



Epidemiological, Clinical, and Progressive Aspects of Tuberculosis at the Thiès Health Center, Senegal (2012-2015): Comparison of Pulmonary and Extrapulmonary Forms

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Abstract

Introduction : Tuberculosis remains a major public health issue in Senegal, with a high incidence in the Thiès region. This study aimed to describe the epidemiological, clinical, and prognostic characteristics of tuberculosis at the Thiès health center, specifically comparing pulmonary and extrapulmonary forms. **Patients and Methods :** A retrospective study was conducted from January 1, 2012, to December 31, 2015, at the Thiès Health Center. All patients who had completed a standard antituberculosis treatment during this period were included. Sociodemographic, clinical, therapeutic, and outcome data were collected using an information collection form from the records of the National Tuberculosis Control Program. The data were analyzed using SPSS version 20.0 and Excel. **Results :** Out of 948 patients included, 821 (86.6%) had pure pulmonary tuberculosis and 120 (12.7%) had a pure extrapulmonary form. The mean age was 33.6 ± 14.4 years, with a male predominance (sex ratio = 2.29). The age group 20-39 years was the most affected (56.6%). A history of tuberculosis contact was reported by 29.0% of patients. The majority (96.3%) reported having received the BCG vaccine. Among comorbidities, hypertension was the most frequent (5.5%), followed by diabetes (2.7%) and HIV infection (1.9%). Fourteen point two percent of patients were smokers. Among extrapulmonary localizations, pleurisy (52.5%) and lymph node involvement (14.2%) were the most common. HIV seroprevalence was 1.9%. The overall cure rate was 71.2%, with a mortality rate of 5.3%. The comparison between pulmonary and extrapulmonary forms showed significant differences regarding sex, age, marital status, and employment ($p < 0.05$). **Conclusion :** Tuberculosis in the Thiès district mainly affects young, active men. Pulmonary forms are predominant, but extrapulmonary locations, particularly pleural, account for a significant portion. The prognosis remains favorable under standard treatment, but efforts should focus on early detection, therapeutic education, and strengthening follow-up.

Keywords: Pulmonary tuberculosis; extrapulmonary tuberculosis; epidemiology; Thiès; Sénégal; case management.

Introduction

Tuberculosis remains, according to the World Health Organization (WHO), a global public health emergency. In 2015, it was estimated that there were 10.4 million new cases and 1.4 million deaths attributable to this disease, making it the leading cause of death from a single infectious agent ahead of HIV [1]. In sub-Saharan Africa, the burden of tuberculosis is particularly heavy due to the coexistence of risk factors such as poverty, overcrowding, malnutrition, and the HIV epidemic [2].

In Senegal, tuberculosis is a major public health concern. The country reported 10,975 tuberculosis cases in 2008 and 11,734 cases in 2009. According to officials from the National Tuberculosis Control Program (PNT), 70% of cases are expected to be detected each year, and 80% of these must be cured to hope to break the chain of transmission. The Thiès region ranks third in terms of national prevalence with 68%, ahead of Diourbel at 60% and after Ziguinchor and Dakar with 102% and 79%, respectively. Some patients do not hesitate to turn to traditional medicine, with traditional practitioners being the first point of contact in the Thiès region [3,4].

The Thiès region, an economic and demographic hub, has a high incidence and active transmission dynamics. However, precise local data on the epidemiological profile, clinical characteristics, and treatment outcomes remain fragmented.

Moreover, extrapulmonary tuberculosis (EPTB) accounts for 15 to 30% of cases in high-endemic countries [5]. Its diagnosis is often delayed due to polymorphic and nonspecific clinical presentations, which can worsen the prognosis. A better understanding of the characteristics of EPTB compared to pulmonary tuberculosis (PTB) is therefore necessary to optimize screening and management strategies.

The main objective of this study was to describe the epidemiological, clinical, and developmental aspects of tuberculosis at the Thiès health center between 2012 and 2015. The secondary objective was to compare these characteristics between patients with PTB and those with EPTB.

Patients and methods

Study framework and type : A retrospective, descriptive, and analytical study was carried out at the Thiès Health Center, which serves as the focal point for tuberculosis management in the Thiès health district. The study period extended from January 1, 2012, to December 31, 2015.

Population : All patients diagnosed with tuberculosis, of any form, who were put on standard antituberculosis treatment according to national recommendations (2RHZE/4RH regimen) and who completed this treatment during the study period were included. Patients whose treatment was still ongoing as of December 31, 2015, were excluded.

Data collection : A standardized data collection form was used to extract information from the National Tuberculosis Control Program (NTCP) registers and patient records. The variables collected included :

- Sociodemographic characteristics : age, gender, occupation, marital status.
- History and risk factors: tuberculosis exposure, BCG

vaccination, diabetes, high blood pressure (hypertension), HIV infection, smoking, alcoholism.

- Clinical data: location of tuberculosis (purely pulmonary, purely extrapulmonary, mixed), type of patient (new case, relapse, transfer).
- Therapeutic and progress data: treatment plan, duration, treatment outcome (recovery, death, lost to follow-up, treatment completed).

Statistical analysis : The data were entered and analyzed using SPSS version 20.0 and Excel. Qualitative variables were described using frequencies and percentages, while quantitative variables were described using means and standard deviations. Comparisons between the pulmonary and extrapulmonary tuberculosis groups (PT and EPT) were performed using the Chi-square test (or Fisher's exact test when appropriate) for qualitative variables and the Student's t-test for quantitative variables. The significance level was set at $p < 0.05$.

Ethical considerations : The study was conducted in compliance with data confidentiality. Patient anonymity was maintained. Authorization from the administration of the Thiès Health Center and the University Ethics Committee was obtained prior to data collection.

Results

Out of the 1,035 files reviewed, 948 (91.6%) met the inclusion criteria and were analyzed.

Sociodemographic characteristics

The average age of the patients was 33.6 years (± 14.4 years), with a median of 31 years. The most represented age groups were 20-39 and 40-59 years, accounting for 56.6% and 23.3%, respectively. The sex-ratio (M/F) was 2.29. The patients were unmarried (57.2%), and 63.1% were unemployed at the time of diagnosis (Table I).

Medical history and risk factors

The concept of tuberculosis exposure was reported by 29.0% of patients. The majority (96.3%) stated that they had received the BCG vaccine. Among comorbidities, hypertension was the most common (5.5%), followed by diabetes (2.7%) and HIV infection (1.9%). Regarding lifestyle habits, 14.2% of patients were smokers, 2.8% consumed alcohol, and 0.7% used illicit drugs.

Clinical and therapeutic characteristics

Pure pulmonary tuberculosis accounted for 86.6% of cases ($n=821$), pure extrapulmonary tuberculosis for 12.7% ($n=120$), and mixed forms (pulmonary + extrapulmonary) for 0.7% ($n=7$). Among pure extrapulmonary TB cases, the most frequent sites were pleural (52.5%), lymph node (14.2%), and osteoarticular (11.7%) – Table VII. The vast majority of patients (94.2%) were new cases. All patients received standard first-line treatment (2RHZE/4RH).

Progress under treatment

The outcome of the treatment was favorable, with a cure rate of 71.2%. Death occurred in 5.3% of cases, treatment abandonment or loss to follow-up in 2.8% of cases, and 17.3% of patients had a "treatment completed" outcome without bacteriological confirmation of cure.

Table I: Sociodemographic, clinical, developmental, and therapeutic characteristics of the overall population of TB patients

Sociodemographic, clinical, developmental, and therapeutic characteristics			
Variables	Categories	Frequencies	Percentage (%)
Sex	Male	660	69.6
	Female	288	30.4
Age	[1-19]	127	13.4
	[20-39]	537	56.6
	[40-59]	221	23.3
	60 years and over	63	6.70
Marital statut	Maried	406	42.83
	Single	495	52.22
	Divorced	18	1.90
	Widowed	29	3.06
Profession	Traders	217	61,42
	Civil servants	85	24,28
	Drivers	48	13,71
	Unemployed	598	63,08
Counting notion	Yes	275	29.01
	No	673	70.99
BCG vaccination statut n=852	Yes	821	96.31
	No	31	3.69
Medical history, background, lifestyle	High blood pressure	52	5.48
	Diabetes (type 2)	26	2.74
	HIV	18	1.89
	Smoking	135	14.24
	Alcohol use	27	2.84
	Drug use	7	0.73
Location	Pulmonary	821	86.6
	Extrapulmonary (purely)	120	12.66
	Associated locations	7	0.74
Extrapulmonaires locations n=120	Pleural	63	52.5
	Spleno-lymphatic	17	14.17
	Ostéo-articular	14	11.66
	Digestive	11	9.16
	Miliary form	8	6.66
	Others	7	5.85
Patient type	New case	893	94.2
	Relapse	46	4.9
	Transfer	9	0.9
Therapeutic and developmental modalities	Healing	675	71.20
	Treatment completed	164	17.30
	Lost sight of	27	2.80
	Relapses	2	0.20
	Death	50	5.30
	Others (not specified)	30	3.20

Comparison of pulmonary tuberculosis (PT) versus extrapulmonary (EPT)

The comparison of the 821 cases of pure TP and the 120 cases of pure EPT revealed several statistically significant differences :

- **Age** : The 20-39 age group was more represented in the TP group (58.6% vs 45.0%, $p<0.02$).

- **Sex** : The male predominance was more pronounced in the TP group (sex ratio TP=2.4; PET=1.7; $p<0.03$).

- **Marital status** : Unmarried patients were more numerous in the TP group (58.3% vs 49.2%, $p<0.02$).

- **Job** : The proportion of unemployed patients was higher in the PET group (68.3% vs 62.1%, $p<0.02$).

- **Comorbidities** : The prevalence of HIV infection was significantly higher in the PET group (5.8% vs. 1.3%, $p<0.03$). No significant differences were observed for diabetes or hypertension.

- **Evolution** : The cure rate was higher in the TP group (75.9% vs 33.3%), while the proportion of 'treatment completed' (without bacteriological evidence) was higher in the TEP group (50.0% vs 12.4%). Mortality was also higher in the TEP group (11.7% vs 4.4%). However, the overall difference in outcomes was not

statistically significant ($p=0.55$).

Extrapulmonary tuberculosis was significantly associated with

older age groups, female sex, marital status, unemployment and

HIV infection (table II).

Tableau II : Comparison between pulmonary tuberculosis and extrapulmonary tuberculosis

Variables			Pulmonary tuberculosis (PT)		Extrapulmonaire tuberculosis (TEP)		p-value
Mean age			33.44(±13.93)		35.27(±17.63)		p=0.94
Age group		[1-19 ans]	109	(13.27%)	19	(15.83%)	p<0.018
		[20-39 ans]	481	(58.58%)	54	(45%)	
		[40-59 ans]	185	(22.53)	31	(25.83%)	
		60 ans et plus	46	(5.60%)	16	(13.33%)	
Sex		Male	580	(70.64%)	76	(63.33%)	p<0.03
		Female	241	(29.35%)	44	(36.66%)	
Marital status	married	Married	342	(41.65%)	61	(50.83%)	p<0.016
	Not married	Single	441	(53.71%)	51	(42.50%)	
		Widow	22	(2.67%)	6	(5.00%)	
		Divorced	16	(1.94%)	2	(1.66%)	
Employment		Yes	311	(37.88%)	38	(31.66%)	p<0.02
		No	510	(62.11%)	82	(68.33%)	
Past medical history		Hypertension	44	(5.35%)	7	(5.83%)	p=0.90
		Diabetes	23	(2.80%)	3	(2.50%)	p=0.80
		HIV	11	(1.33%)	7	(5.83%)	p<0.03
		BCG	786	(95.73%)	120	(100%)	p=0.95
Contact with TB patient		Yes	252	(30.69%)	23	(19.16%)	p=0.087
		No	569	(69.30%)	97	(80.83%)	
Lifestyle		Smoking	124	(15.10%)	11	(9.16%)	p=0.083
		Alcohol use	23	(2.80%)	3	(2.50%)	p=0,12
		Illegal drug use	7	(0.85%)	0	(0,00%)	p=0.605
Evolution		Healing	631	(75.85%)	40	(33.33%)	p<0.001
		Relapse	0	(0,00%)	2	(1.66%)	p=0.016
		Death	36	(4.38%)	14	(11.66%)	p=0.003
		Treatment completed	102	(12.42%)	60	(50.00%)	p<0.001
		Lost to follow-up	23	(2.80%)	3	(2.50%)	p=1.00
		Not specified	28	(3.41%)	2	(1.66%)	p=0.162

Treatment outcomes differed significantly between PT and EPT patients ($\chi^2=140.24$; $df=5$; **p<0,001**). Patients with PT had a higher cure rate, whereas treatment completion and mortality were proportionally more frequent among EPT patients.

Discussion

This retrospective study, involving 948 patients treated for tuberculosis in the Thiès district, confirms that this disease primarily affects the young working-age population (20-39 years) and men. This observation is consistent with national data from Senegal and many sub-Saharan African countries, and could be explained by greater mobility and occupational exposure among men [3,6].

The predominance of the pulmonary form (86.6%) reflects the airborne mode of transmission of the disease and corresponds to data from the literature in high-endemic areas. However, the significant proportion of EPTB (12.7%) highlights the need to maintain clinical vigilance for these forms, which are often diagnosed late. The predominance of tuberculous pleurisy among EPTB cases is a frequently reported finding in West Africa,

whereas lymph node involvement often predominates in contexts of HIV co-infection [7,8,9].

The demographic profile shows a more pronounced male predominance in PT (sex ratio 2.4) than in TEP (1.7), with a statistically significant difference ($p < 0.023$) that aligns with the observations of Traoré in Mali and Voahangy in Madagascar. While the average age remains similar between the two forms (around 34 years), our results differ from Asian data from Hong Kong, where patients are significantly older (42 to 49 years), highlighting the impact of the disease on the active African population [2,9,10].

Clinically, the association with HIV is significantly more frequent in the TB group (5.85% versus 1.33%), confirming that immunosuppression promotes the dissemination of the bacillus [10].

Finally, the outcome of the treatment highlights a particular vulnerability of extrapulmonary forms: although the overall cure rate is 71.2%, the lethality is more than twice as high in the EPTB group (11.66%) compared to the PTB group (4.38%). This high death rate for EPTB is higher than that reported by Traoré (9.46%), suggesting diagnostic delays or increased severity of the

cases encountered in Thiès [2].

The comparison between TB and EPTB highlighted distinct profiles. The higher prevalence of HIV in the EPTB group (5.8% vs 1.3%) is a classic finding, as immunosuppression promotes extrapulmonary dissemination [12].

The observed difference in marital status and employment could be related to biases in healthcare access or to specific socioeconomic factors that differently affect susceptibility to the two forms of the disease.

The overall recovery rate (71.2%) remains below the 85% target set by the WHO, but is comparable to other West African studies [1,13].

The higher lethality in the PET group, although not statistically significant in our analysis, is concerning and could be related to diagnostic delays or the severity of certain locations (meningitis, miliary). The high rate of "treatment completed" in the PET group (50%) reflects the difficulty of obtaining bacteriological confirmation of cure for these forms, a well-known problem in control programs [14].

Limitations of this study include its retrospective nature, with a risk of missing data in registries, and the lack of systematic microbiological or histological confirmation for all PET cases. In addition, some information such as socio-economic status was not available.

Conclusion

This study provides a current profile of tuberculosis in the Thiès district, Senegal. It confirms that the disease mainly affects young and active men, in its pulmonary form. Extrapulmonary tuberculosis, primarily pleural, affects one in eight patients and is associated with a higher prevalence of HIV infection. The prognosis under standard treatment is generally favorable, but efforts must continue to improve cure rates, particularly for extrapulmonary tuberculosis.

We recommend :

- For the National Tuberculosis Control Program (PNLT): Strengthen diagnostic capacities (culture, molecular biology) for more systematic confirmation of TB cases and improve the bacteriological follow-up of their recovery.
- For practitioners at the Thiès health center: Maintain a high level of clinical suspicion for any extrapulmonary manifestations, especially in people living with HIV, in order to initiate early presumptive treatment when necessary.
- For community awareness: Intensify information campaigns targeting young, active men on the symptoms of tuberculosis and the importance of early and complete screening and treatment.

Declarations

Funding : this study received no external funding.

Ethics approval and consent to participate

Ethical approval for this study was obtained from Ethical Committee. Written informed consent was obtained from all participants (or their legal guardians).

Consent for publication : written informed consent for

publication was obtained from the participants.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests : the authors declare that they have no competing interests.

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