

Profile and Determinants of Non-Communicable Comorbidities and Chronic Co-Infections among People Living with HIV in a Multicenter Cohort in Côte d'Ivoire from 2019 to 2026

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Abstract

Context: The success of antiretroviral therapy has transformed HIV infection into a long-term condition, leading to the emergence of non-communicable diseases. The aim of this study is to assess the cumulative prevalence and factors associated with chronic comorbidities among people living with HIV and receiving antiretroviral therapy in Côte d'Ivoire. **Methods:** A retrospective observational study with an analytical focus, involving 447 medical records of people living with HIV, followed from January 2019 to June 2026. Comorbidities were identified on the basis of clinical codes and treatment prescriptions. A multivariate logistic regression analysis was carried out to identify the factors associated with the onset of non-communicable diseases. **Results:** The mean age was 45.7 ± 11.6 years, with a predominance of women (64 per cent); the male-to-female sex ratio was 0.56. HIV-1 was predominant (93.3%). During the study period, 28 per cent of patients had at least one chronic comorbidity, of whom 22.2 per cent had a single comorbidity and 5.8 per cent had multiple comorbidities. Among the 447 patients included, the specific prevalences of the main comorbidities were: hypertension 10.1 per cent (45/447),

tuberculosis 8.7 per cent (39/447), diabetes 4.9 per cent (22/447) and hepatitis B 3.4 per cent (15/447). Of the total of 156 conditions recorded, hypertension accounted for 28.8 per cent of events. In the bivariate analysis, age ($p = 0.000119$), age at HIV diagnosis ($p = 0.0000362$), site of follow-up ($p = 0.002105$) and marital status ($p = 0.0001456$) were independently associated with comorbidities. The adjusted multivariate model showed that only the follow-up site remained significantly associated ($p = 0.002$). **Conclusion:** People living with HIV face a double burden of disease, combining persistent infectious conditions and early-onset non-communicable diseases (hypertension, diabetes). The systematic integration of screening for non-communicable diseases into HIV diagnostic centers is a priority.

Keywords

HIV, Comorbidities, Determinants, Medical Records, Côte d'Ivoire

1. Introduction

The advent and widespread use of highly effective antiretroviral treatments have significantly transformed the natural history of HIV infection.

By restoring immune function and suppressing viral replication in the long term, these therapies have extended the life expectancy of people living with HIV (PLHIV), gradually bringing their life expectancy closer to that of the general population [1].

However, this therapeutic success has been accompanied by a major epidemiological shift: the emergence of non-communicable diseases and non-AIDS-related multimorbidity [2]. High blood pressure (HBP), type 2 diabetes, chronic kidney disease, cardiovascular diseases and cancer are now the leading causes of morbidity among people living with HIV on long-term antiretroviral therapy [3].

The development of these comorbidities results from a multifactorial mechanism involving persistent low-grade systemic inflammation despite viral suppression, prolonged exposure to the metabolic toxicity of certain classes of antiretrovirals, as well as risk factors linked to lifestyle and ageing.

Whilst multimorbidity is well documented in European and North American cohorts such as the EuroSIDA cohort [4]-[8], the evolving dynamics of comorbidities in sub-Saharan Africa present a unique profile. Populations there face a “double burden” of disease, where the rapid emergence of non-communicable diseases linked to urbanization and nutritional transition is compounded by the persistent burden of endemic co-infections (tuberculosis, viral hepatitis) [9].

The rise in these chronic comorbidities could reverse the upward trend in life expectancy among people living with HIV, despite the effectiveness of antiretroviral treatments.

In Côte d'Ivoire, the lack of precise data on the cumulative range of chronic comorbidities among people living with HIV limits response strategies.

The aim of this study is to analyse the socio-demographic characteristics and

the range of chronic comorbidities accumulated over a period of 7 years and 5 months (January 2019 to June 2026) in two specialist HIV care centers, and to identify the determinants associated with the onset of these conditions.

2. Materials and Methods

2.1. Study Setting

This was an observational, retrospective study with an analytical focus, conducted in two leading healthcare facilities in the city of Abidjan, the first of which was the Pulmonology Department (PPH) at the Cocody University Hospital (CHU). This department is situated within a tertiary care center and specializes in the integrated management of infectious lung conditions, including tuberculosis, non-infectious lung diseases and HIV/AIDS. The department provides medical care for both in-patient and out-patient patients and is equipped with state-of-the-art facilities and several university-trained specialists in respiratory medicine. The second department is the Outpatient Care and Counselling Unit (USAC), known as the “day hospital”, located at the Treichville University Hospital Centre (CHU), which provides medical care exclusively for people living with HIV (PLHIV) who are not hospitalized. The period of patient care spanned from January 2019 to June 2026.

2.2. Study Population and Inclusion Criteria

The study population consisted of adult patients who had been screened for and were being monitored for HIV infection. Patients aged 18 years or over, who were HIV-positive (HIV-1, HIV-2 or HIV-1/2 co-infection), followed at one of the two sites during the study period, and with a usable medical record were included. Excluded were patients lost to follow-up and those with an unusable clinical record or with more than 20 per cent of data missing for the primary variables.

2.3. Data Collection

Data were collected from 1 July to 30 July 2026. A well-structured, standardized data collection form, implemented via the Kobo toolbox platform, was used to gather data from medical records (paper and/or electronic). The variables studied included socio-demographic data (age, sex, place of residence (Abidjan or the interior of the country), marital status, educational attainment), and clinical and biological data (age at the time of HIV diagnosis, HIV type (HIV-1, HIV-2, HIV-1 and HIV-2 co-infection), and place of care).

The variable of interest was “chronic comorbidity”. This was defined as the simultaneous presence of one or more long-term conditions, without there necessarily being a direct causal link between them [10].

The comorbidities studied were categorized into two distinct groups: 1) non-communicable diseases (high blood pressure, heart failure, myocardial infarction, depression, insomnia, anxiety, age-related memory loss or impaired concentration, type 2 diabetes, dyslipidemia, obesity, chronic kidney disease, and cancers of

the lung, liver, ovaries and anus) and 2) chronic or recurrent infectious co-infections (pulmonary tuberculosis, hepatitis B).

These comorbidities were identified either by the presence of a diagnostic code for the condition in the medical record or by a documented prescription for a specific long-term treatment (antihypertensives, antidiabetics, antituberculosis drugs, etc.).

Multimorbidity has been defined as the concurrent presence of at least two chronic comorbidities in the same patient.

2.4. Data Analysis

The data collected following the survey were entered using the Kobo Toolbox software (Android version v2025.3.3) and analyzed in two phases using RStudio (version 2025.05.1+513). The descriptive phase was used to describe qualitative variables as proportions and quantitative variables as means, standard deviations and extremes. A bivariate analysis was carried out to examine the interactions between the independent variables (such as socio-demographic, clinical and biological characteristics) and the dependent variable (comorbidity (yes/no)). A comparison of proportions was carried out using the chi-squared test or Fisher's exact test, depending on which was appropriate. The test was considered significant if the p-value was less than 0.05. For the multivariate analysis, variables with a p-value < 0.25 in the bivariate analysis were included in the stepwise descending multivariate logistic regression model. The adjusted odds ratio (aOR), together with its 95% confidence interval, was calculated.

2.5. Ethical Considerations

The National Ethics Committee for Life Sciences and Health (CNESVS) has issued its ethical opinion on this study (reference number: 197-20/MSHP/CNESVS-kp).

3. Results

Out of a total of 590 records reviewed for the period 2019-2026, 143 records were excluded due to missing data, representing 24.2 per cent of the initial total; a total of 447 records meeting the inclusion criteria were retained. All patients included (100 per cent) were receiving antiretroviral treatment. With regard to socio-demographic characteristics, the study population had a mean age of 45.7 years, with a standard deviation of 11.6 years. The predominant age group was patients aged between 40 and 50 years (30.4 per cent). Women were over-represented at 64 per cent, with a sex ratio of 0.56. The majority of patients (91.6 per cent) lived in Abidjan and most (61.7 per cent) were being treated in the respiratory medicine department.

Nearly half, or 46.1 per cent, were single. Married patients and those living with a partner accounted for 21.5 per cent and 25.3 per cent respectively. Patients with a higher education qualification and those with a secondary school qualification accounted for 31.0 per cent and 34.3 per cent respectively.

Table 1. Socio-demographic and biological characteristics of the population.

Variables	Number of staff (n)	Percentage (%)
<i>Socio-demographic characteristics</i>		
Tracking website n = 447		
PPH	276	61.7
USAC	171	38.3
Age group of patients (in years) n = 447		
[18 - 30[	45	10.1
[30 - 40[	92	20.6
[40 - 50[	136	30.4
[50 - 60[	122	27.3
≥60	52	11.6
Sex n = 447		
Woman	286	64.0
Man	161	36.0
Place of residence n = 439++		
Abidjan	402	91.6
Interior	37	8.4
Level of study n = 432++		
Not in education	58	13.4
Primary	92	21.3
Secondary	148	34.3
Superior	134	31.0
Marital status n = 438++		
Single	202	46.1
Cohabitation	111	25.3
Divorce	6	1.4
Married	94	21.5
Widower	25	5.7
<i>Biological characteristics</i>		
Type of HIV n = 447		
VIH 1	417	93.3
VIH 1+2	20	4.5
VIH 2	10	2.2
Age at the time of diagnosis of HIV infection n = 447		
[18 - 30[	78	17.4
[30 - 40[	121	27.1
[40 - 50[	146	32.7
[50 - 60[	73	16.3
≥60	29	6.5

++ Data were missed.

Patients who tested positive for HIV between the ages of 40 and 50 and those who tested positive between the ages of 30 and 40 accounted for 32.7 per cent and 27.1 per cent, respectively. The predominant HIV type was HIV-1 (93.3 per cent) (**Table 1**).

With regard to clinical characteristics, 28 per cent of the total population had at least one chronic comorbidity. The main comorbidities were: hypertension 10.1 per cent (45/447), tuberculosis 8.7 per cent (39/447), diabetes 4.9 per cent (22/447) and hepatitis B 3.4 per cent (15/447) (**Table 2**).

Table 2. Breakdown of patients by number of comorbidities and list of conditions recorded during the study period (January 2019-June 2026).

Variables	Staff numbers (n)	Percentage (%)
The presence of comorbidities in patients n = 447		
No	322	72.0
Yes	125	28.0
Burden of disease per patient n = 447		
No comorbidities	322	72.0
Just one comorbidity	99	22.2
≥2 comorbidities	26	5.8
Breakdown of comorbidities recorded during the study period (Total events = 156) Ω		
High blood pressure	45	10.1
Tuberculosis	39	8.7
Diabetes	22	4.9
Hepatitis B	15	3.4
Asthma	9	1.78
Kidney failure	8	1.79
Sickle cell anaemia	4	0.89
Cancer	4	0.89
Gastric ulcer	3	0.44
Heart failure	2	0.45
Neurological disorder	2	0.45
Psychiatric disorders	1	0.22
Morbid obesity	1	0.22
Human papillomavirus infection	1	0.22

Ω: total number of events.

The trend in the cumulative prevalence of chronic comorbidities from January 2019 to June 2026 is shown in **Figure 1**.

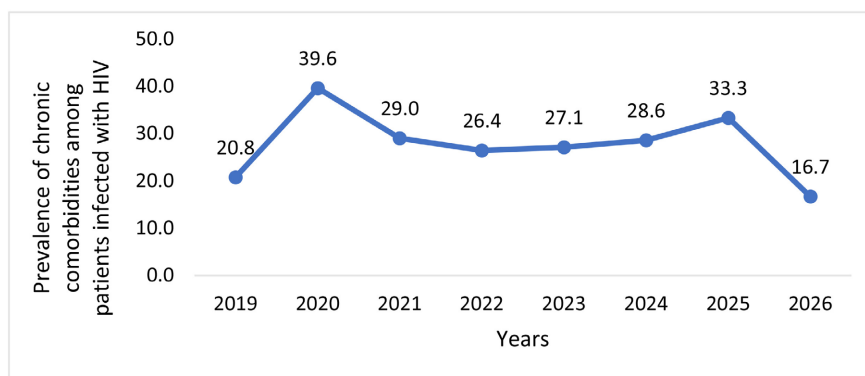


Figure 1. Trends in the prevalence of chronic comorbidities recorded during the study period from January 2019 to June 2026.

The cumulative prevalence of each type of chronic comorbidity is shown in **Figure 2**.

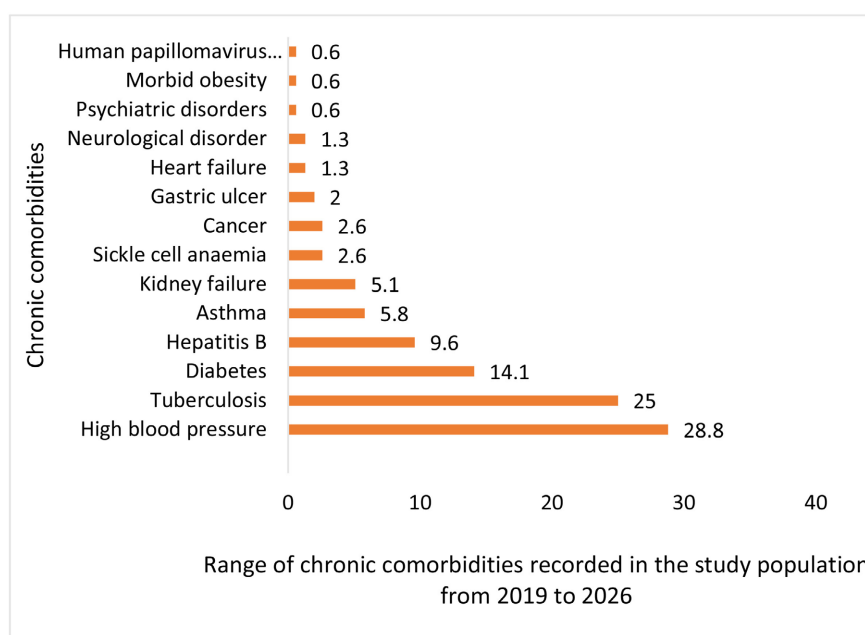


Figure 2. Prevalence of comorbidities recorded during the study period (2019 to 2026) among people living with HIV (PLHIV) in the PPH and USAC programmes.

3.1. Bivariate Analysis

A statistically significant association ($p < 0.05$) was found between chronic comorbidity and the site of follow-up ($p = 0.002105$), age ($p = 0.000119$), marital status ($p = 0.0001456$) and age at the time of HIV seropositivity detection ($p = 0.0000362$) (**Table 3**).

3.2. Multivariate Analysis and Assessment of Multicollinearity

In the final multivariate model (**Table 4**), only the study site emerged as an independent factor significantly associated with comorbidities among people living

with HIV. Patients treated at the USAC site had a significantly higher risk of having a comorbidity compared with those at the PPH site (ORa = 2.02; 95% CI: [1.30 - 3.14]; $p = 0.002$).

Table 3. Bivariate analysis of the relationships between population characteristics and comorbidity.

		Total workforce	Comorbidities n (%)	p-value
Year in which monitoring began				0.3275
	2019	106	22 (20.8)	NS
	2020	53	21 (39.6)	
	2021	62	18 (29.0)	
	2022	53	14 (26.4)	
	2023	59	16 (27.1)	
	2024	42	12 (28.6)	
	2025	60	20 (33.3)	
	2026	12	2 (16.7)	
Tracking website				0.0021
	PPH	276	63 (22.8)	S
	USAC	171	62 (36.3)	
Age				0.0001
	[18 - 30[	45	3 (6.7)	S
	[30 - 40[	92	18 (19.6)	
	[40 - 50[	136	37 (27.2)	
	[50 - 60[	122	48 (39.3)	
	≥60	52	19 (36.5)	
Age at the time of HIV diagnosis				0.00003
	[18 - 30[	78	9 (21.4)	S
	[30 - 40[	121	24 (30.1)	
	[40 - 50[	146	52 (29.2)	
	[50 - 60[	73	27 (14.3)	
	≥60	29	13 (5.0)	
Sex				0.8300
	Woman	286	79 (27.6)	NS
	Man	161	46 (28.6)	
Place of residence				0.0892
	Abidjan	402	110 (27.4)	NS
	Interior	37	15 (40.5)	

Continued

Level of study			
Not in education	58	20 (34.5)	0.5147
Primary	92	22 (23.9)	NS
Secondary	148	43 (29.1)	
Superior	134	35 (26.1)	
Marital status			0.0001
Single	202	46 (22.1)	S
Cohabitation	111	31 (27.9)	
Married	94	30 (31.9)	
Widower	25	16 (64.0)	
Type of HIV			0.298
HIV 1	417	115 (27.6)	NS
HIV 1+2	20	5 (25.0)	
HIV 2	10	5 (50.0)	

S = significant; NS = not significant.

Table 4. Multivariate analysis of comorbidity and population characteristics.

	Odds ratio	p	95 per cent confidence interval
Tracking website			
USAC	2.0208	0.002	[1.30 - 3.14]
PPH	1		
Age			
[18 - 30[	1		
[30 - 40[	3.2328	0.120	[0.73 - 14.21]
[40 - 50[	3.2970	0.171	[0.59 - 18.15]
[50 - 60[	3.7545	0.153	[0.61 - 23.00]
SUP 60	2.0493	0.500	[0.25 - 16.47]
Age at the time of diagnosis of HIV infection			
[18 - 30[	1		
[30 - 40[	1.1213	0.838	[0.37 - 3.35]
[40 - 50[	2.4348	0.181	[0.66 - 8.95]
[50 - 60[	2.8070	0.171	[0.64 - 12.30]
SUP 60	5.2142	0.084	[0.80 - 33.92]
Type of HIV			
VIH 1	1.1712	0.774	[0.39 - 3.44]
VIH 2	2.1773	0.364	[0.40 - 11.69]
VIH 1+2	1		

However, after adjustment, the age of the population, the age at which HIV infection was detected and the type of HIV (HIV-1, HIV-2, HIV 1+2) showed no statistically significant association with the occurrence of a comorbidity ($p > 0.05$), although a non-significant trend was observed for individuals diagnosed at the age of 60 or over (ORa = 5.21; 95% CI: [0.80 - 33.92]; $p = 0.084$).

To verify the assumptions underlying the multivariate logistic regression model, a multicollinearity analysis was carried out (**Table 5**). The variance inflation factor (VIF) values ranged from 1.01 to 1.41 and the tolerance values from 0.710 to 0.990, confirming the absence of multicollinearity between the adjusted independent variables.

Table 5. Tests for multicollinearity.

	VIF	Tolérance
Study site	1.01	0.990
Age	1.41	0.710
Age at HIV diagnosis	1.41	0.710
Type of HIV	1.01	0.988

VIF: variance inflation factor.

4. Discussion

The aim of this multicenter, analytical cohort study was to assess the patterns and determinants of non-AIDS multimorbidity among 447 people living with HIV (PLHIV) in Côte d'Ivoire between 2019 and 2026. It highlights a young population with a clear female predominance (64 per cent, sex ratio 0.56), with a mean age of 45.7 ± 11.6 years. This demographic profile is consistent with those reported by several authors from West and Central Africa, notably from Liberia [11], Burkina Faso [12], Togo [13] and Cameroon [14]. However, it contrasts significantly with that of Western European cohorts (such as the ATHENA cohort), whose records and demographic modelling indicate a median age of around 52 years among people living with HIV [interquartile range: 42 - 60 years] and where the population under study is predominantly male [15].

This contrast could be explained by the widespread and early introduction of effective treatments as early as 1996 in northern countries, which instantly halted mortality at a young age. In the South, universal access to antiretrovirals was delayed by around a decade [16]. Nevertheless, the predominant age group in our study (40 - 50 years for 30.4 per cent of patients) and the age at diagnosis (32.7 per cent diagnosed between 40 and 50 years) indicate a gradual ageing of the cohorts on antiretroviral therapy at the local level, bringing these patients into the critical window of vulnerability to non-communicable diseases [17]. In Côte d'Ivoire, the higher prevalence of HIV among women is largely explained by the predominance of heterosexual transmission, combined with increased biological and socioeconomic vulnerability in women [18]. This contrasts with epidemiological

trends in many European countries, where transmission primarily occurs among men who have sex with men (MSM) [19] [20].

With regard to the range of chronic comorbidities recorded during the study period (2019-2026), 28 per cent of people living with HIV had at least one chronic comorbidity, of whom 22.2 per cent had a single comorbidity and 5.8 per cent had multiple comorbidities (≥ 2 comorbidities). In sub-Saharan Africa, the prevalence of chronic comorbidities amongst people living with HIV who are on antiretroviral therapy is rising sharply [21]. The figures from our study clearly illustrate the epidemiological transition in Côte d'Ivoire. European studies, by contrast, report higher overall prevalences of comorbidities and multimorbidity (reaching up to 40 - 60 per cent for comorbidities and 20 - 30 per cent for multimorbidity among those aged over 50) [22]. This is explained by the more advanced ageing of European cohorts.

High blood pressure was the most common comorbidity identified, accounting for 10.1 per cent (45/447). This figure is lower than the prevalence of high blood pressure observed in cohorts from Western and Central Europe and North America, where a rate of 28.1% (95% CI: 24.5 - 31.9) was recorded [23]. This difference confirms the earlier widespread adoption of antiretroviral therapy in northern countries compared with those in the south, as, according to several authors, HIV and certain antiretroviral therapies (ART) increase the risk of high blood pressure (HBP) beyond traditional risk factors, due to the chronic inflammation and metabolic changes they induce. Similarly, diabetes accounted for 4.9 per cent (22/447) of comorbidities in our cohort. This rate is lower than the prevalences reported in European cohorts (~6% to 12%) [24] and reflects the exposure of people living with HIV (PLHIV) to new treatment regimens based on integrase inhibitors (INIs, e.g. dolutegravir). These regimens have been widely adopted in the Global South since 2018 and are recognised as promoting rapid weight gain and iatrogenic dyslipidaemia [25]. Tuberculosis was the second most common comorbidity in our study (8.7 per cent; 39 out of 447). Its prevalence illustrates the distinct characteristics of sub-Saharan African cohorts compared with the European model [26]. In Europe, tuberculosis has become a marginal opportunistic infection in contemporary cohorts of people living with HIV (<2 - 5 per cent of cases), giving way to non-AIDS-defining cancers (lung, prostate, colon) and coronary heart disease [27]. In our context, people living with HIV face a “double burden” of disease: the persistence of endemic infectious risks (tuberculosis, hepatitis B at 3.4 per cent) combined with the emergence of metabolic non-communicable diseases.

Renal failure accounted for 1.78 per cent (8 out of 447) of comorbidities. This rate is similar to the EuroSIDA data (4.1 per cent to 6.9 per cent in older subjects) [28]; however, its pathophysiology differs. Whilst renal decline in Europe is primarily driven by senile nephrosclerosis and diabetes [29], it is predominantly multifactorial in African cohorts (HIV-associated nephropathy, tenofovir (TDF) toxicity, and post-infectious glomerulonephritis). Furthermore, the low proportion of documented cancers (0.89 per cent; 4/447) in our study and of serious cardio-

vascular complications (heart failure at 0.45 per cent (2/447)) suggests an underlying under-diagnosis. These low proportions are thought to be linked to limited access to specialised imaging and pathological examinations, compared with the routine blood tests and systematic CT scans carried out in Europe.

The study of factors independently associated with comorbidities, using bivariate analysis, identified four independent determinants ($p < 0.05$): age ($p = 0.000119$), age at the time of HIV diagnosis ($p = 0.0000362$), marital status ($p = 0.0001456$) and the centre of care ($p = 0.002105$).

The very strong association between age (overall and at the time of HIV diagnosis) and the development of comorbidities confirms the pivotal role of ageing in the cardiovascular and immune systems. Being diagnosed with HIV at a more advanced age (40 - 50 years) exposes the patient to a prolonged period of uncontrolled systemic inflammation, synergistically increasing cardiovascular and metabolic risk—a phenomenon also widely described in international cohorts [30] [31].

The significant association between marital status and the onset of chronic comorbidities ($p = 0.0001456$) highlights the impact of socio-economic determinants and social support on treatment adherence, lifestyle (diet, physical activity) and the use of primary healthcare services.

The strong association between the follow-up centre and the development of comorbidities ($p = 0.002105$) reflects disparities in healthcare provision and screening practices between centres. Variations in the availability of medicines, the presence or absence of on-site specialists, and the rigour of medical coding in patient records directly influence the detection and reporting of chronic conditions.

In our study, the predominance of patients selected from the PPH at Cocody University Hospital (61.7 per cent) could be explained by the fact that this department houses a joint tuberculosis and HIV care unit, designed to prevent the fragmentation of care. This department is therefore a crucial epidemiological and clinical hub for people living with HIV in Abidjan. This observation corroborates the study by Koffi and colleagues, who demonstrated the prevalence and trends in tuberculosis and HIV co-infection from 2007 to 2016 [32].

Multivariate logistic regression analysis identified the follow-up site ($p = 0.002105$) in the final model as the only independent factor significantly associated with comorbidities in people living with HIV. This finding could be explained by the fact that, in our context, university hospitals are referral centres within the health districts. They have qualified staff and better-equipped facilities, thereby ensuring high-quality patient care.

4.1. Limitations

This study has several limitations that should be highlighted. Firstly, the retrospective data collection—based on the extraction of medical records without repeated biological measurements—creates a risk of underestimation bias (particu-

larly for early-stage renal failure, dyslipidemia and oncological abnormalities). Secondly, the lack of precise data on the duration of exposure to the various molecules in the antiretroviral treatment meant that it was not possible to isolate the proportion attributable to iatrogenic effects of the medication.

4.2. Conclusion and Recommendations

This study demonstrates that the clinical landscape for people living with HIV in Côte d'Ivoire is rapidly shifting towards a pattern of early multimorbidity, dominated by hypertension and diabetes, whilst the burden of other infectious diseases (tuberculosis, hepatitis B) remains significant. In light of this, there is an urgent need to shift the model for HIV screening and management towards integrated care (routine blood pressure and blood glucose monitoring at every HIV consultation) in order to ensure a long and healthy life for people living with HIV.

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Author Contributions

Conceptualization, O.K.D.; methodology, O.K.D.; software: D.K.M. and O.T.R.; validation, O.K.D.; formal analysis, O.K.D.; research: O.K.D.; resources, O.K.D.; data management, O.K.D.; drafting—preparation of the first draft, O.K.D.; drafting—revision and proofreading, O.K.D., S.Y., M.M., D.K.M., D.J.J.R. and KNS; visualisation, O.K.D. and D.K.M.; supervision, A.A., K.N.S. and D.M.; project management, O.K.D.; fundraising, O.K.D. All authors have read and approved the published version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Wandeler, G., Johnson, L.F. and Egger, M. (2016) Trends in Life Expectancy of HIV-Positive Adults on Antiretroviral Therapy across the Globe: Comparisons with General Population. *Current Opinion in HIV and AIDS*, **11**, 492-500. <https://doi.org/10.1097/coh.0000000000000298>
- [2] Effros, R.B., Fletcher, C.V., Gebo, K., Halter, J.B., Hazzard, W.R., Horne, F.M., *et al.* (2008) Aging and Infectious Diseases: Workshop on HIV Infection and Aging: What Is Known and Future Research Directions. *Clinical Infectious Diseases*, **47**, 542-553. <https://doi.org/10.1086/590150>
- [3] Guaraldi, G., Orlando, G., Zona, S., Menozzi, M., Carli, F., Garlassi, E., *et al.* (2011) Premature Age-Related Comorbidities among HIV-Infected Persons Compared with the General Population. *Clinical Infectious Diseases*, **53**, 1120-1126.

- <https://doi.org/10.1093/cid/cir627>
- [4] Bannister, W.P., Reekie, J., Peters, L., Oprea, C., Matulionytė, R., Scheerder, M.D., *et al.* (2026) Trends in Aids-Defining Illnesses among People Living with HIV in Clinical Care in Europe: Results from the EuroSIDA Multicentre Cohort Study (2003-24). *The Lancet HIV*, **13**, e465-e477. [https://doi.org/10.1016/s2352-3018\(26\)00052-4](https://doi.org/10.1016/s2352-3018(26)00052-4)
 - [5] Sacktor, N., Skolasky, R.L., Seaberg, E., Munro, C., Becker, J.T., Martin, E., *et al.* (2016) Prevalence of HIV-Associated Neurocognitive Disorders in the Multicenter AIDS Cohort Study. *Neurology*, **86**, 334-340. <https://doi.org/10.1212/wnl.0000000000002277>
 - [6] Peters, L., Mocroft, A., Lundgren, J., Grint, D., Kirk, O. and Rockstroh, J.K. (2014) HIV and Hepatitis C Co-Infection in Europe, Israel and Argentina: A EuroSIDA Perspective. *BMC Infectious Diseases*, **14**, Article No. S13. <https://doi.org/10.1186/1471-2334-14-s6-s13>
 - [7] Shepherd, L., Borges, Á.H., Ravn, L., Harvey, R., Bower, M., Grulich, A., *et al.* (2016) Predictive Value of Prostate Specific Antigen in a European HIV-Positive Cohort: Does One Size Fit All? *Antiviral Therapy*, **21**, 529-534. <https://doi.org/10.3851/imp3026>
 - [8] Mocroft, A., Lundgren, J.D., Ross, M., Fux, C.A., Reiss, P., Moranne, O., *et al.* (2016) Cumulative and Current Exposure to Potentially Nephrotoxic Antiretrovirals and Development of Chronic Kidney Disease in HIV-Positive Individuals with a Normal Baseline Estimated Glomerular Filtration Rate: A Prospective International Cohort Study. *The Lancet HIV*, **3**, e23-e32. [https://doi.org/10.1016/s2352-3018\(15\)00211-8](https://doi.org/10.1016/s2352-3018(15)00211-8)
 - [9] Eckman, J., Collins, L., Mehta, C. and Ofotokun, I. (2023) 33 Non-Aids Related Comorbidities in People Living with HIV in West Africa. *Journal of Clinical and Translational Science*, **7**, 9. <https://doi.org/10.1017/cts.2023.128>
 - [10] Penner, K., Wicklum, S., Johnston, A. and Kelly, M.A. (2023) Stratégie d'enseignement pour la prise en charge des patients présentant des comorbidités en médecine de famille. *Canadian Family Physician*, **69**, e154-e158. <https://doi.org/10.46747/cfp.6907e154>
 - [11] Loubet, P., Charpentier, C., Visseaux, B., Borbor, A., Nuta, C., Adu, E., *et al.* (2015) Prevalence of HIV-1 Drug Resistance among Patients Failing First-Line ART in Monrovia, Liberia: A Cross-Sectional Study. *Journal of Antimicrobial Chemotherapy*, **70**, 1881-1884. <https://doi.org/10.1093/jac/dkv030>
 - [12] Tapsoba, G.P.M.L., Ouédraogo, M.S., Ouédraogo, N.A., Korsaga, N., Barro, F., Niamba, P., *et al.* (2019) Déterminants des patients infectés par le VIH et perdus de vue de la cohorte du service de dermatologie du CHU Yalgado Ouédraogo. *Annales de Dermatologie et de Vénérologie*, **146**, A270. <https://doi.org/10.1016/j.annder.2019.09.434>
 - [13] Dagnra, A., Konou, A., Salou, M., Kodah, P., Kombate, D. and David, P. (2016) Drug Resistance Mutations and Genetic Diversity in Patients Treated for HIV Type 1 Infection in Rural Care Centers in Togo. *Open Journal of Medical Microbiology*, **6**, 111-115. <https://doi.org/10.4236/ojmm.2016.63015>
 - [14] Essomba, N.E., Mbatchou Ngahane, B.H., Nida, M., Temfack, E., Mapoure Njankouo, Y., Abeng, R.L., *et al.* (2015) Profil clinique et immunologique des patients infectés par le VIH à l'initiation du traitement antirétroviral à Douala. *Bulletin de la Société de pathologie exotique*, **108**, 255-261. <https://doi.org/10.1007/s13149-015-0444-3>
 - [15] Jongen, V.W., Boyd, A., Albers, T., Schat, N., Verhagen, M., van Zoest, R., *et al.* (2025) Harnessing Registry Data to Identify Socio-Demographic and Socio-Economic Gaps in HIV Care in the Netherlands. *Nature Communications*, **16**, Article No. 10517.

- <https://doi.org/10.1038/s41467-025-65512-6>
- [16] Taverne, B., Ahouanto-Chaspoul, M., Carillon, S. and Desclaux, A. (2026) Fin du sida au Nord, 4e épidémie au Sud? Acquis et défis en Afrique de l'Ouest. In: Katlama, C., Ghosn, J. and Wandeler, G., Eds., *VIH, hépatites virales, santé sexuelle*, EDP Sciences, 661-669. <https://hal.science/hal-03338778>
 - [17] Olubayo, L.A.I., Mathema, T., Kabudula, C., Micklesfield, L.K., Mohamed, S.F., Kisiangani, I., et al. (2025) The Prevalence, Incidence, and Sociodemographic Risk Factors of HIV among Older Adults in Sub-Saharan Africa (AWI-Gen): A Multicentre, Longitudinal Cohort Study. *The Lancet Healthy Longevity*, **6**, Article ID: 100690. <https://doi.org/10.1016/j.lanhl.2025.100690>
 - [18] Mt, Y.H., et al. (2024) Epidemioclinical Features, Management and Outcome of Patients Living with HIV in the Test and Treat Era at Bouaké University Teaching Hospital [Profil Épidémioclinique, Thérapeutique et Évolutif des Patients Vivant avec le VIH à l'Ère du Tester et Traiter au CHU de Bouaké]. *Health Research in Africa*, **2**, 72-78.
 - [19] Daw, M.A. and Ahmed, M.O. (2021) Epidemiological Characterization and Geographic Distribution of Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome Infection in North African Countries. *World Journal of Virology*, **10**, 69-85. <https://doi.org/10.5501/wjv.v10.i2.69>
 - [20] de Salazar, A., Viñuela, L., Fuentes, A., Teyssou, E., Charpentier, C., Lambert-Niclot, S., et al. (2023) Transmitted Drug Resistance to Integrase-Based First-Line Human Immunodeficiency Virus Antiretroviral Regimens in Mediterranean Europe. *Clinical Infectious Diseases*, **76**, 1628-1635. <https://doi.org/10.1093/cid/ciac972>
 - [21] Achwoka, D., Oyugi, J.O., Mutave, R., Munywoki, P., Achia, T., Akolo, M., et al. (2020) High Prevalence of Non-Communicable Diseases among Key Populations Enrolled at a Large HIV Prevention & Treatment Program in Kenya. *PLOS ONE*, **15**, e0235606. <https://doi.org/10.1371/journal.pone.0235606>
 - [22] Gunter, J. (2017) Prevalence of Non-Infectious Comorbidities in the HIV-Positive Population in Belgium: A Multicenter, Retrospective Study. *Acta Clinica Belgica*, **73**, 50-53. <https://www.tandfonline.com/doi/abs/10.1080/17843286.2017.1339965>
 - [23] Bigna, J.J., Ndoadoumgué, A.L., Nansseu, J.R., Tochie, J.N., Nyaga, U.F., Nkeck, J.R., et al. (2020) Global Burden of Hypertension among People Living with HIV in the Era of Increased Life Expectancy: A Systematic Review and Meta-Analysis. *Journal of Hypertension*, **38**, 1659-1668. <https://doi.org/10.1097/hjh.0000000000002446>
 - [24] Lopez, S., Ole, K., Jens, L., Kamilla, L. and Simon, E. (2026) Rates of All Age-Related Comorbidities Rise in EuroSIDA from 2006 to 2014. https://www.natap.org/2016/GLASGOW/GLASGOW_03.htm
 - [25] Rupasinghe, D., Bansil-Matharu, L., Law, M., Zangerle, R., Rauch, A., Tarr, P.E., et al. (2025) Integrase Strand Transfer Inhibitor-Related Changes in Body Mass Index and Risk of Diabetes: A Prospective Study from the RESPOND Cohort Consortium. *Clinical Infectious Diseases*, **80**, 404-416. <https://doi.org/10.1093/cid/ciae406>
 - [26] Gelaw, Y.A., Williams, G., Soares Magalhães, R.J., Gilks, C.F. and Assefa, Y. (2019) HIV Prevalence among Tuberculosis Patients in Sub-Saharan Africa: A Systematic Review and Meta-Analysis. *AIDS and Behavior*, **23**, 1561-1575. <https://doi.org/10.1007/s10461-018-02386-4>
 - [27] Smith, C.J., Ryom, L., Weber, R., Morlat, P., Pradier, C., Reiss, P., et al. (2014) Trends in Underlying Causes of Death in People with HIV from 1999 to 2011 (D:A:D): A Multicohort Collaboration. *The Lancet*, **384**, 241-248. [https://doi.org/10.1016/s0140-6736\(14\)60604-8](https://doi.org/10.1016/s0140-6736(14)60604-8)

- [28] Pelchen-Matthews, A., Ryom, L., Borges, Á.H., Edwards, S., Duvivier, C., Stephan, C., *et al.* (2018) Aging and the Evolution of Comorbidities among HIV-Positive Individuals in a European Cohort. *AIDS*, **32**, 2405-2416.
<https://doi.org/10.1097/qad.0000000000001967>
- [29] Masson, E. (2026) Maladie rénale chronique diabétique. EM-Consulte.
<https://www.em-consulte.com/article/1710027/maladie-renale-chronique-diabetique>
- [30] Deeks, S.G. (2011) HIV Infection, Inflammation, Immunosenescence, and Aging. *Annual Review of Medicine*, **62**, 141-155.
<https://doi.org/10.1146/annurev-med-042909-093756>
- [31] Verheij, E., Boyd, A., Wit, F.W., Verboeket, S.O., Verburgh, M.L., van der Valk, M., *et al.* (2023) Long-Term Evolution of Comorbidities and Their Disease Burden in Individuals with and without HIV as They Age: Analysis of the Prospective Agehiv Cohort Study. *The Lancet HIV*, **10**, e164-e174.
[https://doi.org/10.1016/s2352-3018\(22\)00400-3](https://doi.org/10.1016/s2352-3018(22)00400-3)
- [32] Koffi, M.O., Koné, A., Djègbéton, A., Kouassi-Yao, A., Kouamé, A.G., Boulleys, R., *et al.* (2019) Évolution de la co-infection tuberculose et VIH de 2007 à 2016 au service de pneumologie du CHU de Cocody. *Revue des Maladies Respiratoires*, **36**, A171-A172. <https://doi.org/10.1016/j.rmr.2018.10.374>