres in the future [32].

## Conclusion

The majority of patients treated were new cases of tuberculosis, and pulmonary tuberculosis was the predominant type among patients. The smear positive detection and cure rates were below stipulated limits by the STOP TB Programme, and it appears treatment decisions are made mostly from chest radiographs and clinical decision. Sero-positivity for HIV was comparable to those from similar studies in Nigeria and significant improvement in the weight was achieved after treatment. Completeness of data was however very poor.

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