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Original Article

Burden of infectious diseases in a West African tertiary hospital: a two-year retrospective study at CHNU de Fann, Senegal

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Abstract

Introduction: Despite progress in prevention and treatment, infectious diseases remain a major cause of morbidity and mortality in West Africa. Hospital-level data are limited. This study aimed to assess the burden, clinical spectrum, and outcomes of infectious diseases at a referral hospital in Senegal.

Methodology: A retrospective study of all non-coronavirus disease 2019 (COVID-19) infectious disease admissions at the Centre Hospitalier National Universitaire (CHNU) de Fann from January 2021 to December 2022 was conducted. Sociodemographic, clinical, diagnostic, and outcome variables were recorded. Logistic regression identified factors independently associated with in-hospital mortality.

Results: A total of 1,098 patients (median age 42, 57.2% male) were included. Tuberculosis (TB; 21.8%), malaria (13%), and community-acquired pneumonia (9.2%) were the leading diagnoses. Human immunodeficiency virus (HIV) infection was present in 28.1% of patients, with 58.4% having opportunistic infections. Overall mortality was 25.0%. Independent predictors of death included HIV-positive status (OR: 2.1; 95% CI: 1.4–3.2), neurological involvement (OR: 1.7; 95% CI: 1.2–2.5), age > 60 years (OR: 1.9; 95% CI: 1.1–3.1), and sepsis (OR: 2.3; 95% CI: 1.5–3.6).

Conclusions: Infectious diseases remain a leading cause of hospitalization and death in Senegal. Improving early diagnostics, integrating TB/HIV services, and expanding access to fungal testing are crucial to improve outcomes in resource-limited hospital settings.

Key words: hospital; burden; mortality; HIV; tuberculosis; Senegal.

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Introduction

Infectious diseases remain a major cause of morbidity and mortality in low- and middle-income countries, particularly in sub-Saharan Africa. This disproportionate burden reflects the interaction of multiple contextual factors: structural poverty, inadequate sanitation, high population density, late presentation to care, and the limited availability of diagnostics and treatment options [1–3]. In this context, patients often present in advanced stages of illness, frequently after repeated self-medication with empirical antibiotics or traditional remedies, contributing to delayed diagnosis and suboptimal outcomes [4].

Senegal's healthcare system, while relatively robust by regional standards, continues to face these challenges. Despite marked progress in malaria control, the expansion of antiretroviral therapy (ART), and improvements in tuberculosis (TB) diagnostics, infectious and parasitic diseases still rank among the top causes of premature death nationally [5]. In addition, the clinical landscape is evolving, with emerging fungal infections, syndemics such as human immunodeficiency virus (HIV)/TB co-infection, and increasing antimicrobial resistance (AMR), further complicating diagnosis and management [6–8].

The Centre Hospitalier National Universitaire (CHNU) de Fann in Dakar is one of the country's leading referral hospitals, managing complex infectious disease cases from across the nation. Despite its importance, few comprehensive studies have examined the full spectrum of infectious diseases treated at this center. Most available data are either disease-specific (e.g., HIV, TB) or based on regional or outpatient settings [9,10].

Hospital-based data are crucial to inform national policy, guide diagnostic resource allocation, and shape context-appropriate clinical guidelines. By assessing the real-world burden of infectious diseases at the hospital level, such studies also shed light on systemic gaps in care, training needs, and potential targets for intervention.

The present study aimed to (1) describe the sociodemographic and clinical characteristics of patients hospitalized for infectious diseases at CHNU de Fann over a two-year period, (2) assess in-hospital outcomes including mortality and complications, and

(3) identify factors independently associated with death, with the ultimate goal of informing clinical and policy-level strategies to improve outcomes.

Methodology

Study design and setting

A retrospective, descriptive, and analytical study was conducted in the Infectious and Tropical Diseases Department of the CHNU de Fann in Dakar, Senegal. This tertiary center serves as a national referral hospital and has a 70-bed capacity, including an intensive care unit and a specialized HIV ward.

Study population

All adult patients (aged ≥ 15 years) admitted between 1 January 2021 and 31 December 2022 with a primary diagnosis of infectious disease were included. Coronavirus disease 2019 (COVID-19) cases and patients referred for non-infectious indications were excluded.

Data collection

Data were extracted from paper and electronic medical records using a standardized collection tool. The following variables were recorded: demographic data (age, gender, geographic origin), comorbidities (HIV status, diabetes, hypertension), clinical presentation and affected organ systems, final diagnoses (microbiologically, radiologically, or clinically confirmed), treatment regimens and empirical antibiotic use, length of stay, complications, and mortality.

Clinical definitions and case classification

Diagnoses were based on available documentation and classified using the ICD-10 categories. Clinical syndromes were defined based on documentation in the medical records at admission and during hospitalization. Neurological involvement was defined by the presence of altered consciousness (Glasgow coma scale < 15), seizures, focal neurological deficits, meningeal signs, or coma documented by the attending clinician.

Sepsis was defined clinically as suspected or confirmed infection associated with signs of acute organ dysfunction, such as hypotension, respiratory distress, altered mental status, or oliguria, in the absence of systematically recorded sepsis-related organ failure assessment (SOFA) scores.

Complications were defined as acute clinical events occurring during hospitalization that required additional diagnostic or therapeutic intervention. When multiple syndromes or complications were present in the same patient, all were recorded.

Statistical analysis

Data were analyzed using R version 4.2.2. Descriptive statistics were used for baseline characteristics. Categorical variables were compared using the Chi-square test or Fisher's exact test, as appropriate. Continuous variables were expressed as medians or means. Multivariate logistic regression was used to identify independent predictors of in-hospital mortality, adjusting for relevant covariates. Odds ratios (ORs) and 95% confidence intervals (CIs) were reported. A p value < 0.05 was considered statistically significant.

Handling of missing data and regression modeling strategy

Given the retrospective design of the study, some variables contained missing data. No data imputation was performed. Analyses were therefore conducted using complete-case analysis for the multivariate regression model.

Variables associated with in-hospital mortality in univariate analysis with a p value < 0.20 were considered for inclusion in the multivariate logistic regression model. Collinearity between variables was assessed before model construction. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were reported.

Ethical considerations

This study used anonymized secondary data. According to Senegalese regulations, formal ethical review is not required for retrospective analyses involving non-identifiable patient data. The study complied with the principles of the Declaration of Helsinki.

Results

Patient characteristics

Of the 1,208 admissions recorded during the study period, 1,098 patients met the inclusion criteria. The median age was 42 years (range: 15–87 years), and 57.2% were male. Most patients (66%) lived in the Dakar metropolitan area. The most frequent comorbidities were HIV infection (28.1%), diabetes (9.3%), and hypertension (7.6%).

When comparing outcomes, patients who died during hospitalization were generally older and more frequently had underlying comorbidities than survivors, while gender distribution was similar between the two

Table 1. Comparison of survivors and non-survivors.

Variable	Survivors (n = 823)	Non-survivors (n = 275)	*p* value	Significant in final multivariate model
Median age (years)	39	54	< 0.001	Yes
Age > 60 years, n (%)	152 (18.5%)	95 (34.5%)	< 0.001	Yes
Male gender, n (%)	471 (57.2%)	157 (57.1%)	0.98	No
HIV infection, n (%)	188 (22.8%)	120 (43.6%)	< 0.001	Yes
Diabetes mellitus, n (%)	62 (7.5%)	40 (14.5%)	< 0.001	No
Hypertension, n (%)	49 (6.0%)	34 (12.4%)	< 0.001	No
Neurological involvement, n (%)	220 (26.7%)	106 (38.5%)	< 0.001	Yes
Sepsis, n (%)	57 (6.9%)	35 (12.7%)	< 0.001	Yes

groups. A comparison between survivors and non-survivors is presented in Table 1.

Clinical syndromes and diagnoses

As shown in Table 2, the most frequently involved clinical systems at admission were respiratory (35.2%), neurological (29.7%), and digestive (16.6%). Respiratory involvement mainly included pneumonia and pulmonary tuberculosis, while neurological involvement was dominated by cerebral malaria, meningitis, and neuro-tuberculosis.

Several patients presented with more than one affected system at admission; therefore, clinical system categories were not mutually exclusive. Multisystemic involvement mainly reflected severe infections complicated by sepsis.

The leading infectious diagnoses were tuberculosis (239 cases, 21.8%), malaria (142 cases, 13%), and community-acquired pneumonia (101 cases, 9.2%). Among the tuberculosis cases, 77% were pulmonary. Most malaria cases were classified as severe, with cerebral malaria accounting for 68.4% of cases.

HIV infection and opportunistic infections

HIV infection was documented in 308 patients (28.1%). Among these patients, tuberculosis was the most frequent associated diagnosis (36.4%), followed by oral candidiasis (6.8%), pneumocystis pneumonia (4.9%), and cryptococcal meningitis (2.3%). Overall, 58.4% of HIV-positive patients presented with at least one opportunistic infection.

Information on prior antiretroviral therapy was not available for 40% of HIV-positive patients.

Complications and outcomes

The mean length of hospital stay was 10.6 ± 5.1 days. Complications occurred in 222 patients (20.2%), as detailed in Table 3. The most frequent complications were sepsis, severe metabolic disorders, and acute respiratory distress.

Complications occurred predominantly in patients with severe disease at presentation. Sepsis and acute respiratory distress were more frequent among patients who did not survive hospitalization.

Overall, in-hospital mortality was 25.0% (275 deaths). Mortality was higher among patients with neurological involvement (32.4%), those presenting with sepsis (38.2%), patients aged over 60 years (34.7%), and those with underlying comorbidities.

Figure 1 illustrates the distribution of the main infectious diagnoses and their associated in-hospital mortality rates.

Multivariate predictors of in-hospital mortality

Based on multivariate logistic regression analysis, 4 variables were independently associated with in-hospital mortality: positive HIV status (OR: 2.1; 95% CI: 1.4–3.2; $p = 0.001$), neurological involvement (OR: 1.7; 95% CI: 1.2–2.5; $p = 0.005$), age over 60 years

Table 3. Distribution of patients according to affected clinical systems.

Affected system	Number of cases (n)	% of total (N = 1,098)
Respiratory	387	35.2%
Neurological	326	29.7%
Digestive	182	16.6%
Genitourinary	68	6.2%
Multisystemic/sepsis	92	8.4%
Others (skin, ENT, etc.)	43	3.9%

Based on the primary locations of clinical syndromes at admission.

Table 2. Complications observed during hospitalization.

Type of complication	Number of cases (n)	% of patients with complications (N = 222)	% of total patients (N = 1,098)	Typical timing
Sepsis	59	26.6	5.4	Early
Severe metabolic disorders	50	22.5	4.6	Early
Acute respiratory distress	34	15.3	3.1	Early
Encephalopathy	28	12.6	2.6	Early
Acute kidney injury	26	11.7	2.4	Variable
Septic shock	25	11.3	2.3	Early

(OR: 1.9; 95% CI: 1.1–3.1; $p = 0.021$), and sepsis (OR: 2.3; 95% CI: 1.5–3.6; $p < 0.001$).

Figure 2 presents the adjusted odds ratios and 95% confidence intervals for factors independently associated with in-hospital mortality.

Discussion

This study provides a comprehensive overview of the infectious disease burden in a tertiary West African hospital. The overall in-hospital mortality in this cohort of 1,098 consecutive admissions reached 25%, with markedly higher mortality among patients presenting with neurological involvement, sepsis, older age, and major comorbidities. These findings highlight the severity of disease at hospital admission and provide context for the predictors identified in the multivariate analysis. The data confirm that tuberculosis, malaria, and HIV-associated infections continue to dominate admissions and drive hospital mortality. Despite national progress in tuberculosis control, many patients in this cohort were admitted with advanced disease, often requiring hospitalization for severe pulmonary or disseminated forms. Late presentation, frequent HIV co-infection, and limited access to rapid diagnostic confirmation at earlier levels of care likely contributed to the persistently high mortality observed.

High mortality (25%) reflects systemic constraints, including late presentation, insufficient diagnostic capacity, and therapeutic delays. As in other African settings, many patients arrive at tertiary centers after weeks of self-medication, often with incomplete or inappropriate antibiotic courses [2,10]. This practice undermines diagnostic yield and fosters AMR [11,12].

HIV-positive patients, particularly those with advanced immunosuppression, were disproportionately affected. Opportunistic infections were common, but

Figure 2. Multivariate analysis of independent factors associated with in-hospital mortality.

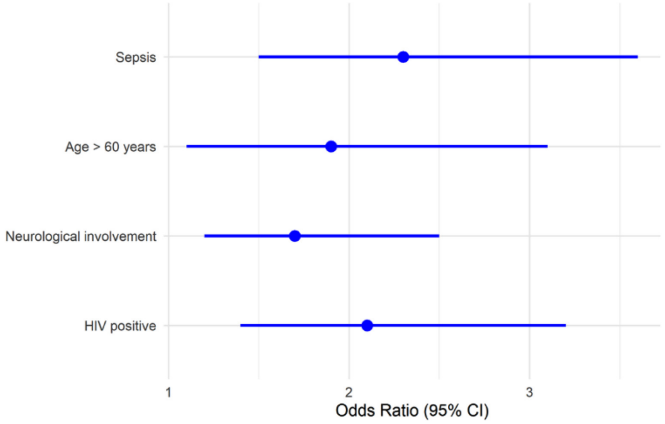
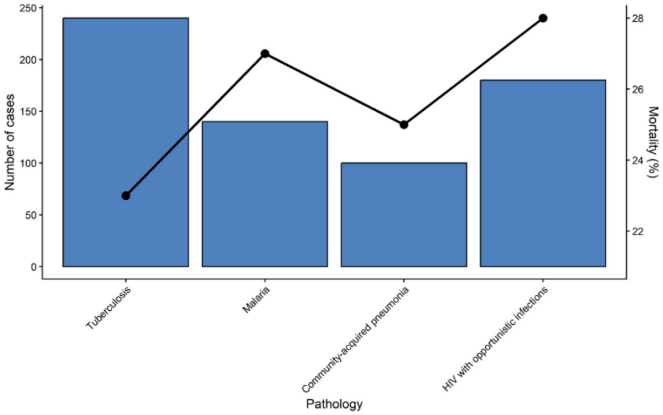


Figure 1. Distribution of primary infections and associated mortality rates.



many remained undiagnosed until hospitalization. This suggests critical gaps in outpatient screening, ART retention, and access to prophylactic therapies [13].

Neurological forms—especially cerebral malaria and cryptococcal meningitis—were strongly associated with mortality, consistent with literature [14,15]. Although malaria diagnosis was routinely performed using rapid diagnostic tests or microscopy, detailed information on parasite density and timing of diagnosis was not consistently available, limiting further stratification of disease severity. Limited access to brain imaging and delayed lumbar punctures likely contributed to poor outcomes. The expansion of point-of-care cryptococcal antigen testing and increased clinician training are urgently needed.

Sepsis was an underrecognized yet highly lethal complication. Standardized sepsis protocols, early warning scores, and availability of blood cultures could reduce delays in management and improve survival [16].

Finally, the findings of this study highlight the need to integrate care for infectious and chronic diseases. Diabetes and hypertension were frequently associated with poor outcomes, mirroring global patterns of comorbidity in infectious disease care.

Limitations

This study has several limitations. Its retrospective design relies on the accuracy and completeness of medical records, exposing the analysis to potential misclassification bias. Many diagnoses were based on clinical and radiological criteria in the absence of microbiological confirmation, particularly for fungal and bacterial infections.

Missing data were substantial for some key variables, notably ART history among HIV-positive

patients, which may have influenced mortality estimates. The study did not capture temporal variations in admission volumes, seasonal patterns, or diagnostic delays, nor did it quantify access to specific diagnostic tools such as multiplex PCR in cerebrospinal fluid or cryptococcal antigen testing.

Finally, this single-center study reflects practices in a tertiary referral hospital and may not be fully generalizable to district or rural settings.

Conclusions

Infectious diseases remain a predominant cause of hospitalization and mortality in Senegal, as illustrated by this 2-year study at CHNU de Fann. TB, malaria, and HIV-associated infections—often complicated by late presentation and limited diagnostics—continue to overwhelm referral centers.

To improve outcomes, targeted investments are needed in early diagnostic capacity (e.g., point-of-care tests, microbiology labs), integration of HIV and TB services, standardized sepsis recognition and management protocols, and expanded training on fungal and neurological infections. In addition, hospital-based surveillance should be strengthened to better inform policy, prioritize interventions, and guide local guidelines.

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Conflict of interest

No conflict of interest is declared.

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