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## Clinical and epidemiological characterization of tuberculosis at the Raoul Follereau Hospital. Guinea Bissau, 2024

### Caracterización clínico-epidemiológica de la tuberculosis en el Hospital Raoul Follereau. Guinea Bissau, 2024

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**RESUMEN**

**Introducción:** La tuberculosis (TB) continúa siendo una de las enfermedades infecciosas con mayor carga mundial, especialmente en África subsahariana. En Guinea Bissau, los datos clínico-epidemiológicos actualizados son escasos, lo que limita las intervenciones locales. **Objetivo:** Caracterizar los casos diagnosticados de tuberculosis según variables sociodemográficas, clínicas y epidemiológicas en el Hospital Raoul Follereau durante 2024. **Métodos:** Estudio descriptivo transversal. Se incluyeron los 385 pacientes con diagnóstico de tuberculosis ingresados en el hospital. Los datos se obtuvieron mediante revisión de historias clínicas y registros estadísticos. Se analizaron frecuencias absolutas y relativas. **Resultados:** Predominó el sexo masculino (54,8%) y el grupo de 60 años o más (25,5%). La ocupación más frecuente fue "ama de casa" (48,6%). Los principales factores de riesgo fueron alcoholismo (63,6%) y desnutrición (52,2%). El VIH fue la comorbilidad más común (22,6%). El 80,8% de los casos se confirmó bacteriológicamente. **Conclusiones:** Existe una alta frecuencia de factores de riesgo modificables (alcoholismo, desnutrición) y comorbilidades como el VIH en los pacientes con tuberculosis. Se requieren estrategias locales de prevención y control para reducir la transmisión y avanzar hacia la eliminación de la enfermedad.

**ABSTRACT**

**Introduction:** Tuberculosis (TB) remains one of the infectious diseases with the greatest global burden, especially in sub-Saharan Africa. In Guinea-Bissau, up-to-date clinical and epidemiological data are scarce, limiting local interventions. **Objective:** To characterize diagnosed cases of tuberculosis according to sociodemographic, clinical, and epidemiological variables at Raoul Follereau Hospital during 2022. **Methods:** Cross-sectional descriptive study. All 385 patients diagnosed with tuberculosis and admitted to the hospital were included. Data were obtained through review of medical records and statistical registers. Absolute and relative frequencies were analyzed. **Results:** Males predominated (54.8%), as did the 60 years and older age group (25.5%). The most frequent occupation was "housewife" (48.6%). The main risk factors were alcoholism (63.6%) and malnutrition (52.2%). HIV was the most common comorbidity (22.6%). 80.8% of cases were bacteriologically confirmed. **Conclusions:** There is a high frequency of modifiable risk factors (alcoholism, malnutrition) and comorbidities such as HIV in patients with tuberculosis. Local prevention and control strategies are needed to reduce transmission and move toward eliminating the disease.

## INTRODUCTION

Tuberculosis (TB) is one of the world's leading infectious disease causes of death, with a particularly high burden in low- and middle-income countries <sup>(1)</sup>. In 2024, the World Health Organization (WHO) reported that TB had once again become the leading cause of death from a single infectious agent, with approximately 10.8 million incident cases and 1.25 million deaths in 2023 <sup>(2)</sup>. Sub-Saharan Africa bears a disproportionate share of this burden, with an estimated incidence of 361 cases per 100,000 population. In Guinea-Bissau, TB is endemic, with an estimated 7,800 incident cases annually, a significant proportion of which go undiagnosed and unreported <sup>(3,4)</sup>.

TB transmission is facilitated by adverse socioeconomic conditions, such as overcrowding, poverty, and limited access to health services <sup>(5)</sup>. In addition, there are well-documented individual risk factors. Malnutrition is the most prevalent risk factor globally; a 2024 Cochrane review estimated that it increases the risk of developing active TB by a factor of 2.23 (HR 2.23; 95 % CI: 1.83–2.72) <sup>(6)</sup>. Excessive alcohol consumption is associated with a relative risk of 2.94 (95 % CI: 1.89–4.59), and approximately 10 % of global TB cases are attributable to alcohol <sup>(7)</sup>. Smoking also increases the risk; a 2023 meta-analysis showed an odds ratio of 1.49 (95% CI: 1.34–1.66) for symptomatic TB in current smokers <sup>(8)</sup>. HIV coinfection remains the most potent risk factor: in sub-Saharan Africa and Ethiopia, between 20 % and 25 % of new TB cases occur in people living with HIV, and in the AIDS stage, the relative risk exceeds 100 times <sup>(9,10)</sup>.

In Guinea-Bissau, despite the existence of a national TB control program, the lack of up-to-date local characterizations hinders the implementation of targeted interventions. All diagnosed TB cases are admitted to the Raoul Follereau Hospital, the national referral center, making this hospital an ideal setting for studying the characteristics of the affected population <sup>(11)</sup>. However, to date, no studies have been published that comprehensively characterize TB patients at this institution. Therefore, this study aimed to clinically and epidemiologically characterize patients diagnosed with tuberculosis and admitted to the Raoul Follereau Hospital during 2024, in order to provide local evidence to guide strategies for prevention, early diagnosis, and control of the disease.

## METHODS

### Study Design and Type

A cross-sectional, descriptive, observational study was conducted at Raoul Follereau Hospital (Guinea-Bissau) during 2024.

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## Population and Sample

The population consisted of all patients with a confirmed diagnosis of TB admitted to the hospital during the study period. A total of 385 patients were included, representing the entire population (census sampling). The following criteria were applied:

**Inclusion criteria:** Patients of any age and sex, with a confirmed diagnosis of TB (pulmonary or extrapulmonary) based on bacteriology or clinical-radiological criteria, who had been hospitalized for at least 24 hours during 2024.

**Exclusion criteria:** Patients whose usual residence was outside of Bissau (due to incomplete follow-up) and those transferred to another region immediately after diagnosis without data available for the study.

## Variables and Operational Definitions

The variables analyzed were grouped as follows:

**Sociodemographic:** age (in completed years, categorized into ten-year age groups: 19-29, 30-39, 40-49, 50-59,  $\geq 60$  years), sex (male/female), place of residence (neighborhood of origin within Bissau), occupation (homemaker, worker, unemployed).

**Clinical and Epidemiological:** comorbidities (HIV/AIDS, diabetes mellitus, hypertension, COPD, bronchial asthma, bronchiectasis, lung cancer); vulnerable groups/risk factors (alcoholism, malnutrition, contact with cases of smear-positive pulmonary TB, age  $\geq 60$  years, homelessness, smoking, drug addiction, non-communicable diseases, prolonged hospitalization). Diagnostic confirmation (bacteriologically confirmed/clinically diagnosed); clinical classification (new case, relapse, treatment failure, readmission due to treatment abandonment, chronic case), according to definitions from the Cuban National Tuberculosis Control Program adapted to the local context<sup>(21)</sup>; radiological findings (chest x-ray: normal, cavities, diffuse alveolar infiltrates, tuberculoma, bronchogenic dissemination, pleural effusion); symptoms and signs (weight loss, sputum production, fever, persistent non-productive cough, asthenia, night sweats, nausea, dyspnea, chills, hemoptysis); discharge category at the end of treatment (cured, treatment failure, transfer, deceased).

The criteria for defining alcoholism, malnutrition, and other variables were based on medical records and TB program records (previous diagnosis or evaluation by the healthcare team). No new measurements or specific tests were performed for the study.

## Data Sources and Collection Procedure

Information was obtained through a systematic review of individual medical records and statistical records from the hospital's Tuberculosis Control Program. An electronic data collection form (Microsoft Excel) was designed that included all study variables. Two trained researchers independently extracted the data, with discrepancies resolved by consensus with a third researcher. No personally identifiable information was collected; only aggregated clinical and demographic variables were gathered.

## Statistical Analysis

Data were stored and processed using Microsoft Excel (version 16, Microsoft Corp., Redmond, WA, USA). A descriptive analysis was performed, calculating absolute (n) and relative (percentage) frequencies for qualitative variables, and measures of central tendency and dispersion (mean, standard deviation, minimum, and maximum) for quantitative variables. Given the descriptive nature of the study, hypothesis testing and regression models were not applied. The results are presented in tables and graphs, accompanied by their interpretation in the text.

## Ethical Considerations

The study was conducted in accordance with the principles of the Declaration of Helsinki and Good Clinical Practice guidelines. It was approved by the Research Ethics Committee of the University of Medical Sciences of Matanzas (Cuba) and by the Scientific Committee of the Raoul Follereau Hospital (Guinea-Bissau) (Approval Code: CEI UCM TB 2022 05). Since this was a retrospective study based on a review of medical records and registries, the committee waived the requirement for individual informed consent, provided that data confidentiality was guaranteed. All records were anonymized, removing any information that could identify patients. The authors declare no conflicts of interest and that no generative artificial intelligence was used in the drafting of the manuscript.

## RESULTS

A study was conducted on 385 patients diagnosed with tuberculosis and admitted to Raoul Follereau Hospital during 2024. The mean age was 48.3 years (SD: 16.2; range: 19–89 years). 54.8 % were male, with a male-to-female ratio of 1.21:1. The most affected age groups were 60 years and older (25.5 %) and 50–59 years (24.2 %), together accounting for almost half of the cases (49.7 %) (Table 1).



**Table 1.** Distribution of tuberculosis patients by age group and sex

| Age Groups   | Male (n=211) |             | Female (n=174) |             | Total (N=385) |              |
|--------------|--------------|-------------|----------------|-------------|---------------|--------------|
|              | No           | %           | No             | %           | No            | %            |
| 19-29 years  | 22           | 5,7         | 21             | 5,5         | 43            | 11,2         |
| 30-39 years  | 35           | 9,1         | 28             | 7,3         | 63            | 16,4         |
| 40-49 years  | 49           | 12,7        | 39             | 10,1        | 88            | 22,9         |
| 50-59 years  | 53           | 13,8        | 40             | 10,4        | 93            | 24,2         |
| 60+ years    | 52           | 13,5        | 46             | 11,9        | 98            | 25,5         |
| <b>Total</b> | <b>211</b>   | <b>54,8</b> | <b>174</b>     | <b>45,2</b> | <b>385</b>    | <b>100,0</b> |

**Source:** Medical records and records of the Tuberculosis Control Program.

HIV/AIDS was the most frequent comorbidity (22.6 %), followed by diabetes mellitus (19.7 %) and hypertension (17.1 %). Other comorbidities present were bronchiectasis (13.2 %), lung cancer (13.0 %), bronchial asthma (8.3 %), and COPD (6.0 %) (Table 2). A single patient could present with multiple comorbidities.

**Table 2.** Distribution of comorbidities in patients with tuberculosis

| Comorbidity       | No | %*   |
|-------------------|----|------|
| HIV/AIDS          | 87 | 22,6 |
| Diabetes mellitus | 76 | 19,7 |
| Hypertension      | 66 | 17,1 |
| Bronchiectasis    | 51 | 13,2 |
| Lung cancer       | 50 | 13,0 |
| Bronchial asthma  | 32 | 8,3  |
| COPD              | 23 | 6,0  |

**Source:** Medical records. Percentage based on 385 patients (not mutually exclusive).

The most prevalent risk factors were alcoholism (63.6 %), malnutrition (52.2 %), and contact with a case of smear-positive pulmonary tuberculosis (51.4 %). Adults over 60 years of age and homeless individuals represented 25.5 % and 22.6 %, respectively (Table 3).

**Table 3.** Distribution of risk factors in patients with tuberculosis

| Risk factors                          | No  | %*   |
|---------------------------------------|-----|------|
| Alcoholics                            | 245 | 63,6 |
| Malnourished                          | 201 | 52,2 |
| Contact with a smear-positive TB case | 198 | 51,4 |
| Adults ≥ 60 years                     | 98  | 25,5 |
| Homeless                              | 87  | 22,6 |
| Smokers                               | 78  | 20,3 |
| Drug users                            | 76  | 19,7 |
| Prolonged institutionalization        | 52  | 13,5 |

**Source:** Epidemiological histories. Percentage based on 385 patients (not mutually exclusive).

Of the cases, 80.8 % were bacteriologically confirmed, while 19.2 % were diagnosed based on clinical and radiological criteria. Regarding clinical classification, new cases represented 48.8 %, relapses 20.3 %, and treatment failure 14.6%. Readmissions due to treatment abandonment (10.7 %) and chronic cases (5.7 %) completed the series. At discharge, 71.9 % of patients were discharged as cured, 16.4 % as treatment failure, 6.0 % were transferred, and 5.7 % died (Table 4).

**Table 4.** Distribution of patients according to clinical classification and discharge category

| Clinical classification                  | No  | %    |
|------------------------------------------|-----|------|
| New case                                 | 188 | 48,8 |
| Relapse                                  | 78  | 20,3 |
| Therapeutic failure                      | 56  | 14,6 |
| Readmission due to treatment abandonment | 41  | 10,7 |
| Chronic case                             | 22  | 5,7  |
| Graduation category                      |     |      |
| Discharged                               | 277 | 71,9 |
| Therapeutic failure                      | 63  | 16,4 |
| Transfer                                 | 23  | 6,0  |
| Deceased                                 | 22  | 5,7  |

**Source:** Medical records and discharge records.

The most frequent symptoms were weight loss (78.2 %), sputum production (76.1 %), and fever (74.6 %). Persistent nonproductive cough and asthenia were reported by more than half of the patients (52.2 % and 51.7 %, respectively). Hemoptysis was the least common symptom (15.8 %). Chest radiography was normal in 25.7 % of patients; among the abnormal findings, cavities (23.1 %) and diffuse alveolar infiltrates (20.0 %) were the predominant findings. Solitary tuberculoma was observed in 13.8 %, bronchogenic spread in 9.1 %, and pleural effusion in 8.3 % (Table 5).

**Table 5.** Distribution of the main symptoms and radiological findings

| Symptoms and signs              | No  | %    |
|---------------------------------|-----|------|
| Weight loss                     | 301 | 78,2 |
| Coughing up sputum              | 293 | 76,1 |
| Fever                           | 287 | 74,6 |
| Persistent non-productive cough | 201 | 52,2 |
| Weakness                        | 199 | 51,7 |
| Hemoptysis                      | 61  | 15,8 |

| Radiological findings        |    |      |
|------------------------------|----|------|
| Normal X-ray                 | 99 | 25,7 |
| Cavities                     | 89 | 23,1 |
| Diffuse alveolar infiltrates | 77 | 20,0 |
| Solitary tuberculoma         | 53 | 13,8 |
| Bronchogenic spread          | 35 | 9,1  |
| Pleural effusion             | 32 | 8,3  |

**Source:** Clinical and radiological records.

Regarding the patients' place of origin, the neighborhoods with the highest number of cases were Militar (18.4 %), Bandin (12.2 %), and Quelele (11.7 %). Almost half of the patients (48.6 %) were unemployed or homemakers, while employed individuals represented 27.8 %.

**DISCUSSION**

In this study, the characterization of 385 tuberculosis patients admitted to the Raoul Follereau Hospital in Guinea-Bissau during 2024 shows a predominance of males (54.8 %) and adults over 60 years of age (25.5 %), with a high frequency of modifiable risk factors such as alcoholism (63.6 %), malnutrition (52.2 %), and HIV coinfection (22.6 %). These results reflect a reality shared with other sub-Saharan African countries and allow for the identification of priorities for local interventions.

The observed male predominance (male:female ratio 1.21:1) coincides with the global findings reported by the WHO, where tuberculosis disproportionately affects men in all age groups and geographic regions (1,2). This pattern has been attributed to greater exposure to risk factors such as alcohol and tobacco use, as well as men's lower rate of seeking medical attention (7,8). In our series, alcoholism reached 63.6 %, reinforcing this association. Conversely, a study in Colombia found a female predominance (59 %), highlighting the geographic and cultural variability of the disease (12).

The higher incidence in the 60 and older age group (25.5 %) contrasts with studies conducted in other African countries where cases are concentrated between 15 and 54 years of age (3,4). However, this finding aligns with research in Cuba and the United States that has documented a shift in TB cases toward older adults, explained by immunosenescence, the higher prevalence of comorbidities (diabetes, hypertension), and the reactivation of latent infections (13,14). In our context, the high proportion of older adults could also reflect improvements in life expectancy in Guinea-Bissau, although unfavorable socioeconomic conditions and overcrowding in multigenerational households could facilitate transmission (6,15).

Alcoholism was the most prevalent risk factor (63.6 %). A 2023 systematic review estimated that alcohol use disorder increases the risk of TB by a factor of 2.94 (95 % CI: 1.89–4.59) and that approximately 10 % of global cases are attributable to alcohol <sup>(7)</sup>. This association is particularly relevant in Guinea-Bissau, where the consumption of artisanal beverages is common and harm reduction programs are limited.

Malnutrition, present in 52.2 % of our patients, is another determining factor. The 2024 Cochrane review <sup>(6)</sup> cited above confirms the magnitude of this risk. In sub-Saharan Africa, food insecurity and diets deficient in micronutrients (vitamin D, zinc, selenium) contribute to the progression of latent infection to active disease <sup>(15)</sup>. The high prevalence of malnutrition in our series (52.2 %) exceeds the estimated global average for TB patients (around 30–40 %), suggesting the need to implement nutritional interventions as part of standard treatment <sup>(16)</sup>.

HIV coinfection (22.6 %) was the most frequent comorbidity, consistent with WHO data for sub-Saharan Africa, where approximately 20–25% of new TB cases occur in people living with HIV <sup>(9)</sup>. A 2024 meta-analysis confirmed that HIV is the most potent risk factor for developing pulmonary TB, with relative risks exceeding 100-fold in the AIDS stage <sup>(17)</sup>. In our hospital, 5.7 % of patients died, mostly from TB/HIV coinfection, highlighting the need to strengthen early HIV diagnosis and integrated antiretroviral therapy <sup>(2,9)</sup>.

80.8 % of cases were bacteriologically confirmed, exceeding the WHO target of 70 % for sputum smear detection <sup>(2)</sup>. This high percentage reflects the use of smear microscopy and, in some cases, GeneXpert, although its availability in Guinea-Bissau during 2022 was limited <sup>(18)</sup>. A study in Ethiopia demonstrated that the implementation of GeneXpert shortened the time to treatment initiation from more than three weeks to just seven days <sup>(18)</sup>. Full adoption of rapid molecular testing should be a priority in the country.

New cases represented 48.8 %, a lower proportion than that reported in other African countries (where they typically exceed 70 %) <sup>(3,19)</sup>. This difference is explained by the high frequency of relapses (20.3 %) and treatment failures (14.6 %), suggesting problems with treatment adherence, the quality of supervision, or the presence of undiagnosed drug-resistant TB. In 2024, the WHO warned that global treatment coverage for multidrug-resistant TB (MDR/RR TB) had fallen to 164 545 patients, well below estimated needs <sup>(20)</sup>. In Guinea-Bissau, the lack of drug susceptibility testing makes it impossible to know the true extent of resistance.



The triad of weight loss, sputum production, and fever (present in >74 % of cases) is consistent with the medical literature, which describes these symptoms as the most frequent in active pulmonary TB <sup>(1,13)</sup>. Surprisingly, 25.7 % of patients had a normal chest X-ray despite florid clinical symptoms, confirming the well-known clinical-radiological dissociation of TB <sup>(13)</sup>. This finding has practical implications: a normal chest X-ray does not rule out the disease, especially in immunocompromised patients <sup>(17)</sup>. Cavities (23.1 %) and alveolar infiltrates (20.0 %) were the most common abnormal patterns, consistent with typical adult cavitary post-primary TB <sup>(11)</sup>.

The cure rate of 71.9 % falls short of the WHO's target of 85 % <sup>(2)</sup>. This result is concerning and reflects multiple barriers: treatment abandonment, therapeutic failures (16.4 %), and mortality (5.7 %). A recent study in Latin America identified factors associated with treatment abandonment as including alcohol consumption, lack of family support, and adverse drug effects <sup>(21)</sup>. In our series, the high prevalence of alcoholism and malnutrition likely contributes to these poor outcomes. The mortality rate of 5.7 % is similar to that reported in other African countries for TB/HIV, although it could be underestimated if patients die after discharge <sup>(2,9)</sup>.

Several limitations should be acknowledged. First, the cross-sectional and descriptive design precludes establishing causal relationships. Second, the reliance on medical records may introduce information bias (incomplete or inaccurate records). Third, because it was conducted in a single referral hospital, the results may not be generalizable to all of Guinea-Bissau, especially to rural areas with less access to health services. Fourth, the absence of drug susceptibility testing (GeneXpert for resistance) prevents the identification of multidrug-resistant TB cases <sup>(18)</sup>. Fifth, standardized anthropometric criteria were not used to define malnutrition, which could have overestimated or underestimated its prevalence <sup>(6)</sup>. Finally, the study did not include extrapulmonary forms of TB, which may be the most frequent in patients with advanced HIV.

Despite these limitations, this study is the first to characterize TB at Raoul Follereau Hospital and one of the few conducted in Guinea-Bissau. The sample is large (385 patients) and represents the universe of cases diagnosed at the main national referral center. The findings have immediate applicability: TB control programs in the country should prioritize nutritional interventions, alcohol reduction programs, integration of HIV testing and antiretroviral therapy, and the widespread implementation of rapid molecular tests with drug resistance detection.

Prospective studies are needed to evaluate treatment adherence and predictors of treatment failure and abandonment. Likewise, research on the prevalence of drug-resistant TB using GeneXpert or culture is urgently needed. Finally, it would be valuable to explore the role of malnutrition and alcoholism as targets for community interventions to break the chain of transmission.

## CONCLUSIONS

The study revealed that tuberculosis in Guinea-Bissau predominantly affects males and adults over 60 years of age, with a mean age of 48.3 years. The most prevalent modifiable risk factors were alcoholism and malnutrition, while HIV was the most frequent comorbidity. 80.8 % of cases were bacteriologically confirmed, but the proportion of new cases was low, with high rates of relapse and treatment failure. The cure rate at discharge reached only 71.9 %, below the WHO target of 85 %, and the mortality rate was 5.7 %. These findings demonstrate that significant barriers to tuberculosis control persist in the country. Comprehensive strategies are needed, including nutritional interventions, alcohol reduction programs, integration of HIV diagnosis and treatment, and the implementation of rapid molecular tests to detect drug resistance.

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## AUTHORS' CONTRIBUTIONS

**CMHB:** conceptualization, formal analysis, research, methodology, validation, original draft, revised draft, and editing.

**DdICHS:** conceptualization, data curation, formal analysis, research, methodology, supervision, validation, visualization, original draft, revised draft, and editing.

**ACCF:** data curation, formal analysis, methodology, validation, original draft, revised draft, and editing.

**RMQ:** data curation, formal analysis, original draft.

**EAA:** visualization, original draft, revised draft, and editing.

**CCH:** visualization, original draft, revised draft, and editing.

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The authors declare no conflict of interest.

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### **USE OF ARTIFICIAL INTELLIGENCE**

The authors declare that no artificial intelligence was used in the writing of this manuscript.