

## Tuberculosis Treatment Outcomes at a University Hospital in Senegal: A Retrospective Study of 1030 Cases

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### Abstract

**Introduction:** Determining treatment outcomes is a key component of the fight against tuberculosis. This has become even more important with the emergence of multidrug resistant TB. The objective of this study was to determine the outcomes of patients treated for tuberculosis within the National Program for the Fight Against Tuberculosis (NTP) in Senegal.

**Methods:** We conducted a retrospective cohort study involving all patients treated for tuberculosis in the Department of Infectious Diseases at the Fann University Hospital in Senegal from January 1, 2011 to December 31, 2014. Data were entered and analysed using the software Epi-Info 3.7.1. The Chi-square test was used to compare treatment outcomes in 2011 versus 2014.

**Results:** Data were collected for 1030 cases of tuberculosis. Pulmonary (49%), lymphatic (15.9%) and neuro-meningeal tuberculosis (11.7%) were the main sites of involvement. The mean weight gain was  $5.3 \pm 4$  kg. TB treatment outcomes were distributed as follows: 504 (49%) treatment success, 278 (27%) deaths, 103 (10%) lost to follow-up, 143 (13.9%) transferred out and 1 (0.1%) failed. The therapeutic success rate fluctuated from 45.4% to 59.5% between 2011 and 2014 ( $p=0.07$ ). The proportion of patients lost to follow-up decreased significantly from 15.3% to 3.5% ( $p<0.001$ ). However, mortality increased from 22% to 31% ( $p=0.001$ ).

**Conclusion:** Tuberculosis treatment success rate within this hospital population remains low. Early detection of tuberculosis and HIV is the key point to improve outcome treatment.

**Keywords:** Tuberculosis; Treatment outcomes; Senegal

### Introduction

Tuberculosis (TB) remains a public health problem with 10.4 million cases worldwide in 2015 [1]. In 2014, the World Health Assembly set the goal of reducing TB mortality by 95% and TB incidence by 90% by the year 2035 [2]. Despite reductions in incidence by 2% per year and mortality by 3% per year, enhanced efforts are needed in order to end the tuberculosis epidemic by 2035 [1]. To achieve this goal, all diagnosed cases must be followed until the end of treatment. Treatment follow-up leads to decreased transmission, reduced mortality, and helps to prevent the emergence of cases of multidrug-resistant tuberculosis. Senegal has 78 Tuberculosis Treatment Centers (CDT) which ensure the detection and follow-up of cases according to the national guidelines. The goal of the National TB Program (NTP) is to diagnose at least 70% of smear-positive TB cases and cure 85% [3]. The objective of this study was to determine the outcomes of patients treated for tuberculosis at the Tuberculosis Treatment Center within the Department of Infectious Diseases at Fann University Hospital, located in Dakar, Senegal.

### Methods

#### Study design

We conducted a retrospective cohort study involving all patients treated for tuberculosis in the Department of Infectious Diseases at the Fann University Hospital in Senegal from January 1, 2011 to December 31, 2014.

#### Diagnostic criteria

Diagnosis of TB was confirmed by the presence of Acid Fast Bacilli

(AFB) highlighting bacilli in specimen smears using Ziehl Nielsen staining, the presence of Mycobacterium tuberculosis in pathological material following culture on Löwenstein-Jensen, or by GenXpert.

In the absence of confirmation, the diagnosis was made by the physician based on a set of standardized clinical criteria suggestive of tuberculosis.

#### Case definitions

A case is defined according to whether or not the patient has previously received TB treatment. TB cases were classified as a new cases (A patient who has never had treatment for TB or who has taken antituberculosis drugs for less than 1 month) or a retreatment cases (relapse cases, Treatment after failure, Treatment after default) [4].

#### Treatment regimen

**New cases:** Two months (intensive phase) of rifampicin - isoniazid - pyrazinamide - ethambutol, followed by 4 months (maintenance phase)

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of rifampicin - isoniazid (2RHZE/4RH).

**Treatment cases:** Two months (intensive phase) of rifampicin - isoniazid - pyrazinamide - ethambutol - streptomycin, followed by 6 months (maintenance phase) of rifampicin - isoniazid - pyrazinamide - ethambutol (2 RHZES / 6RHZE).

### TB treatment outcome

**Cured:** A pulmonary TB patient with bacteriologically confirmed TB at the beginning of treatment who was smear or culture negative in the last month of treatment and on at least one previous occasion.

**Completed treatment:** 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 are unavailable.

**Failure:** 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 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.

**Transferred out:** This includes cases "transferred out" to another treatment unit as well as cases for whom the treatment outcome is unknown to the reporting unit. Therapeutic success was defined as cured or completed treatment.

### Data collection

Data were collected from medical records and NTP treatment cards. Socio-demographic data, clinical data (hospitalization, date of TB diagnosis, weight at treatment initiation, form of TB, site of involvement, TB confirmation, and HIV status), and treatment outcomes were collected.

### Statistical analysis

Data was entered and analysed using Epi-info 3.7.1 software. The Chi-square test was used to compare treatment outcomes in 2011 versus 2014. A p-value less than 0.05 was considered significant.

### Ethics statement

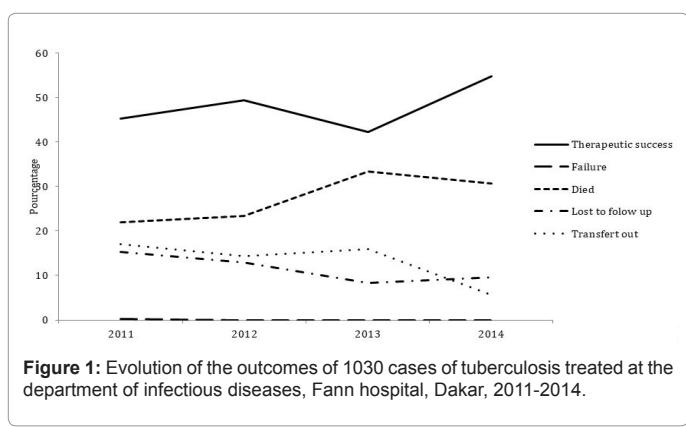
The Head of the Department of Infectious Diseases approved this retrospective study. All data collected were anonymized prior to analysis.

### Results

Data were collected for 1030 cases of tuberculosis from 2011- 2014: 300 (2011), 264 (2012), 237 (2013) and 229 (2014). The mean age of the patients was  $37.5 \pm 12.7$  years. The sex ratio was 1.3. The majority (92.7%) of patients came from the Dakar region, primarily from central district, Northern District, Pikine and Southern district (Table 1). Sixty percent (60%) of patients were hospitalized at the time of diagnosis. The mean patient weight at initiation of tuberculosis treatment was  $52.7 \text{ kg} \pm 11.1 \text{ kg}$ . Isolated pulmonary tuberculosis (49%) was the most common clinical presentation followed by multifocal tuberculosis (29%). Lymph node involvement (15.9%) neuro-meningitis (11.7%) and pleural involvement (9.0%) were the primary extra-pulmonary sites. For the majority of cases (94%), this was the first episode of tuberculosis (new cases). The diagnosis of tuberculosis was confirmed (31%) by

Variables	Number	Percent
Sex		
Male	585	57
Female	445	43
Age group (years)		
15-44	749	73
45-60	224	22
$\geq 60$	57	6
Districts Residence		
Dakar	955	92,7
Others regions of Senegal	64	6,2
Others countries	11	1,1
Hospitalization		
Yes	615	60
No	415	40
Site		
Pulmonary only	505	49
Extrapulmonary only	226	22
Multifocal	299	29
HIV status (n=777)		
Positive	520	67
Negative	257	33
Treatment outcomes		
Cured	133	13
Completed	361	35
Deceased	278	27
Transferred	145	14
Lost to follow-up	103	10
Failure	10	
Treatment category		
New case	967	94
Retreatment	63	6

**Table 1:** Characteristics of 1030 cases of tuberculosis treated at the department of infectious diseases, Fann Hospital, Dakar, 2011-2014.



**Figure 1:** Evolution of the outcomes of 1030 cases of tuberculosis treated at the department of infectious diseases, Fann hospital, Dakar, 2011-2014.

the detection of AFB in pathological products in 257 cases (25%) and by Gen-Xpert in 61 cases (6%). There was no rifampicin resistance for cases confirmed by GenXpert. The HIV prevalence was 67% (520 cases). Cotrimoxazole was prescribed in 85% of cases and one third (32.1%) of TB-HIV co-infected patients were receiving antiretroviral therapy (ART) at the time of TB diagnosis. Nearly half (49%) of patients achieved therapeutic success. Mortality was 27% and the percent lost to follow-up was 10% (Table 1). The lethality was 34% in patients co-infected TB/VIH versus 21% for the patients not infected with VIH

( $p<0.001$ ). From 2011 to 2014, the rate of therapeutic success fluctuated from 45.4% to 59.5% ( $p=0.07$ ), the percent of patients lost to follow-up decreased from 15.3% to 3.5% ( $<0.001$ ) (Figure 1). In contrast, mortality increased from 22% in 2011 to 31% in 2014 ( $p=0.001$ ).

## Discussion

TB is endemic in Senegal, with nearly 13,599 cases of TB were reported in 2015 [5]. Our results suggest that in Senegal, TB primarily affects young male patients residing in overcrowded urban areas. This study was conducted in a specialized infectious diseases department, which explains the high prevalence of HIV infection (67%). Nationally, the prevalence of HIV among TB patients is 8% [3]. In the setting of HIV-TB co-infection, there is an increase in the prevalence of extra-pulmonary or multifocal TB and it is often difficult to obtain bacteriological confirmation in these sites [6]. In our study we found 51% of extra pulmonary or multifocal tuberculosis.

Nearly half (49%) of the cases in this study achieved therapeutic success. This result is low compared to the national goal of curing 85% of smear positive tuberculosis cases. However, the therapeutic success rate increased from 45.4% in 2011 to 59.5% in 2014 ( $p=0.07$ ).

The overall mortality rate in our study was 27%, which increased from 22% to 31% ( $p=0.001$ ) during the study period. The high prevalence of HIV infection in our cohort likely contributed to the high mortality rate. The risk of death is significantly higher in TB patients co-infected with HIV [7]. In addition, the patients in this study had severe clinical presentations requiring hospitalization in 60% of cases. In order to improve outcomes, enhanced efforts are needed to ensure early detection and treatment of tuberculosis and HIV infection. Despite appropriate treatment mortality remains high especially early in the course of treatment [8-10].

In our series, 24% of subjects were lost to follow-up, or transferred to another structure during the treatment. Interruption of TB treatment is one of the main reasons for the emergence of multidrug-resistant tuberculosis [11]. The proportion of patients lost to follow-up remains high in our series (10%) even if it decreased significantly during the study period (15.3% to 3.5%;  $p<0.001$ ). Comparable lost to follow-up rates were reported in South Africa (11%) and Madagascar (16.5%) [12,13]. The reduction in the percentage of cases lost to follow-up noted in our series may be attributed to the establishment of an alert system and social worker participation in seeking out patients. A survey conducted in the our department found that worsening disease, distance, financial problems and the use of traditional therapy were the main causes of treatment discontinuation [14].

## Conclusion

Overall, the tuberculosis treatment success rate within this population remains low. In order to improve outcomes, enhanced efforts are needed to reduce the percentage of patients lost to follow-up and promote the early detection of tuberculosis and HIV infection before progression to advanced disease.

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