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Prevalence and factors associated with co-infection among patients living with HIV at the Mbandaka General Referral Hospital, Democratic Republic of the Congo: a retrospective study 2023–2024

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Abstract

Introduction: In the Democratic Republic of the Congo (DRC), co-infection among people living with HIV (PLHIV) remains a major challenge. This study aimed to determine the prevalence and factors associated with co-infection (opportunistic infections or advanced WHO stages 3/4) within the cohort at the Mbandaka General Referral Hospital (HGR).

Methods: A retrospective cross-sectional study was conducted on 52 records of PLHIV followed between January 2023 and December 2024. Sociodemographic, clinical, biological and therapeutic data were analysed. Binary logistic regression identified the independent factors associated with co-infection.

Results: The prevalence of co-infection was 65.4% (95% CI: 51.4%–77.8%). Tuberculosis (64.7% of those with co-infections) and candidiasis (52.9%) were the most common opportunistic infections. The mean age was 38.4 ± 14.2 years, with a higher proportion of women (57.7% female). In multivariate analysis, delay in seeking consultation (≥ 3 months) (ORa = 3.60; 95% CI: 1.02–12.71; p = 0.046) and a CD4 count < 350 cells/mm³ (ORa = 4.26; 95% CI: 1.02–17.80; p = 0.047) were independently associated with co-infection. Malnutrition (BMI < 18.5) was close to reaching statistical significance (p = 0.062). Mortality was 13.5%, and 23.1% of patients were lost to follow-up.

Conclusion: Co-infection is highly prevalent in Mbandaka and is diagnosed late. Early screening, reducing delays in initiating ARVs and strengthening prophylaxis (isoniazid) are nursing and clinical priorities.

Keywords: HIV, co-infection, tuberculosis, DRC, Mbandaka, associated factors, late diagnosis.

1. Introduction

Sub-Saharan Africa is home to two-thirds of the world's people living with HIV (PLHIV). In the Democratic Republic of the Congo (DRC), the national prevalence rate is estimated at 1.2%, but pockets of high endemicity persist, particularly in the provinces of Équateur and Haut-Uélé. In Mbandaka, the General Referral Hospital (HGR) serves as a key care centre, but data on co-infection (opportunistic infections and advanced stages) are limited there. Identifying the factors associated with co-infection is essential for guiding screening and treatment adherence strategies. This study aimed to: (1) estimate the prevalence of co-infection among PLHIV followed at the HGR/Mbandaka; (2) describe the spectrum of opportunistic infections; (3) identify associated socio-demographic, clinical and biological factors.

2. Methods

2.1. Setting and period

A retrospective cross-sectional study conducted at the Mbandaka General Hospital (Equateur Province, DRC) from January 2023 to December 2024.

2.2. Population and sampling

All PLHIV aged over 18 (and accompanied minors) with usable medical records were included. Exclusion criteria: incomplete records or incoming transfers without an initial assessment. A comprehensive sample included 52 records meeting the criteria.

2.3. Variables and definitions

Co-infection: presence of at least one documented opportunistic infection (OI) or WHO stage 3 or 4 at diagnosis.

Time to consultation: late if ≥ 3 months between first symptoms and first HIV consultation.

Malnutrition: BMI < 18.5 kg/m².

Severe immunodeficiency: CD4 count < 200 cells/mm³.

2.4. Statistical analyses

Analyses were performed using R software (version 4.2). Chi-square or Fisher's exact test was used for categorical variables, and Student's t-test for continuous variables. Binary logistic regression (stepwise downward method) was used for independent factors. The significance threshold was set at $p < 0.05$.

2.5. Ethical considerations

Approval from the Ethics Committee of the HGR/Mbandaka and anonymisation of data.

3. Results

3.1. Sociodemographic characteristics (N=52)

Table 1: Sociodemographic characteristics of the study population (N=52)

Characteristics	Number (n)	Percentage (%)
Age (years)		
< 15 years	3	5.8
15–24 years	6	11.5
25–34	12	23.1
35–44	15	28.8
45–54	10	19.2
55 and over	6	11.5
Gender		
Male	22	42.3
Female	30	57.7
Occupation		
Unemployed / Housewife	18	34.6
Shopkeeper	12	23.1
Farmer / Fisherman	9	17.3
Other	13	25
Level of education		
No schooling	11	21.2
Primary	19	36.5
Secondary	16	30.8
Higher education	6	11.5
Origin		
Urban	28	53.8
Suburban / Rural	24	46.2

Comment: Analysis of this table shows that the sample, with an average age of 38.4 ± 14.2 years, consists mainly of young adults, with the 35–44 age group being the most represented (28.8%). There is a marked predominance of women, with 57.7% of the sample being female, giving a male-to-female ratio of 0.73. Socio-economically, the population is predominantly in precarious circumstances, with a high prevalence of unemployed people or homemakers (34.6%) and a limited level of education (only 11.5% have attained upper secondary education). Finally, a slight majority of participants live in urban areas (53.8%).

3.2. Prevalence and clinical profile

Table 2: Clinical and nutritional characteristics (N=52)

Parameter	Sample size (n)	Percentage (%)
WHO stage		
Stage 1	8	15.4
Stage 2	10	19.2
Stage 3	18	34.6
Stage 4	16	30.8
BMI (kg/m²)		
Malnutrition (< 18.5)	34	65.4
Normal (18.5–24.9)	15	28.8
Overweight (≥ 25)	3	5.8
Performance status (WHO)		
Good	12	23.1
Impaired	21	40.4
Poor / Very poor	19	36.5

Comment: The clinical data reveal a significant severity of the patients' health status at the time of the study. A large majority of the sample (65.4%) are in advanced clinical stages of the disease (WHO Stages 3 and 4). This poor clinical condition is corroborated by an alarming nutritional status, as 65.4% of patients are malnourished (BMI < 18.5 kg/m²). Furthermore, the general health status (performance status) is assessed as impaired to very poor for 76.9% of subjects, reflecting a major systemic impact of the disease.

3.3. Spectrum of opportunistic infections (in 34 co-infected patients)

Table 3: Spectrum of opportunistic infections (N=34)

Opportunistic infection	Number (n)	Percentage (%) *
Tuberculosis (all forms)	**22**	**64.7**
– Pulmonary form	*14*	*41.2*
– Extrapulmonary form	*8*	*23.5*
Candidiasis	**18**	**52.9**
– Oropharyngeal	*14*	*41.2*
– Oesophageal	*4*	*11.8*
Cerebral toxoplasmosis	6	17.6
Cryptococcosis	5	14.7
Pneumocystosis	4	11.8
Multiple infections (≥ 2 IO)	**18**	**52.9**

**The total may exceed 100% as a patient may have multiple IO.*

Comment: The spectrum of opportunistic infections (OIs) is largely dominated by tuberculosis, which affects nearly two-thirds of co-infected patients (64.7%), with a marked prevalence of the pulmonary form (41.2%). Candidiasis ranks second, affecting more than half of the subjects (52.9%), mainly in the oropharyngeal form. Other serious conditions such as cerebral toxoplasmosis (17.6%) and cryptococcosis (14.7%) are also present. It is crucial to note that co-infection is a major characteristic of this population: 52.9% of patients suffer from at least two simultaneous opportunistic infections, which highlights the diagnostic and therapeutic complexity.

3.4. Laboratory profile

The mean CD4 count was **248 ± 186 cells/mm³** (median: 196). Severe immunodeficiency (CD4 < 200) was found in more than half of the patients (**51.9%**).

Anaemia was almost universal, affecting **84.6%** of subjects (mean Hb = 9.8 ± 2.3 g/dL). Furthermore, HBs antigen (Hepatitis B) carriage was noted in **13.5%** of patients.

Table 4: Distribution of key laboratory parameters (N=52)

Parameter	Number (n)	Percentage (%)
CD4 (cells/mm³)		
< 200 (Severe)	27	51.9
200–349 (Moderate)	14	26.9
350–499 (Mild)	6	11.5
≥ 500 (Normal)	5	9.6
Haemoglobin (Hb)		
< 8 g/dL (Severe anaemia)	12	23.1
8–9.9 g/dL (Moderate)	18	34.6
10–11.9 g/dL (Mild)	14	26.9
≥ 12 g/dL (Normal)	8	15.4

Comment: The patients' laboratory profile indicates profound immunosuppression and high haematological morbidity. More than half of the cohort (51.9%) has severe immunosuppression with a CD4 count below 200 cells/mm³, the median being 196. At the same time, anaemia is almost universal, affecting 84.6% of subjects, with nearly a quarter of patients (23.1%) suffering from severe anaemia (Hb < 8 g/dL). These results, coupled with HBs antigen carriage in 13.5% of participants, confirm the biological vulnerability of this study population.

3.5. Factors associated with co-infection

Table 5: Multivariate logistic regression analysis (N=52)

Variable	Coefficient (β)	ORa	95% CI	p-value
Delay in consultation (3 months)	1.28	**3.6**	[1.02 – 12.71]	**0.046**
CD4 < 350/mm³	1.45	**4.26**	[1.02 – 17.80]	**0.047**
Malnutrition (BMI < 18.5)	1.21	3.35	[0.94 – 11.95]	0.062
Rural/peri-urban origin	1.12	3.06	[0.82 – 11.42]	0.096

Model adjusted for age and sex. ORa: Adjusted odds ratio.

Comment: Multivariate logistic regression analysis enables the identification of the major determinants of co-infection within the study population. After adjusting for age and sex, two independent risk factors emerge as significant. Firstly, a **delay in seeking medical advice of three months or more** increases the risk of co-infection by **a factor of 3.6** ($p = 0.046$), highlighting the detrimental impact of delayed care. Secondly, a **CD4 count below 350 cells/mm³** appears to be the most powerful predictive factor, with a **4.26-fold increased** risk ($p = 0.047$). Although malnutrition and rural origin showed associations in the bivariate analysis, they did not retain statistical significance after adjustment ($p > 0.05$), although malnutrition showed a strong trend ($p = 0.062$).

Table 6: Management and treatment outcomes of patients

Categories	Indicators	Frequency (n=52)	Percentage (%)
Antiretroviral therapy (ART)	Overall coverage	48	92.30%
	Immediate initiation	13	25.00%
Preventive Treatments	Cotrimoxazole prophylaxis	44	84.60%
	Preventive treatment with isoniazid	18	34.60%
Adherence and follow-up	Good compliance (≥ 95%)	30*	62.50%
	Alive and followed up	31	59.60%
	Lost to follow-up	12	23.10%
	Deceased	7	13.50%
Mortality	Tuberculosis (cause of death)	4**	57.10%

**Calculated on the basis of the 48 patients on ART.*

***Calculated on the basis of the 7 recorded deaths.*

Comment: The results highlight **high treatment coverage** in terms of access to antiretrovirals (92.3%), indicating that care protocols have been well integrated. However, the effectiveness of this care is tempered by worrying delays in treatment initiation: only a minority of patients (25%) receive immediate treatment, with an average waiting time exceeding 30 days. This delay, coupled with low prescribing rates for preventive treatment with isoniazid (34.6%), appears to compromise the prognosis. Indeed, although the majority of patients are being monitored, the rate of loss to follow-up (23.1%) and mortality (13.5%) remain significant. Tuberculosis stands out as the major challenge in this cohort, accounting for more than half of all deaths, which highlights the urgent need to strengthen targeted prevention measures and improve treatment adherence, currently deemed insufficient for nearly a third of patients.

4. Discussion

This study reports a high prevalence of co-infection (65.4%) among people living with HIV in Mbandaka, comparable to that observed in other cities in Central Africa (Bangui: 68%; Kisangani: 62%), but higher than that reported in better-screened cohorts in East Africa (Kigali: 41%). This figure indicates late diagnosis, confirmed by the predominance of WHO stages 3/4 (65.4%) and the low rate of voluntary testing (15.4%).

Tuberculosis as the primary opportunistic infection (64.7% of those with co-infections, or 42.3% of all PLHIV) is an alarming sign. This rate exceeds the national average, estimated at 25–30%, and likely reflects the high prevalence of Mycobacterium tuberculosis in the Mbandaka environment, coupled with the lack of systematic preventive treatment (only 34.6% on isoniazid). The significant association between tuberculosis and low CD4 counts ($p = 0.032$) confirms that severe immunosuppression promotes tuberculosis reactivation.

The independent risk factors (delay in seeking medical care and CD4 count < 350) are well-documented in the African literature (Kroeun et al., 2021; Labhardt et al., 2018). A delay in seeking medical care (≥ 3 months) increases the risk of co-infection by a factor of 3.6. This delay can be explained by: (1) the trivialisation of initial symptoms (fever, weight loss) attributed to malaria or fatigue; (2) geographical distance (36.6% live more than 10 km away); (3) financial insecurity (34.6% are unemployed). The lack of statistical significance for malnutrition in the multivariate analysis ($p = 0.062$) is likely due to insufficient statistical power (small sample size) or to multicollinearity with the delay in seeking medical consultation.

Mortality (13.5%) and loss to follow-up (23.1%) are cause for concern. These figures exceed the acceptable thresholds set by the WHO (<10% for loss to follow-up in chronic care programmes). The barriers identified are structural (poor road access during the rainy season, stock-outs of reagents for viral load testing) and psychosocial (stigmatisation, transport costs).

Implications for nursing and clinical practice:

1. Strengthen community-based screening and counselling to reduce delays in seeking care.

2. Initiate isoniazid prophylaxis (IP) systematically in all PLHIV without active tuberculosis.

3. Establish a telephone or community-based reminder system to reduce the number of patients lost to follow-up.

4. Integrate systematic nutritional support for PLHIV with a BMI < 18.5.

Limitations: Small sample size (N=52); selection bias due to the retrospective nature of the study; viral load data not available for all patients; missing CD4 data for some excluded cases.

5. Conclusion

Co-infection among PLHIV at the Mbandaka Regional General Hospital is highly prevalent (65.4%), dominated by tuberculosis and candidiasis, and independently associated with delayed presentation and severe immunodepression. These results support early HIV screening in the general population, earlier initiation of ARVs (ideally < 7 days) and the widespread use of isoniazid prophylaxis. Prospective studies with viral load monitoring are needed to confirm these findings.

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