

Factors Associated with Non-Adherence to Antiretroviral Therapy among People Living with HIV Receiving Care in Military Health Facilities in Côte d'Ivoire

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Abstract

Introduction: Non-adherence to antiretroviral therapy remains a barrier to achieving and maintaining virological suppression. This study aimed to explore factors associated with antiretroviral therapy non-adherence among people living with HIV receiving care in military health facilities in Côte d'Ivoire. **Methods:** A multicentre cross-sectional study was conducted among 213 people living with HIV receiving antiretroviral therapy. Adherence was assessed using a composite criterion combining good self-reported adherence and an undetectable viral load. Sociodemographic, socioeconomic, treatment-related, healthcare-related, and psychosocial factors, including HIV-related stigma, were explored using unadjusted bivariate analyses. The Benjamini-Hochberg procedure was applied within families of related variables to control the false discovery rate. **Results:** Based on the composite criterion, 28.2% of participants were classified as non-adherent, whereas 82.6% had good self-reported adherence and 81.2% met the predefined undetectable viral load threshold. After correction for multiple comparisons, adherence remained associated with the ability to meet basic needs, circumstances of HIV testing, ART duration, concomitant treatment for a chronic condition, and several psychosocial dimensions. Associations with access to support services, confidentiality or management of medical records, guilt, and worthlessness did not remain statistically significant after correction. No association was found with

sociodemographic characteristics or experiences of discrimination in healthcare settings. **Conclusion:** Among people living with HIV receiving care in the military health facilities included in this study, ART adherence appeared to reflect socioeconomic, psychosocial, and treatment-related circumstances beyond medication-taking behaviour alone. These findings support a person-centred approach to adherence, while healthcare support and confidentiality warrant further investigation.

Keywords

HIV, Antiretroviral Therapy, Medication Adherence, HIV-Related Stigma

1. Introduction

Over the past decades, international initiatives to expand the availability of antiretroviral therapy (ART) have substantially improved access to treatment, particularly in low- and middle-income countries. These advances have contributed to improved outcomes among people living with HIV (PLHIV). However, the benefits of ART depend not only on access to treatment but also on the ability of PLHIV to maintain adequate adherence over time. Non-adherence can compromise treatment response, increase the risk of virological failure, and limit both the individual and population-level benefits of ART. It therefore remains a barrier to achieving the UNAIDS 95-95-95 targets, which aim for 95% of PLHIV to know their HIV status, 95% of those diagnosed to receive ART, and 95% of those receiving treatment to achieve viral suppression [1]. In Sub-Saharan Africa, despite substantial progress in ART access, lack of viral suppression remains an important concern among PLHIV receiving treatment [2]. Reported adherence levels vary across populations, definitions, and measurement methods. A meta-analysis conducted in Ghana highlighted this heterogeneity, suggesting that access to treatment, although essential, does not alone ensure sustained optimal adherence [3]. This variability underscores the need to identify factors associated with non-adherence within specific healthcare contexts to inform tailored interventions. ART adherence is a complex and multifactorial phenomenon influenced by individual and socioeconomic factors, treatment and healthcare-related characteristics, and the psychosocial environment. This multidimensional nature was highlighted by Buh *et al.* in their systematic review of barriers and facilitators to ART adherence in sub-Saharan Africa [4]. Among these factors, HIV-related stigma warrants particular attention. Stigma may interfere with regular medication taking through several mechanisms, including concealment of HIV status, fear of taking medication in the presence of others, social isolation, reduced use of social support, and disengagement from healthcare services. In their study examining the relationships between HIV-related stigma, ART adherence, and viral suppression across several African settings, Esber *et al.* emphasized the importance of considering the

social dimensions of HIV when examining treatment-related behaviours [5]. However, evidence on ART adherence in military healthcare facilities in Côte d'Ivoire remains limited. These facilities provide HIV care to both civilians and members of the defence and security forces within a specific institutional environment. A better understanding of factors associated with non-adherence in this setting could help inform more targeted interventions to support sustained ART adherence. This study therefore aimed to explore factors associated with ART non-adherence among PLHIV receiving care in military health facilities in Côte d'Ivoire.

2. Materials and Methods

A multicentre cross-sectional study was conducted from July to November 2025 in military health facilities across the four military regions of Côte d'Ivoire. These facilities are integrated into the national HIV care system and provide care to both civilian populations and members of the defence and security forces.

2.1. Study Population and Eligibility Criteria

The study population consisted of PLHIV receiving ART and routinely followed at the participating military health facilities. Eligible participants were aged 18 years or older, had been receiving ART for at least 12 months, were receiving care at one of the 35 study sites, and had provided informed consent. Individuals who were unable to provide their views or who declined to participate were excluded. The minimum sample size was calculated using the formula for estimating a proportion with finite population correction [6]:

$$n = \frac{NZ^2 p(1-p)}{d^2 (N-1) + Z^2 p(1-p)}$$

where: n = sample size; N = total population size; $Z = 1.96$ for a 95% confidence level; $d = 0.05$ for a 5% margin of error.

The estimated proportion (p) of patients considered non-adherent was 12.7% [7]. The sample was proportionally allocated across the 35 participating military health facilities according to the number of PLHIV actively followed at each site, yielding a minimum sample of 194 participants after rounding. Eligible patients were then recruited consecutively during routine visits until the required sample size was reached at each site. **Table 1** summarizes the sampling data.

2.2. Data Collection

Data were collected through individual interviews using a structured electronic questionnaire. Developed using CSPro version 8 in collaboration with the Military Health Information Management Service, the questionnaire comprised 115 questions organized into four sections: sociodemographic characteristics; interactions with healthcare services regarding HIV testing and medical follow-up; experiences of stigma and discrimination; and treatment and medication adherence.

Table 1. Active patient population and minimum sample size by study site.

Military region	Site	Active patient population (N)	Minimum sample size (n)	Site	Active patient population (N)	Minimum sample size (n)
A	A1	1264	58	A2	287	13
	A3	226	10	A4	114	5
	A5	98	5	A6	91	4
	A7	87	4	A8	51	2
	A9	43	2	A10	24	1
	A11	27	1	A12	103	5
	A13	60	3			
B	B1	248	11	B2	191	9
	B3	169	8	B4	82	4
	B5	70	3	B6	84	4
	B7	64	3	B8	13	1
	B9	15	1	B10	9	1
C	C1	219	10	C2	120	6
	C3	87	4	C4	41	2
	C5	42	2	C6	25	1
	C7	20	1	C8	5	1
	C9	7	1			
D	D1	87	4	D2	62	3
	D3	2	1			
Total active patient population (N)		4137	Total minimum sample size (n)		194	

The questionnaire was administered using Android smartphones or tablets. Biological data required for the study, particularly the most recent Viral Load (VL) result, were obtained from participants' medical records. Data collection was conducted by community-based workers from two non-governmental organizations partnering with the Armed Forces. A total of 35 data collectors received two training sessions covering data collection procedures, administration of the electronic questionnaire, ethical principles, confidentiality, and respect for participants' privacy. Data collection was supervised and technical support was provided by the Military Health Information Management Service in collaboration with supervisors from the partner non-governmental organizations to ensure consistent implementation of study procedures across all sites.

2.3. Assessment of ART Adherence

ART adherence was assessed using a prespecified composite criterion integrating

self-reported medication-taking behaviour and virological status. This approach was chosen to capture complementary behavioural and biological dimensions of adherence rather than relying on either measure alone. Self-reported adherence was assessed using a three-item questionnaire adapted from the CASE Adherence Index [8]. The adapted questionnaire assessed, over the previous 12 months, the frequency of missed doses, difficulty remembering to take ART, and doses taken more than six hours later than scheduled. Responses were assigned prespecified scores, which were summed to give a total score ranging from 0 to 12. A score ≥ 10 indicated good self-reported adherence, whereas a score < 10 indicated suboptimal adherence. Virological status was included as the objective component of the composite criterion. It was determined from VL result obtained within the previous 12 months. In accordance with World Health Organization (WHO) recommendations, a VL ≤ 50 copies/ml was considered undetectable, whereas a VL > 50 copies/ml was considered detectable [9]. Participants were classified as adherent when they simultaneously had good self-reported adherence and an undetectable VL. Those who did not meet both criteria were classified as non-adherent. This composite classification was used as the dependent variable in the analysis of factors associated with ART non-adherence.

2.4. Assessment of HIV-Related Stigma and Psychosocial Factors

HIV-related stigma was assessed using items adapted from the PLHIV Stigma Index 2.0, an instrument developed to document different manifestations of stigma and discrimination by PLHIV [10]. The questionnaire explored experiences of stigma and discrimination within social and family environments and healthcare settings, as well as manifestations of internalised stigma. The latter included self-exclusion behaviours and negative perceptions related to HIV status, such as shame, guilt, feelings of worthlessness, and concealment of HIV status. Each manifestation was analysed separately as a categorical variable according to the questionnaire response options. For opinion based items related to internalised stigma, responses were grouped into two categories, “yes/agree” and “no/disagree”. Associations between each stigma-related manifestation and ART adherence were then examined separately.

2.5. Statistical Analysis

Data were analysed using R version 4.5.0. Categorical variables were summarized as frequencies and percentages. Continuous variables were summarized using means and standard deviations, as well as medians and interquartile ranges, where appropriate. The final analytical dataset was complete for all study variables. “No response” and “Not applicable” were predefined response categories and were retained in descriptive analyses but excluded from the corresponding bivariate analyses. Consequently, the number of participants included in each analysis is reported where applicable. No data imputation was performed. Associations between ART adherence and categorical variables were assessed using Pearson’s chi-

squared test (χ^2) or Fisher's exact test with Monte Carlo simulation (20,000 replicates) for tables with small cell counts. Continuous variables were compared using the Wilcoxon-Mann-Whitney test when parametric assumptions were not met. Effect estimates were reported with 95% confidence intervals (CIs): Cramér's V for categorical variables, odds ratios (ORs) for 2×2 tables, and the absolute rank-biserial correlation coefficient for ART duration. Bootstrap CIs were used for Cramér's V and the rank-biserial correlation coefficient. The Benjamini-Hochberg procedure was applied within families of related variables to control the false discovery rate. Findings that were statistically significant before but not after correction were considered exploratory. All tests were two-sided, with statistical significance set at 5% ($\alpha = 0.05$). Analyses of factors associated with ART adherence were bivariate and unadjusted and were intended to identify crude associations rather than independent predictors. Accordingly, no inference was made regarding independent effects or causal relationships.

2.6. Ethical Considerations

The study protocol was approved by the Directorate of Military Health and Social Services of Côte d'Ivoire, acting as the local ethics committee. All participants provided informed consent before enrolment. Data were anonymized and handled confidentially throughout the study.

3. Results

3.1. Study Population

Of the 243 interview records collected, 30 (12.3%) were excluded following eligibility and data quality checks, leaving 213 participants for analysis. Reasons for exclusion included age < 18 years ($n = 1$; 0.4%), ART duration < 12 months ($n = 5$; 2.1%), and missing ART initiation date ($n = 24$; 9.9%). The mean age was 46.9 ± 11.8 years, ranging from 19 to 79 years. The male to female sex ratio was 0.6. Regarding educational attainment, 37.6% had completed secondary education, 26.3% primary education, 8.0% higher education, and 3.8% vocational training, while 24.4% had no formal education. Nearly one-third were unemployed, whereas 35.7% were self-employed or engaged in entrepreneurial activities. **Table 2** summarizes the sociodemographic characteristics of the study population.

Table 2. Sociodemographic characteristics of study participants.

Characteristics	n (%)
Military region	
A	133 (62.4)
B	34 (16.0)
C	30 (14.1)
D	16 (7.5)

Continued

Age, years	
18 - 24	6 (2.8)
25 - 59	183 (85.9)
≥ 60	24 (11.3)
Sex	
Female	133 (62.4)
Male	80 (37.6)
Population category	
Civilian	177 (83.1)
Defence personnel (Military and gendarmerie)	34 (16.0)
Security personnel (Paramilitary)	2 (0.9)
Difficulty meeting basic needs during the past 12 months	
Never	147 (69.0)
Some of the time	54 (25.4)
Most of the time	12 (5.6)
Membership in a support group	
Yes	50 (23.5)
No	161 (75.6)
No response	2 (0.9)
Circumstances of HIV testing	
No, I was tested without my knowledge and only found out after the test	25 (11.7)
No, I was forced to undergo HIV testing without my consent	1 (0.5)
No, I was born with HIV or acquired it during infancy or childhood and was unaware that I had been tested	2 (0.9)
Yes, it was my choice	129 (60.6)
Yes, but I was under pressure from others	56 (26.3)

3.2. ART Adherence

Among the 213 PLHIV, 71.8% were classified as adherent and 28.2% as non-adherent according to the composite adherence criterion. When the two components of the composite criterion were considered separately, 176 participants (82.6%) had good self-reported adherence, while 173 (81.2%) had an undetectable VL (≤ 50 copies/ml). The mean self-reported adherence score was 10.26 ± 1.89 , with a median of 11 out of 12. The reported reasons for missed doses or irregular ART intake are presented in **Figure 1**.

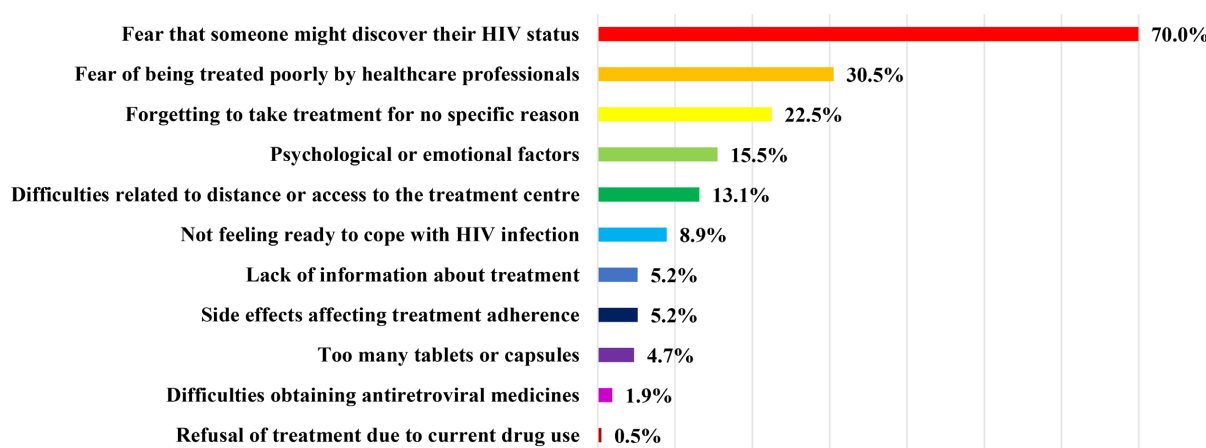


Figure 1. Reported reasons for missed doses or irregular ART intake.

3.3. Factors Associated with ART Adherence

3.3.1. Sociodemographic and Socioeconomic Factors

None of the sociodemographic characteristics examined was significantly associated with ART adherence ($p > 0.05$). Membership in a support group was also not associated with adherence ($p = 0.175$). In contrast, adherence decreased with increasing difficulty in meeting basic needs, from 80.3% among participants reporting no difficulty to 55.6% among those reporting difficulties some of the time and 41.7% among those reporting difficulties most of the time (BH-adjusted $p < 0.001$; $V = 0.288$, 95% CI 0.156 - 0.428). The circumstances of HIV testing were also associated with adherence (BH-adjusted $p = 0.004$; $V = 0.255$, 95% CI 0.181 - 0.383), although some categories included small numbers of participants.

3.3.2. Healthcare and Service Access-Related Factors

Access to support services was associated with higher adherence in the unadjusted analysis (78.2% versus 63.8%; $p = 0.021$; $V = 0.158$, 95% CI 0.025 - 0.294), but this association did not remain significant after Benjamini-Hochberg correction (BH-adjusted $p = 0.074$). Similarly, participants reporting issues related to the confidentiality or management of their medical records had lower adherence (60.8% versus 77.7%; $p = 0.009$; $V = 0.179$, 95% CI 0.041 - 0.314), but the association did not remain significant after correction (BH-adjusted $p = 0.064$). These findings were therefore considered exploratory. No associations were found with access to treatment, information, testing, prevention, or counselling services.

3.3.3. HIV-Related Stigma

None of the experiences of stigma or discrimination in healthcare settings was significantly associated with ART adherence ($p > 0.05$). In contrast, several dimensions reflecting the perceived impact of HIV status were associated with adherence, including stress management (BH-adjusted $p = 0.031$; $V = 0.201$, 95% CI 0.081 - 0.354), ability to find love (BH-adjusted $p = 0.014$; $V = 0.251$, 95% CI 0.113 - 0.410), achievement of personal goals (BH-adjusted $p = 0.031$; $V = 0.197$, 95% CI 0.070 - 0.352), contribution to the community (BH-adjusted $p = 0.024$; $V =$

0.222, 95% CI 0.088 - 0.378), and religious practice (BH-adjusted $p = 0.024$; $V = 0.210$, 95% CI 0.084 - 0.369). Among manifestations of internalised stigma, feelings of guilt and worthlessness were associated with lower adherence in the unadjusted analyses but did not remain significant after correction (BH-adjusted $p = 0.103$ and 0.058 , respectively) and were therefore considered exploratory.

3.3.4. Treatment-Related Factors

The median duration of ART was longer among adherent than non-adherent participants (92.2 [58.0 - 164.7] versus 70.9 [48.9 - 105.8] months; $p = 0.017$), although the effect size was small ($|r| = 0.211$, 95% CI 0.047 - 0.374; $N = 212$). Concomitant treatment for a chronic condition was associated with higher adherence (95.8% versus 68.6%; $p = 0.005$; $V = 0.191$, 95% CI 0.108 - 0.262; $N = 212$). In contrast, the use of traditional medicines or herbal remedies was not significantly associated with adherence (63.0% versus 72.9%; $p = 0.284$; $V = 0.074$, 95% CI 0.004 - 0.217; $N = 208$). Factors and psychosocial dimensions related to HIV status that were associated with adherence are presented in **Table 3** and **Table 4**.

Table 3. Bivariate analysis of factors associated with ART adherence among PLHIV.

Factors	N	Non-adherent n (%)	Adherent n (%)	P	BH- adjusted p	Effect size (95% CI)
Sociodemographic and socioeconomic factors						
Sex	213			0.645	0.645	$V = 0.032$ (0.002 - 0.175)
Female		36 (27.1)	97 (72.9)			
Male		24 (30.0)	56 (70.0)			
Age, years	213			0.173 [‡]	0.173	$V = 0.125$ (0.045 - 0.243)
18 - 24		2 (33.3)	4 (66.7)			
25 - 59		55 (30.1)	128 (69.9)			
≥60		3 (12.5)	21 (87.5)			
Educational level	213			0.115	0.115	$V = 0.187$ (0.110 - 0.340)
No formal education		17 (32.7)	35 (67.3)			
Primary education		11 (19.6)	45 (80.4)			
Secondary education		26 (32.5)	54 (67.5)			
Vocational training		4 (50.0)	4 (50.0)			
University/higher education		2 (11.8)	15 (88.2)			
Population category	213			0.916 [‡]	0.916	$V = 0.064$ (0.043 - 0.168)
Civilian		51 (28.8)	126 (71.2)			
Defence forces personnel		9 (26.5)	25 (73.5)			
Security forces personnel		0 (0)	2 (100)			
Membership in an HIV support group	211			0.175	0.175	$V = 0.093$ (0.005 - 0.234)
No		42 (26.1)	119 (73.9)			

Continued

Yes	18 (36.0)	32 (64.0)			
Difficulty meeting basic needs	213		<0.001	<0.001	V = 0.288 (0.156 - 0.428)
Never	29 (19.7)	118 (80.3)			
Some of the time	24 (44.4)	30 (55.6)			
Most of the time	7 (58.3)	5 (41.7)			
Circumstances of HIV testing	213		0.004	0.004	V = 0.255 (0.181 - 0.383)
No, I was tested without my knowledge and only found out after the test	12 (48.0)	13 (52.0)			
No, I was forced to undergo HIV testing without my consent	1 (100.0)	0 (0.0)			
No, I was born with HIV or acquired it during infancy or childhood, and I was unaware that I had been tested	0 (0.0)	2 (100.0)			
Yes, it was my choice	39 (30.2)	90 (69.8)			
Yes, but I was under pressure from other people	8 (14.3)	48 (85.7)			
Healthcare- and service access-related factors					
Access to treatment services	213		0.078*	0.182	V = 0.137 (0.009 - 0.283)
No	6 (54.5)	5 (45.5)			
Yes	54 (26.7)	148 (73.3)			
Access to support services	213		0.021	0.074	V = 0.158 (0.025 - 0.294)
No	34 (36.2)	60 (63.8)			
Yes	26 (21.8)	93 (78.2)			
Reported issue with confidentiality or management of medical records	213		0.009	0.064	V = 0.179 (0.041 - 0.314)
No	31 (22.3)	108 (77.7)			
Yes	29 (39.2)	45 (60.8)			
Internalised stigma					
Feelings of guilt	213		0.034	0.103	V = 0.145 (0.014 - 0.290)
No/disagree	41 (24.7)	125 (75.3)			
Yes/agree	19 (40.4)	28 (59.6)			
Feelings of worthlessness	213		0.01	0.058	V = 0.177 (0.031 - 0.318)
No/disagree	46 (25.0)	138 (75.0)			
Yes/agree	14 (48.3)	15 (51.7)			
Treatment-related factors					
Duration of ART, months\$	212		0.017	0.017	 r = 0.211 (0.047 - 0.374)

Continued

Non-adherent		70.9 [48.9 - 105.8]			
Adherent			92.2 [58.0 - 164.7]		
Concomitant treatment for a chronic condition	212			0.005	0.005 V = 0.191 (0.108 - 0.262)
No		59 (31.4)	129 (68.6)		
Yes		1 (4.2)	23 (95.8)		
Traditional medicines/herbal remedies	208			0.284	0.284 V = 0.074 (0.004 - 0.217)
No		49 (27.1)	132 (72.9)		
Yes		10 (37.0)	17 (63.0)		

Table 4. Psychosocial dimensions related to HIV status associated with ART adherence.

Factors	N	Non-adherent n (%)	Adherent n (%)	P	BH- adjusted p	Effect size (95% CI)
Stress management	206			0.015	0.031	V = 0.201 (0.081 - 0.354)
Negative		13 (21.3)	48 (78.7)			
Positive		13 (52.0)	12 (48.0)			
No impact		33 (27.5)	87 (72.5)			
Ability to find love	202			0.002	0.014	V = 0.251 (0.113 - 0.410)
Negative		8 (32.0)	17 (68.0)			
Positive		13 (61.9)	8 (38.1)			
No impact		38 (24.4)	118 (75.6)			
Achievement of personal goals	205			0.019	0.031	V = 0.197 (0.070 - 0.352)
Negative		3 (27.3)	8 (72.7)			
Positive		13 (52.0)	12 (48.0)			
No impact		42 (24.9)	127 (75.1)			
Ability to contribute to the community	205			0.006	0.024	V = 0.222 (0.088 - 0.378)
Negative		3 (37.5)	5 (62.5)			
Positive		13 (54.2)	11 (45.8)			
No impact		41 (23.7)	132 (76.3)			
Ability to practice religion	208			0.009	0.024	V = 0.210 (0.084 - 0.369)
Negative		2 (50.0)	2 (50.0)			
Positive		14 (50.0)	14 (50.0)			
No impact		42 (23.9)	134 (76.1)			

*Fisher's exact test with Monte Carlo simulation; [§]Median [Q1 - Q3], Wilcoxon-Mann-Whitney test; **V** = Cramer's V; **|r|** = absolute value of the rank-biserial correlation coefficient.

4. Discussion

ART adherence remained suboptimal in our study population. Nearly three in ten participants did not meet the composite criterion combining good self-reported adherence and virological suppression. The proportion of participants with an undetectable VL also remained below the UNAIDS target of 95% viral suppression among people receiving treatment [1]. The discrepancy between self-reported, virological, and composite measures highlights the value of a multidimensional assessment of adherence. Self-reported measures are susceptible to recall and social desirability biases, whereas virological response, although closely related to ART intake, may be influenced by other factors. This complementarity is illustrated by data from the observational African Cohort Study (AFRICOS), in which Kiweewa *et al.* reported viremia ≥ 50 copies/ml in 19.3% of participants and virological failure in 9.0%. Importantly, missing at least one day of ART during the previous month was independently associated with an increased risk of virological failure (aRR = 1.8; 95% CI 1.27 - 2.57) [11]. Comparisons across studies should nevertheless be interpreted cautiously because of heterogeneity in adherence definitions and measurement methods. In Ghana, a meta-analysis estimated adherence at 70% (95% CI 58% - 81%), with substantial heterogeneity across studies [3].

4.1. Multifactorial Nature of ART Adherence

Our findings support the multifactorial nature of ART adherence. It is influenced by circumstances that extend beyond individual sociodemographic characteristics. The overall pattern points to the relevance of the material, psychosocial, and treatment context in which PLHIV manage long-term therapy. This interpretation is consistent with evidence from sub-Saharan Africa showing that adherence reflects the interplay of individual, social, economic, psychosocial, treatment-related, and healthcare factors [4] [12]. The variation in these contextual influences may also help explain why the sociodemographic correlates of non-adherence have varied across contexts [12].

4.2. Socioeconomic Vulnerability

Socioeconomic vulnerability emerged more clearly in our study, with adherence decreasing progressively as difficulties in meeting basic needs increased. Similar patterns have been reported across sub-Saharan Africa, where food insecurity, financial constraints, and transportation costs have been identified as barriers to sustained ART adherence [4] [12]. The Stigma Index 2.0, conducted in the Democratic Republic of Congo (DRC), also highlighted this vulnerability, with 80% of participants reporting difficulties meeting their basic needs [13]. However, Ouner *et al.* found no association between food security and adherence in Ghana (OR = 0.69; 95% CI 0.25 - 1.83) [14]. Differences in the definitions and measures of socioeconomic vulnerability could partly explain these divergent results.

4.3. Healthcare Environment

The healthcare environment may nevertheless influence how patients engage with long-term treatment. Although the association between access to support services and adherence did not persist after correction for multiple comparisons, the observed pattern warrants further investigation rather than firm interpretation. In the AFRICOS study, Mbah *et al.* found that participation in a support group was not associated with improved ART adherence or viral suppression among 1959 PLHIV receiving ART [15]. Similarly, Somi *et al.* found no significant association between satisfaction with HIV care and viral suppression [16]. Taken together, these findings suggest that access to support services, group participation, or perceived satisfaction with care may not alone be sufficient to promote adherence. The quality, accessibility, and responsiveness of support to patients' needs may also be relevant.

4.4. Confidentiality of Medical Information

The confidentiality of medical information deserves particular attention in our context. Reported problems concerning the management or confidentiality of medical records were associated with lower adherence in the unadjusted analysis. However, this association did not remain statistically significant after correction for multiple comparisons and should therefore be interpreted as exploratory. The Stigma Index 2.0 Côte d'Ivoire provides relevant contextual information for interpreting this exploratory finding. Among the PLHIV interviewed, 78% felt that the confidentiality of their medical records was guaranteed, while 20% were uncertain and 2% thought it was not. Fear that their HIV status would be discovered by third parties or disclosed without consent by healthcare professionals was also among the reasons given for delaying or interrupting care [17]. In this context, confidence in the protection of HIV status may contribute to engagement in care. This issue could be particularly relevant in an institutional environment that accommodates both civilians and members of the defence and security forces, although this hypothesis was not specifically evaluated in our study.

4.5. HIV-Related Stigma and Adherence

The relationship between HIV-related stigma and ART adherence appears to be complex and may depend on the dimension of stigma considered. Our findings suggest that the psychosocial experience of living with HIV may be more relevant to adherence than specific manifestations of stigma considered in isolation. This distinction is important because stigma may affect treatment behaviour indirectly through its effects on emotional well-being, interpersonal relationships, social participation, and the ability to pursue personal aspirations, rather than solely through overt experiences of discrimination. This interpretation is particularly relevant in the Ivorian context. The Stigma Index 2.0 in Côte d'Ivoire documented shame (32.2%), guilt (28.5%), and feelings of worthlessness (15.8%), as well as broader psychosocial effects among PLHIV [17]. Comparable manifestations have

also been reported in the DRC [13]. These descriptive data illustrate the multiple ways in which HIV may affect psychosocial well-being, although they do not establish a relationship with adherence. Evidence regarding such a relationship is itself heterogeneous. In the AFRICOS study, experienced stigma was associated with lower adherence (OR = 0.67; 95% CI 0.56 - 0.80) and lower viral suppression [5]. Conversely, Ouner *et al.* reported an association between stronger internalised stigma and better adherence (OR = 1.08; 95% CI 1.01 - 1.15) [14]. These apparently contrasting findings suggest that different dimensions of stigma should not be considered interchangeable and that their relationship with adherence may vary according to coping mechanisms, social support, and sociocultural context.

4.6. Treatment-Related Factors and Adherence

Treatment-related factors yielded more nuanced findings. Longer ART duration was associated with better adherence, which may reflect the progressive integration of treatment into daily routines. Conversely, sustained adherence may itself contribute to longer retention in care, making the direction of this relationship difficult to determine. The cross-sectional design does not allow these possibilities to be distinguished. Reported reasons for missed doses or irregular ART intake were dominated by fear that someone might discover the participant's HIV status, followed by fear of being treated poorly by healthcare professionals and forgetting to take treatment for no specific reason. Psychological or emotional factors and difficulties related to distance or access to the treatment centre were reported less frequently. These findings illustrate the interplay between stigma-related, psychosocial, and practical barriers to ART adherence described across sub-Saharan Africa [4]. The relationship with concomitant treatment for a chronic condition may also reflect greater familiarity with long-term medication use or more frequent contact with healthcare services, both of which could facilitate the incorporation of ART into daily routines. However, this interpretation remains tentative given the small number of participants receiving such treatment. Furthermore, the lack of association between the use of traditional medicines or herbal remedies and adherence contrasts with the meta-analysis by Heestermans *et al.*, which reported a higher risk of non-adherence among users of these treatments (OR = 2.65; 95% CI 1.18 - 5.95), although substantial heterogeneity was observed across studies [12]. These discrepancies further emphasize the context-dependent nature of factors associated with ART adherence.

4.7. Strengths and Limitations

This study has several strengths. The use of a composite endpoint combining self-reported adherence and virological suppression allowed for the consideration of both behavioural and biological dimensions of adherence. The simultaneous assessment of individual, socioeconomic, treatment-related, care-related, stigma-related, and psychosocial factors also provided a multidimensional perspective on non-adherence. However, several limitations should be noted. The cross-sectional

nature of the study did not allow for the assessment of the temporality or causality of the observed associations. Self-reported data were susceptible to recall bias and social desirability bias, while the small sample sizes in some categories limited the precision of certain estimates. Although the Benjamini-Hochberg procedure was applied within families of related variables to control the false discovery rate, the number of comparisons warrants cautious interpretation, particularly for associations that did not remain statistically significant after correction. Finally, the absence of multivariable adjustment is an important limitation, as residual confounding cannot be excluded. Consequently, the observed associations cannot be interpreted as independent effects, and the findings should primarily be regarded as hypothesis-generating.

5. Conclusion

ART non-adherence remains an important concern among PLHIV receiving care in military health facilities in Côte d'Ivoire. The observed associations with socioeconomic, treatment-related, and psychosocial factors underscore the importance of a person-centred approach that considers the broader context in which patients manage long-term antiretroviral therapy. Healthcare support and confidentiality also warrant further investigation. Given the cross-sectional design and unadjusted nature of the analyses, these findings should primarily inform context-specific hypotheses and the design and evaluation of targeted adherence interventions.

Author Contributions

TBLFO conceived and designed the project, made a major contribution to it, and wrote the manuscript. BNA and AMDG participated in the supervision and design of the project and made a major contribution to it. ING participated in the design of the questionnaire and the supervision of the project. YMK contributed to the data analysis, made a major contribution to it, and participated in writing the manuscript. All authors have read and approved the final version of the manuscript and agree to be responsible for the quality of the data.

Conflicts of Interest

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

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