AN EVALUATION OF TREATMENT OUTCOME IN TUBERCULOSIS DIRECTLY OBSERVED TREATMENT SHORT COURSE FACILITIES IN JIGAWA STATE, NIGERIA (2010–2014)

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ABSTRACT

Tuberculosis (TB) is a major public health problem worldwide. It is estimated that 2 billion people, a third of the world population, have TB infection, but are not down with the disease. Globally, incident cases of TB showed a rising trend, with a 6.6 million reported in 1990, 8.3 million in 2000, 9.24 million in 2004, and an estimated 9.27 million incident cases in 2007. The aim of this study was to evaluate the treatment outcome of TB patients in Nigeria in the state of Jigawa. A cross sectional retrospective study was conducted to evaluate the treatment outcome in directly observed treatment with a short course for tuberculosis (TB DOTS) in facilities in the state between the years 2010 to 2014. The study population were all the patients with TB, who had access to DOTS therapy. Data were collected from the various local governmental areas for tuberculosis control (LGA TB) register. The LGA TB control registers contained basic information of the patients, and a statistical software SPSS-V22.0 was used to analyse the data. A total of 963 TB patients were studied. More than half (57.4%) of the patients were male, and nearly three- fourths (71.2%) of the patients accessed care from urban local government areas in the state. The greater majority (96.3%) of the cases had pulmonary tuberculosis (PTB). Among the patients, more than two-fifths (45%) were cured, and a little over one-fifth (20.6%) of them were HIV positive. This study revealed that the treatment success rate (TSR) in the Jigawa State of Nigeria was higher than the overall TSR of Nigeria, and the defaulter rate in this state was lower than the Nigerian average. The aim of this study was to evaluate the treatment outcome of TB patients in Nigeria in the state of Jigawa. A cross sectional retrospective study was conducted to evaluate the treatment outcome in directly observed treatment with a short course for tuberculosis (TB DOTS) in facilities in the state between the years 2010 to 2014. The study population were all the patients with TB, who had access to DOTS therapy. Data were collected from the various local governmental areas for tuberculosis control (LGA TB) register. The LGA TB control registers contained basic information of the patients, and a statistical software SPSS-V22.0 was used to analyse the data. A total of 963 TB patients were studied. More than half (57.4%) of the patients were male, and nearly three- fourths (71.2%) of the patients accessed care from urban local government areas in the state. The greater majority (96.3%) of the cases had pulmonary tuberculosis (PTB). Among the patients, more than two-fifths (45%) were cured, and a little over one-fifth (20.6%) of them were HIV positive. This study revealed that the treatment success rate (TSR) in the Jigawa State of Nigeria was higher than the overall TSR of Nigeria, and the defaulter rate in this state was lower than the Nigerian average.

Keywords: Cases, DOTS, Health, HIV, Nigeria, Patients, Pulmonary, Treatment, Tuberculosis, WHO

Introduction

Tuberculosis (TB) is a major public health problem worldwide. Globally, it is estimated that 2 billion people, a third of the world population, have TB infection, but not the disease. There is an increase in the incident cases of tuberculosis from 6.6 million cases in 1990, 8.3 million cases in 2000, and 9.24 million cases in 2006, to an estimated 9.27 million incident cases of TB in 2007(1).

In the mid-1990s, the World Health Organisation (WHO) initiated various efforts to improve TB care and control at national and international levels. TB was declared a global public health emergency in 1993 (2). The increase in the incident cases in 2007 was in Asia (55%) and Africa (31%), with a very small proportion of cases in the Eastern Mediterranean region (6%), Europe (5%), and the Americas (3%) (1). In the 21st century, TB remains a global emergency and is one of the major public health problems (3). It is not only a public health burden, but also a significant socioeconomic issue (4). According to the Global TB Report, in 2013, an estimated 9.0 million people developed TB, and 1.5 million died from the disease with more than half (56%) in South-East Asia and the Western Pacific region, and 29% were in Africa. The highest rates of cases and deaths occurred in Africa (5). However, the global TB prevalence in 2015 was 42% lower than in 1990 (6).

There were an estimated 0.5 million cases of multi-drug resistant tuberculosis (MDR-TB) in 2007. 27 countries, of which 15 were in the European region, accounted for 85% of the MDR-TB cases. The countries that ranked from the first to the fifth, in terms of the total numbers of MDR-TB cases were India with 131000, China with 112000, the Russian Federation with 43000, South Africa with 16000 and Bangladesh with 15000. Globally about 3.7% of new TB patients had MDR-TB, and the rate was much higher, about 20%, in those who had been previously treated. The frequency of MDR-TB varied substantially between countries. About 9% of MDR-TB cases also had resistance to two other classes of drugs, and were termed the extensively drug-resistant TB (XDR-TB). By the end of 2008, 55 countries and territories had reported at least one case of XDR-TB (1) and by March 2013, the number of countries reporting at least one XDR-TB case had increased to 84.(7).

WHO developed a treatment strategy for TB, with a directly observed treatment with a short course (DOTS). DOTS was introduced in 1994, where the patient took each dose of medication under the direct observation of a health care worker to ensure that the correct dosage and combination of TB medications were taken for the entire course of the treatment. It became the standard of care for the TB patient, and it was adopted within a decade by almost all countries. Considerable progress was seen towards achieving the global targets established for 2005 (2). It was evident that the best way to cure TB was to be treated under the DOTS where the TB patients' response and adherence to treatment were closely monitored, and treatment failure, the emergence of drug resistance and spread of the disease could be avoided. In 2006, the Stop TB Strategy, stretching from 2006 to 2015 was launched as a continuation of programme.

Nigeria was rated 4th among the 22 countries worldwide with a high TB burden. Nigeria had 774 local government areas (LGAs), and at least two health facilities in each of these LGAs had functional DOTS services (1). The case detection rate had been increasing steadily but remained relatively low. Although the outcome of treatment was not evaluated in many of the patients, the TSR was 76% in Nigeria using the 2006 TB cohort (1). It was estimated that the incidence of TB cases in the country was 311 per 100,000 population with an incidence of new smear-positive cases of TB at 131 per 100,000 population. The prevalence was estimated at 521 per 100,000 population, with new MDR-TB contributing 1.8% of the number. The mortality rate was 93 per year per 100,000 population. The prevalence rate of HIV in adult TB patients was 27% ranging from 15% to 49%, in the state. WHO estimated that TB accounted for 50% of all AIDS related death annually in Sub Saharan Africa with Nigeria included (1). Although the implementation of DOTS increased treatment success and decreased transmission of resistant TB, the disease still killed 5000 people every day (8-10).

TB treatment in Nigeria was usually through the DOTS therapy through the National Tuberculosis and Leprosy Control Programme (NTBLCP). Criteria for assigning treatment included age, history of previous anti TB exposure, pregnancy, HIV status, pretreatment and weight. The drugs used for TB treatment in Nigeria included rifampicin (R), isoniazid (H), ethambutol (E), pyrazinamide (Z), and streptomycin (S). The treatment regimen under the NTBLCP was for 8 months for all categories of TB patients (CAT 1 and CAT 2 patients). CAT 1 patients included all new cases who were smear-positive, or smear-negative, and who had pulmonary or extra pulmonary TB. CAT 2 patients included patients who had relapsed, who had defaulted and returned for treatment, or had treatment failure and others. In the 8 months of the treatment by NTBLCP, there was an intensive phase for the first 2 months, and then a follow up of 6 months of treatment called the continuation phase. For CAT 1 TB patients, the intensive phase medication consisted of a combination of rifampicin, isoniazid, pyrazinamide and ethambutol followed by a 6 months continuation phase of isoniazid and ethambutol (2RHZE/6EH). For CAT 2 TB patients, the intensive phase with daily supervision was for 3 months with rifampicin, isoniazid, pyrazinamide, and ethambutol. Streptomycin was added in the first 2 months daily. The continuation phase involved a daily intake for 5 months of rifampicin, isoniazid, ethambutol and pyrazinamide (2SRHZE/RHZE/5RHZE). Under the NTBLCP, TB drugs came as a fixed dose combination (FDC) which helped to ensure adherence (11).

Monitoring of the progress of TB patients while on treatment was an essential part of the case management for TB patients. This was to ascertain the effectiveness of treatment as well as assessing improvement in the

patients' clinical state. Monitoring was done through sputum microscopy examination, clinical examination and drug intake recording.

Sputum smears were made on two early morning sputum samples, taken within two days and examined under microscopy for the bacilli. They were done at the end of the 2nd month for new cases, and at the end of the 3rd month for retreatment cases. The sputum smear examinations were then repeated at the end of 5th and 7th months respectively. A clinical examination of the patient was regularly conducted at least monthly, including a weight assessment. Assessment of the regularity of the drug intake was made by an examination of the patients' records.

NTBLCP adopted DOTS as the central strategy and mainstay in tackling the TB scourge in Nigeria. It was adopted to help in achieving its main targets of identifying at least 70% of the estimated infectious cases with positive sputum smear; a cure rate of at least 85% of the detected smear-positive cases; a reduction of TB prevalence and death rates by 50% relative to the 1990 level by 2015; and the elimination of TB as a public health problem by 2050 (11).The DOTS strategy improved treatment compliance, and increased the TB cure rate (12). Left alone, many people with TB failed to take all their medication and contributed to the spread of drug-resistant TB (Source: http://www.medicinenet.com/ script/ main/ art. asp?articlekey=12850).

In Jigawa state, DOTS was practised in all the local government areas, and the activities were coordinated by the State TB Leprosy Control Program (STBLCP) as well. DOTS activities were usually comprehensive and included both the treatment and diagnoses of TB. In 2006, the World Health Organization (WHO) launched the Stop TB Strategy, stretching from 2006 to 2015. This study was designed to evaluate the treatment outcome of TB patients in the selected areas, in Jigawa State, Nigeria.

Methodology

A cross sectional retrospective study was carried out to assess the treatment outcome in the selected TB DOTS facilities. The study was conducted at the seven local government areas of Jigawa State of Nigeria, with all the 963 TB patients, who were registered between years through 2010 to 2014, and had their treatment using the DOTS therapy. The outcome of the patients were evaluated at the end of their treatment.

Data were collected from the various LGA TB control registers used for the study with the help of data collection instruments. The LGA TB control registers contained basic information of the patients. This information included the date of registration and the LGA TB registration number; the demographic data of name, age and sex of the patient ; the details of treatment, the unit or facility, the date of the start of treatment and the treatment category; the details of the infection, the site of the infection (pulmonary/extra pulmonary),and the type of patient; the investigations including the baseline and follow up of TB smear results, and the x-ray results where applicable; the treatment follow up, HIV classification and the eventual treatment outcome. All the records obtained from the documents or history of TB patients were coded numerically and entered into the statistical software SPSS-V 22.0 for analysis. Chi-square tests were employed to compare different groups for categorical data. A p-value less than 0.05 was considered as significant.

Ethical Approval and Consent

The study was ethically approved by the Ethical Committee, Department of Public Health Daffodil International University Dhaka, Bangladesh. The ethics number was FAHSEC/DIU/2016/1002.

Results

Socio-demographic distribution of patients

The age group of 20 –29 years had the highest number of patients (25.2%) followed by the age group of 30 –39 years (22.9%). The older age groups of 50 –59 years and those older than 60 years had the least number of TB cases. More than half (57.4%) of the patients were male, and the rest were female (Table 1). It was observed that 71.2% of the patients accessed care from the urban local government areas, while the rest of the cases accessed care from rural local government areas (Table 1).

Table 1: Socio demographic distribution of patients (n=963)

Variables	Frequency	Percent (%)
Age (years)		
0-19	122	12.7
20-29	243	25.2
30-39	221	22.9
40-49	169	17.5
50-59	89	9.2
>59	119	12.4
Sex		
Male	553	57.4
Female	410	42.6
Type of residence		
Urban	686	71.2
Rural	277	28.8
Mean age = 36 years, SD ± 7.97		

Distribution of patients by disease classification and category

Table 2 showed the distribution of the patients by disease classification. 96.3% of the cases were PTB-cases while the remaining were EPTB-cases. Table 2 also showed the distribution of the TB patients by disease category. More than four-fifths (85.2%) of the cases were Category 1 TB cases while the remaining were Category 2 TB cases. Category 1 patients were all patients classified as new

cases including smear positive, smear negative and extra pulmonary new cases. Category 2 patients were patients classified under relapse, return with default, failure and others (Table 2).

Table 2: Distribution of patients by disease classification (n=963)

Variables	Frequency	Percent (%)
Disease classification		
PTB	927	96.3
EPTB	36	3.7
Disease Category		
CAT 1	820	85.2
CAT 2	143	14.8
Total	963	100

Distribution of patient by treatment outcome

Figure 1 showed the treatment outcome of the 963 patients in the study: 45% of the cases were cured; 38.2% had completed their treatment as scheduled; 5.3% of them died while undergoing treatment; slightly below one-tenth (8.4%) were defaulters; 1.3% had treatment failure, and 1.8% were transferred out. TSR for the state which is defined as the total number of patients that were either cured or had treatment completed was 83.2% (Figure 1).

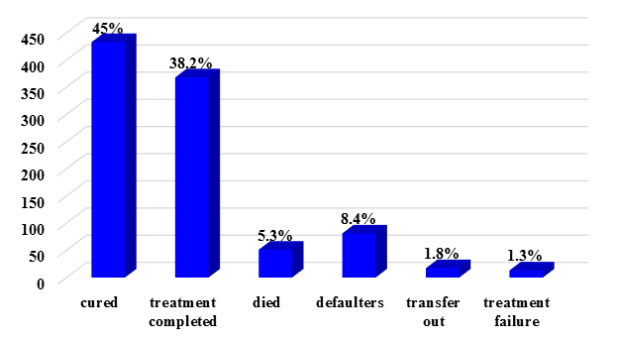

Figure I : The distribution of patients by treatment outcome (n=963)

Factors affecting treatment outcome

Table 3 showed the effect of smear characteristics, disease category and disease classification on treatment outcome. The study showed that the TSR of smear positive and smear negative TB patients are close (82.6% vs.84.5%). The table showed that there was a highly significant ($p<0.001$) association between smear characteristics and treatment outcome. The TSR of Category 2 and I were 83.9% and 79.1 %. There was also a statistically significant ($p<0.05$) association between the disease category and the treatment outcome. The table showed that the TSR of PTB patients was better than that of EPTB patients (83.4% vs.75.0%). It could be seen that there was a statistically

Table 3: Factors affecting treatment outcome (n=963)

Factors	Cured n (%)	Treatment n (%)	Died n (%)	Defaulter n (%)	Transfer n (%)	Failure n (%)	Total n (%)	TSR* (%)	Statistics
Smear type									
+ve	378(57.4)	166(25.2)	33(5.0)	61(9.3)	12(1.8)	9(1.4)	659(100)	82.6	X^2=1.661
-ve	55(18.1)	202(66.4)	18(5.9)	20(6.6)	5(1.6)	4(1.3)	304(100)	84.5	P<0.001
Category									
CAT 1	379(46.2)	309(37.7)	42(5.1)	71(8.7)	11(1.3%)	8(1.0)	820(100)	83.9	X^2=14.413
CAT 2	54(37.8)	59(41.3)	9(6.3)	10(7.0)	6(4.2%)	5(3.5)	143(100)	79.1	P<0.05
Disease classification									
PTB	425(45.8)	349(37.6)	48(5.2)	75(8.1)	17(1.8)	13(1.4)	927(100)	83.4	X^2=11.224
EPTB	8(22.2)	19(52.8)	3(8.3)	6(16.7)	0(0.0)	0(0.0)	36(100)	75.0	P<0.05
Residence									
Urban	283(41.3)	272(39.7)	33(4.8)	72(10.5)	17(2.5)	9(1.3)	686(100)	81.0	X^2=28.858
Rural	150(54.2)	96(34.7)	18(6.5)	9(3.2)	0(0.0)	4(1.4)	277(100)	88.9	P<0.001
Sex									
Male	228(41.2)	222(40.1)	32(5.8)	51(9.2)	11(1.9)	10(1.8)	554(100)	81.3	X^2=9.293
Female	205(50.1)	146(35.7)	19(4.6)	30(7.3)	6(1.5)	3(0.7)	409(100)	85.8	P>0.05
Age (years)									
≤19	122(100)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	122(100)	100	
20-29	243(100)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	243(100)	100	X^2=2.403
30-39	68(30.8)	127(57.5)	26(11.8)	0(0.0)	0(0.0)	0(0.0)	221(100)	88.3	P<0.001
40-49	0(0.0)	169(100)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	169(100)	100	
50-59	0(0.0)	72(80.9)	12(13.5)	1(1.1)	4(4.5)	0(0.0)	89(100)	80.9	
>59	0(0.0)	0(0.0)	13(10.9)	80(67.2)	13(10.9)	13(10.9)	119(100)	0.0	
Total	**433**	368	51	81	17	13	963		

*TSR: Treatment Success Rate, *PTB: Pulmonary Tuberculosis, *EPTB: Extra-pulmonary Tuberculosis, *CAT 1: Category 1, *CAT 2: Category 2.

significant (p<0.05) association between them. The TSR of rural areas was higher than the TSR of the urban area (88.9% vs. 81.0%). There were more defaulters in urban areas compared to rural areas (10.5% Vs 3.2%). There was also a highly significant (p<0.001) association between the location of treatment facility and treatment outcome. There was no significant (p>0.05) association between sex of the patients and treatment outcome. There was a highly significant (P<0.001) association between treatment outcome and age of the respondents.

Screening of HIV Disease

Figure 2 showed that out of 963 TB patients who were screened for HIV, 198(20.6%) of them were HIV positive and the rest 765(79.4%) were HIV negative. HIV prevalence rate of the study was 20.6%.

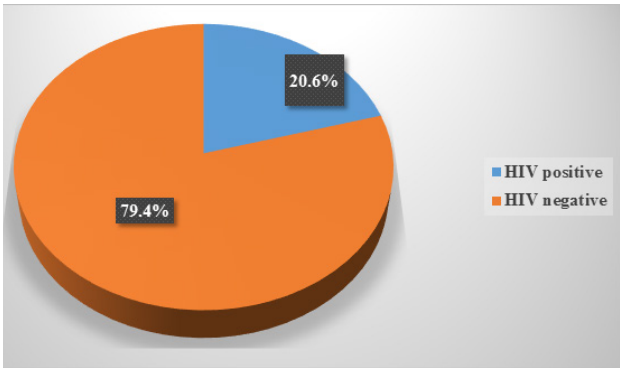

Figure 2: Screening of HIV Disease (n=963)

Discussion

In this study, 963 TB patients were evaluated. 633 (65.7%) patients were within the age range 20 –50 years (Table 1), showing that TB mainly infected the productive age group in the state, constituting a strong economic burden which could affect the work force. This was consistent with findings in previous reports in developing countries. The study done by Bello in Ilorin found that 75% of TB patients were in the age group 16 –45 years (13) and the study in Ile Ife by Erhabor et al. also showed that 80% of patients evaluated for TB compliance in Ile Ife were of the age range 16 –45 years (14). In contrast, TB had been reported to be two-to-four times more prevalent among the elderly age grouping in developed countries (15). In this study, the mean age of the patients was 36 years. This was consistent with the findings of Bello in Ilorin Nigeria where he found that 36 years was the mean age of the patients (13). Table 1 also showed that 553 (57.4%) of the TB patients were of the male sex. The finding was consistent with the previous study done in Gambella (16). Underutilization of DOTS services by females could be the reason behind the higher proportion of males in the present study. This factor was also of economic importance as males are predominantly the bread winners of the family in Africa. This was consistent with the findings in studies in Ibadan, Thailand and Malawi (17-19).

Of the 963 TB patients, 930 cases (96.3%) were PTB while 33 cases (3.7%) were EPTB cases (Table 2). The TSR for PTB was higher than that of EPTB (83.4% Vs 75.0). It could be due to the rate of HIV co-infection among the group of patients (20). This might be due to diagnostic challenges in identifying EPTB cases as a diagnosis of EPTB was made only by doctors and most TB DOTS services were manned by trained nurses and community health extension workers who were not competent or trained to diagnose EPTB. Other reasons might be the over reliance on alternative medical practitioners and native doctors by the general populace and poor intensive case findings of TB cases in Nigeria. Table 2 also showed that 820 (85.2%) of the TB cases were of CAT 1 TB cases. CAT 1 patients comprised of new cases both smear positive and smear negative, it also included all the extra pulmonary new cases. CAT 2 patients that included the patients classified under relapse, return after default, failure and others. According to the WHO 2009 report on global TB control, the TSR under the DOTS programs among 22 high-burden countries (HBCs) ranged from 58% in Russia to 94% in China, with an average of 87% (1). Our study showed that 45% and 38.2% of the TB patients were cured and completed treatment respectively (figure 1). This accounted for a TSR of 83.2% which was higher than that of Nigeria and African region (17). The TSR was also lower than that of 2013 international TSR (86%) among all new TB cases (21) and also lower than that reported from Dabat (87.8%) (22). The African region from the same 2009 report had a TSR of 75%, and Nigeria with the 4th highest TB burden had a TSR of 76% (17). The higher TSR of this study might be attributed to increased government commitment in the implementation of DOTS in the state. Causes of treatment failure from TB in other studies included drug resistant TB, TB-HIV co infection, prescription errors by unqualified health care workers, non-acceptable regimen, treatment outside the national program, patient related factors including illiteracy and poverty. Our findings found the death, default and treatment failure rate was 5.3%, 8.4% and 1.3% respectively. Cumulatively an overall unsuccessful TB treatment outcome rate was 15.0% which was similar to the findings of a study done in Southern Ethiopia (14.8%) (23). Unsuccessful treatment outcome higher than ours had been reported from southern Ethiopia (16.7%) (24). There were more deaths in DOTS facilities located in rural areas compared to the DOTS facilities located in urban areas (4.8% Vs 6.5%). Patients from rural areas might have lower awareness of TB treatment, and the long distance between their homes and the treatment centres could contribute to lower treatment success (25). Nevertheless, in our study, the TSR in the rural area (88.9%) was higher than TSR in the urban area (81.0%). Of the 963 TB patients evaluated in the study, 198(20.6%) of them were HIV positive. This was lower than the Nigerian TB HIV prevalence rate of 27% but was much higher than the average for the whole world 15% (26). TB HIV patients were monitored both by the TB team and the HIV team leading to increased compliance of the patient to both treatments hence improving treatment outcome. Of the total 963 TB

patients screened for HIV, slightly above one-fifth (20.6%) were HIV positive, with the majority males. This showed that more males were screened and supported the fact that in Nigeria attendance and utilisation of the health services depended on many factors. In some cultures and religions, the females would have to depend on their male counterparts for advice and funding before attending hospital hence delaying attendance. A study conducted in Bangladesh on access to TB diagnosis and treatment also documented that women had poorer access to public outpatient clinics than men (27).

This study showed that the introduction of the DOTS program made a commendable positive impact in the Jigawa state of Nigeria and steps should be taken to maintain a momentum to reach the NTBLCP and world TB target of 85% cure rate. DOTS as the standard of treatment and care in the LGAs would enable all to have treatment especially in the rural areas. The training of DOTS health care professionals with a commitment by the national health authorities in health policies, human resource development would ensure that the patients are cared for. TB HIV collaboration should be encouraged and enhanced. HIV testing should be extended to all TB patients while all HIV patients should be screened for TB. Proper reporting of data by DOTS facilities, with trained staff with accurate observation and follow up of patients during treatment, was important. Observations could be done by regular home visits of TB patients, formation of TB support groups, and usage of a family member as a treatment supporter. All these would help to monitor and report issues of defaulters to health care workers. These also would help in making sure that the treatment protocol was followed, leading to better treatment outcome.

Conclusion

This study revealed a treatment success rate (TSR) in Jigawa State of Nigeria that is higher than the TSR of Nigeria. The defaulter rate was lower than the Nigerian average. The failure rate was marginally lower and better than the Nigeria average using 2009 WHO Global TB report. This study found a death rate which is close to the death rate of TB patients in Nigeria.

Abbreviations

DOTS: Directly Observed Treatment Short course;

TB: Tuberculosis;

HIV: Human Immunodeficiency Virus;

TSR: Treatment Success Rate;

WHO, World Health Organization;

MDR: Multi Drug Resistant;

LGAs: Local Government Areas;

AIDS: Acquired Immune Deficiency Syndrome;

NTBLCP: Nigeria Tuberculosis and Leprosy Control Program;

STBLCP: State TB Leprosy Control Program;

TBL: Tuberculosis and Leprosy;

PTB: Pulmonary Tuberculosis;

EPTB: Extra-Pulmonary Tuberculosis.

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Competing interests

The authors declare that they have no competing interests.

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