






Research Article

# Barriers to Antiretroviral Treatment Adherence Among Refugees Living with HIV/AIDS in Douala, Cameroon

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## Abstract

The success of antiretroviral treatment (ART) depends on adherence. Adherence is necessary to reduce the risk of resistance, restore immunity, and reduce incidence, morbidity and mortality. Data on the ratio of refugees and conflict-affected people living with HIV and on ART needs are scarce. The objective of this study is to identify barriers to ART adherence among refugees living with HIV/AIDS in Douala. In a cross-sectional, analytical study conducted among refugees living with HIV/AIDS in Douala and followed in health facilities that are partners of the High Commissioner for Refugees (HCR). Adherence was evaluated on the basis of patient declarations (declared adherence) and the regularity of the renewal of their prescriptions (calculated adherence). The quantitative data collected with the anonymous questionnaire administered after informed consent was entered with Epi Info version 7.1.3.0. Descriptive and inferential analysis was carried out with SPSS version 17.0, which allowed us to determine the association between predisposing factors and adherence to antiretroviral treatment using Pearson's Chi-square test. 200 refugees meeting our inclusion criteria were interviewed. The average length of follow-up was 4 years. The average age was  $40.66 \pm 9.35$  years and the sex ratio was 2.39 in favour of the female sex. 91.5% of the refugees had started treatment more than a year ago. The level of reported compliance was significantly lower than the overall level of calculated compliance (67.5% vs. 71.0%,  $P=0.000$ ). The main obstacles to adherence were forgetting and lack of food. People who received accurate information about their illness were more observant ( $P=0.000$ ). Adherence to antiretroviral treatment was best when the year of initiation of treatment was two years or more ( $P=0.000$ ) and the patient knew the duration of treatment ( $p=0.000$ ). The low adherence rate (<95%) among refugees was related to several factors. The difference observed between the results of the two methods used to estimate adherence shows us the need for biological methods in assessing the level of treatment adherence. Measures will be needed to improve the level of adherence among refugees, including the strengthening of psycho-social support.

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## Keywords

Adherence to Treatment, Refugees, Antiretroviral Treatment, HIV/AIDS

## 1. Introduction

Adherence to therapy indicates a person's ability to take a treatment according to a given prescription [1]. These abilities are influenced positively or negatively by interacting cognitive, behavioural, social and emotional co-factors [1]. The use of this term includes the notion of adherence, which is the degree of patient acceptance of the prescription and can be primary or persistent. Primary adherence refers to the patient's compliance at the beginning of treatment, as opposed to persistence, which is defined as the patient's ability to comply with his or her prescriptions over the medium/long term. The danger of poor adherence is the emergence of virus resistance, rapid disease progression, increased viral load and a higher risk of virus transmission [2]. It is a key public health issue.

According to the World Health Organisation (WHO), one in two people, regardless of their country of origin, do not take their treatment as they should [3]. Adherence is assessed by, among other things, clinical assessment, and viral load suppression and counting of remaining tablets in systems where the patient is required to obtain medicines from the same pharmacy [2]. Prescription refill rates have been shown to be a good indicator of adherence, sensitive to the duration or complexity of antiretroviral therapy (ART) [4]. Improved knowledge of this issue is an asset in the care of the host population and refugees living with HIV. Most of these people live in countries heavily affected by HIV, and about 4 million of them live in sub-Saharan Africa [5]. Data on the ratio of refugees to conflict-affected people living with HIV are scarce.

According to the UNHCR, Cameroon has since September 2019 nearly 395 187 refugees and asylum seekers with 34 877 refugees and asylum seekers living mainly in the city of Yaounde and Douala [6]. Indeed, Cameroon has ratified the 1951 convention relating to the status of refugees according to which it undertakes to provide refugees with the same quality of relief and assistance as their nationals, including medical care. It is with this in mind that a mass HIV testing campaign was organised during the second semester of 2018 in the refugee camps of the three regions (Adamawa, East and Far North) showing a prevalence of 0.50% [7]. These people living with HIV live in precarious living conditions that do not allow for adequate nutrition in relation to their state of health. Their follow-up in the community is not always ensured. As for clinical management, ART is not always available or observed by patients because of the lack of means of subsistence, and adherence to treatment is necessary to achieve the third UNAIDS objective: 90% of HIV-positive people on

treatment must have an undetectable viral load [8]. This often creates resistance that further complicates their treatment and in most cases leads to death. Data on adherence to treatment is scarce in Cameroon and more specifically in the refugee community, which is a vulnerable group.

In Dschang in 2010, Mbopi-Kéou found a non-compliance of 48.70% [9]. It is fully accepted that success in antiretroviral treatment (ART) depends on the degree of adherence to ART. Improving knowledge of this problem would be an asset in the care of refugees living with HIV in Douala, hence the interest of this study, which aims to determine the obstacles to adherence to antiretroviral treatment among refugees living with HIV/AIDS in Douala. More specifically, to determine the level of adherence to antiretroviral treatment among refugees living with HIV/AIDS in Douala; to highlight the obstacles to adherence to antiretroviral treatment in the study population and to determine the association between certain socio-demographic characteristics and variables linked to adherence.

## 2. Material and Method

### 2.1. Study Location and Population

Our study took place in the city of Douala, more precisely in some health facilities (District Medical Centers of Congo II, Soboum, Bonadiwoto, Deido District Hospital and Douala Laquintinie Hospital) in the Health Districts of Nylon, New-bell and Deido, which are partner health facilities of the High Commissioner for Refugees (HCR). We carried out an analytical cross-sectional study of refugees living with HIV/AIDS. The study population was made up of HIV+ refugee patients on ART, who came on an outpatient basis for the monthly renewal of prescriptions or for routine medical visits in the health facilities from which the participation agreement was obtained through an informed consent signed by the latter. All refugee patients over the age of 18 who had been receiving ART for at least 6 months, followed up in the selected health facilities, and who had consented to the study were included, and those admitted to hospital on ART were excluded. We proceeded with an exhaustive sampling of health facilities implementing the United Nations High Commissioner for Refugees (UNHCR) project on health care for urban refugees. In terms of the choice of participants, we carried out a probability sampling of community patients who

came for the monthly renewal of their prescriptions or for their routine medical visits in the Care Units (CU) of the said health facilities and from whom the agreement to participate was obtained by informed and written consent. The sample size was determined using Lorentz's formula.

## 2.2. Data Collection Instrument

The data collection instrument used was an anonymous questionnaire. The questions were pre- tested beforehand. Each patient came with his or her last prescription and remaining antiretroviral drugs. They were then given the questionnaire, which they filled out alone for literate people, in the presence of the provider, who helped them understand the questions. For the illiterate, the questionnaire was filled in by the providers who asked each question, recorded the answer and any spontaneous comments made by the patient. The letter were accompanied by previously trained refugee community liaison workers who acted as interpreters for patients with language difficulties.

## 2.3. Evaluation Criteria

In our study, adherence to treatment was measured by two methods: on the basis of patient declarations (declared adherence), the regularity of prescription renewal (calculated adherence):

Declared compliance: assessed by the frequency with which medication is skipped since the start of therapy. Non-Compliance was defined as those who had missed more than one dose of medication in the last 4 days for three-daily regimens (less than 95% of doses taken); those who had missed more than one dose of medication in the last 10 days for twice-daily regimens (less than 95% of doses taken); and those who had missed one week or more of treatment since initiation of therapy [10].

Calculated compliance: measured by the ratio of the number of prescriptions dispensed to the theoretical quantity of prescriptions expected (which corresponds to the number of months of treatment follow-up). The patient was considered to be compliant when this ratio was greater than 0.95 [11].

## 2.4. Data Analysis

The data collected was analysed using Word version 2013 and Epi Info version 7.1.3.0 (Epi Info <sup>TM</sup>, CDC). Descriptive analysis was presented where the central trend variables and the association between dependent and independent variables were presented using Pearson's Chi- square tests to determine the association between predisposing factors and adherence to antiretroviral treatment. Statistical significance was set at  $p < 0.05$ . All tests were interpreted with a statistical significance level of 5% and confidence intervals calculated at 95%.

## 2.5. Ethical Considerations

Within the framework of the respect of research ethics, our study was submitted to the agreement of the Institutional Ethics Committee of the University of Douala, which gave us an ethical clearance. The survey authorisation was delivered by the Regional Delegate of Public Health for the Littoral. The agreement of the managers of the selected health facilities was also obtained for the recruitment of patients. All information collected from patients was secure and kept confidential.

## 3. Results

### 3.1. Socio-Demographic Characteristics

A total of 200 refugees on ART were monitored in the centers district hospitals of the selected health facilities in the city of Douala, for a 100% response rate. The average age of the patients was  $40.66 \pm 9.35$  years with a minimum of 20 years and a maximum of 68 years. The median age was 39 years. More than half (66.50) of the patients were aged between 31 and 50. The most represented were Central Africans (87.50), women (70.50) in cohabitation (42.5), working in small trades (32.50) with primary education (42.5) (Table 1).

**Table 1.** Socio-demographic characteristics of refugees on ART.

Variables	Numbers (n)	Frequencies (%)
Age (Year)		
<= 30 years old	32	16
31-50 years old	133	66.50
51-60 years old	31	15.50
> 60 years old	4	2
Nationality		
Central African Republic	175	87.50
Congolese	15	7.50
Malian	3	1.50
Chadian	5	2.50
Ivorian	2	1
Sex		
Men	59	29.50
Women	141	70.50
Marital status		
Cohabitation	95	42.5
Widow (er)	55	27.5
Married	50	25

Variables	Numbers (n)	Frequencies (%)	Variables	Numbers (n)	Frequencies (%)
Divorced	10	5	University	30	15
Occupation Worker	60	30	Total	200	100
Agent	40	20			
Small trades	65	32.50			
Unemployed	35	17.50			
Level of education					
None	25	12.5			
Primary	85	42.5			
Secondary	60	30			

### 3.2. Association of Therapeutic Adherence with Sociodemographic Characteristics and Clinical Data

In univariate analysis, gender ( $p=0.003$ ), marital status ( $p=0.043$ ), year of HIV diagnosis ( $p=0.018$ ) and year of initiation of antiretroviral therapy ( $p=0.013$ ) were associated with adherence (Table 2).

**Table 2.** Association of therapeutic adherence with sociodemographic characteristics and clinical data.

Variables	Non-Compliance n (%)	Compliance n (%)	Total N (%)	p
Sex				
Male	28 (14%)	31 (15.50%)	59 (29.50%)	0.003
Female	37 (18.50%)	104 (52 %)	141 (70.50%)	
Marital status				
Married	12 (6%)	23 (11.50%)	35 (17.50%)	0.043
Single	34 (17%)	50 (25%)	84 (42%)	
Widow (widower)	8 (4%)	44 (22%)	52 (26%)	
Divorced	4 (2%)	7 (3.50%)	11 (5.50%)	
Cohabitation	7 (3.50%)	11 (5.50%)	18 (9%)	
Year of HIV diagnosis				
[6 months -1 year]	10 (5%)	8 (4%)	18 (9%)	0.018
]1 year - 1 year 6month]	6 (3%)	5 (2.50%)	11 (9%)	
]1 year 6 months - 2years]	13 (6.50%)	20 (10%)	33 (16.50%)	
> 2 years	36 (18%)	102 (51%)	138 (69%)	
Year of initiation of treatment				
[6 months -1 year]	11 (5.50%)	8 (4%)	18 (9%)	0.013
]1 year - 1 year - month]	5 (2.50%)	5 (2.50%)	11 (9%)	
]1 year - 6 months-2years]	14 (7%)	21 (10.50%)	33 (16.50%)	
> 2 years	35 (17.50%)	101 (50.50%)	138 (69%)	
Total	65 (32.50%)	135 (7.50%)	200 (100%)	

### 3.3. Reported Adherence According to the Measurement of Therapeutic Adherence of Refugee Patients on ART

Most of the patients, (81%) did not miss taking any tablets in the 4 days prior to the interview. The proportion of patients who reported observing increases from (81%) when considering the 4 days prior to the date of submission of the questionnaire to 74.50% when considering the last ten days prior to the survey. 59% of patients with reported compliance find the number of ART tablets taken per day acceptable but this relationship is not statistically significant ( $P=0.361$ ). People who do not know the importance of ART are 5% less compliant and the relationship between the importance of treatment according to compliance is statistically significant ( $P=0.000$ ). Looking at the relationship between associative support and adherence, we observe that 31% of non-adherent patients declare not having received family support compared to 4.50% of observant patients ( $p=0.003$ ). Furthermore, the

compliance rate of patients who declared having knowledge of the risks of non-adherence to ART treatment is 56% as opposed to 14.50% of non-adherent patients ( $p=0.003$ ). 24% of refugee patients are on treatment other than ART treatment and have an adherence rate of 11.50% ( $n=23$ ) with non-adherence of 12.50% ( $P=0.001$ ), 10% of these patients are on traditional treatment and 9% on other medical treatment. In uni-varied analysis, the relationship between viral load achievement and compliance is statistically significant ( $P=0.001$ ) as well as CD4 achievement ( $P=0.051$ ). Patients with no opportunistic disease have a reported adherence of 57.5% compared to 9% adherence for those with opportunistic disease. This relationship between the presence of an opportunistic disease is not statistically significant ( $P=0.192$ ). 61% is the compliance of refugee patients with no opportunistic disease according to the compliance calculated with tuberculosis followed by candidacies as the most frequent opportunistic disease. This relationship is statistically significant ( $p=0.000$ ) (Table 3).

**Table 3.** Reported adherence according to the measurement of therapeutic adherence of refugee patients on ART.

Variables	Non-Compliance n (%)	Compliance n (%)	Total N (%)	p
More than one catch in the last 4 days				
Yes	29 (14.50%)	9 (4.50%)	38 (19%)	0.018
No	36 (3%)	126 (63%)	162 (81%)	
Jump more than 2 catches in the last 10 days				
Yes	36 (18%)	15 (7.50%)	51 (25.50%)	0.000
No	29 (14.50%)	120 (60%)	20(74.50%)	
Forgetting to take it for a week or more since the beginning of the treatment				
Yes	50 (25.50%)	44 (22%)	47 (47%)	0.000
No	15 (7.50%)	91 (45.50%)	106 (53%)	
Respect of the last 3 appointments given				
Yes	31 (15.50%)	133 (66.50%)	164 (82%)	0.000
No	34 (17%)	2 (1%)	36 (18%)	
Receipt of accurate information about the disease				
Yes	33 (16.50%)	97 (48.50%)	130 (9%)	0.003
No	32 (16.50%)	38 (19%)	70 (35%)	
Importance of treatment				
Yes	38 (19%)	125 (62.50%)	163 (81%)	0.000
No	27 (13.50%)	10 (5%)	37 (18.50%)	
Duration of treatment				
6 months	2 (1%)	1 (31%)	3 (1.50%)	0.000
1 year	1 (0.50%)	0 (0%)	1 (0.50%)	

Variables	Non-Compliance n (%)	Compliance n (%)	Total N (%)	p
Don't know	47 (23.50%)	49 (24.50%)	96 (48%)	0.000
All your life	15 (7.50%)	85 (42.50%)	100 (50%)	
Knowledge of the side effects of ART				
Yes	23 (11.50%)	93 (15%)	116 (25.50%)	0.003
No	42 (21%)	42 (21%)	84 (42%)	
Improved health since taking ART				
Aggravation	1 (0.50%)	2 (1%)	3 (1.50%)	0.000
No improvement	2 (1%)	0 (0%)	2 (1%)	
Slight improvement	19 (9.5%)	5 (2.5%)	24 (12%)	
Marked improvement	42 (21%)	126 (63%)	168 (84%)	0.361
Don't know	1 (1%)	2 (1%)	3 (1.50%)	
Staff availability				
Yes	44 (22%)	122 (61%)	166 (83%)	0.000
No	21 (10.50%)	13 (6.50%)	34 (17%)	
Number of tablets taken				
Acceptable	52 (26%)	118 (59%)	170 (85%)	0.006
Excessive	1 (0.50%)	2 (1%)	3 (1.50%)	
Don't know	12 (6%)	15 (7.50%)	27 (13.50%)	
Importance of treatment				0.003
Yes	38 (19%)	125 (62.50%)	163 (81%)	
No	27 (13.50%)	10 (5%)	37 (18.50%)	
Associative support				0.004
Yes	3 (1.50%)	26 (13%)	29 (14.50%)	
No	62 (31%)	109 (54.50%)	145 (85.50%)	
Alcohol consumption				0.001
Yes	26 (13%)	29 (14.50%)	55 (27.50%)	
No	39 (19.50%)	106 (53%)	145 (72.50%)	
Problem swallowing some tablets				0.192
Yes	21 (10.50%)	20 (11.50%)	41 (20.50%)	
No	44 (22%)	115 (56%)	159 (79.50%)	
Follow-up of another treatment				0.192
Yes	25 (12.50%)	23 (11.50%)	48 (24%)	
No	40 (20%)	112 (56%)	152 (76%)	
Opportunistic affections				0.192
Tuberculosis	11 (5.50%)	12 (6%)	23 (11.50%)	
Toxoplasmosis	1 (0.50%)	0 (0%)	1 (0.50%)	
Application	10 (5%)	8 (4%)	18 (9%)	0.192
None	43 (21.50%)	115 (57.50%)	158 (79%)	
Viral load production				



Variables	Non-Compliance n (%)	Compliance n (%)	Total N (%)	p
Yes	36 (18%)	105 (52.50%)	141 (70.50%)	0.001
No	29 (14.50%)	30 (15.50%)	59 (29.50%)	
Making CD4				
Yes	12 (6%)	41 (20.50%)	53 (26.50%)	0.051
No	53 (26.50%)	94 (47%)	147 (73.50%)	
Total	65 (32.50%)	135 (67.50%)	200 (100%)	

### 3.4. Adherence Calculated According to Socio-Demographic Characteristics and Barriers to Adherence of Refugee Patients on ART

Patients with an income-generating activity have a calculated compliance of 25.50% compared to a compliance of 12.50% for patients with no source of income. The relationship between calculated compliance and source of income is statically significant ( $P=0.002$ ). Assessment of the number of

tablets taken per day and calculated compliance are not associated ( $P>0.05$ ). The relationship between calculated compliance and follow-up of another treatment, the presence of food before taking ART, the presence of embarrassing symptoms after taking ART, the perception of the benefit of the treatment and knowledge of the risks of non-compliance is statistically significant ( $P=0.000$ ). According to the calculated compliance, refugee patients consuming alcohol have low compliance (14.50%) compared to 56.50% of non-drinking patients; statistically significant relationship with  $P=0.001$  (Table 4).

**Table 4.** Adherence calculated according to socio-demographic characteristics and barriers to adherence of refugee patients on ART.

Variables	Non-Compliance n (%)	Compliance n (%)	Total N (%)	p
Age (years)				
<= 30 years old	14 (7%)	18 (9%)	32 (16%)	0.010
31-50 years old	41 (20.50%)	92 (46%)	133 (66.50%)	
51-60 years old	2 (1%)	29 (14.50%)	31 (15.50%)	
>60 years old	1 (0.50%)	3 (1.50%)	4 (2%)	
Sex				
Male	20 (10%)	39 (19.50%)	59 (29.50%)	0.323
Female	38 (19%)	103 (51.50%)	142 (70.50%)	
Marital status				
Married	5 (2.50%)	30 (15%)	35 (17.50%)	0.000
Single	33 (16.50%)	51 (25.50%)	84 (42%)	
Widow (widower)	6 (3%)	46 (23%)	52 (26%)	
Divorced	5 (2.50%)	6 (3%)	11 (5.50%)	
Cohabitation	9 (4.50%)	9 (4.50%)	18 (9%)	
Source of income				
Salary	4 (2.50%)	13 (6.50%)	17 (8.50%)	0.002
Agriculture	30 (15%)	66 (33%)	96 (48%)	
Third party support	2 (1%)	21 (10.50%)	23 (11.50%)	

Variables	Non-Compliance n (%)	Compliance n (%)	Total N (%)	p
UNHCR Assistance	0 (0%)	16 (8%)	16 (8.50%)	
None	22 (11%)	25 (12.50%)	47 (23.50%)	
Other	0 (0%)	1 (0.50%)	1(0.50%)	
Number of tablets taken				
Acceptable	52 (26%)	118 (59%)	170 (85%)	
Excessive	1 (0.50%)	2 (1%)	3 (1.50%)	0.361
Don't know	12 (6%)	15 (7.50%)	27 (13.50%)	
Importance of treatment				
Yes	29 (14.50%)	134 (67%)	163 (81%)	0.000
No	29 (14.50%)	8 (4%)	37 (18.50%)	
Duration of treatment				
6 months	0 (0%)	3 (1.50%)	3 (1.50%)	
1 year	0 (0%)	1 (0.50%)	1 (0.50%)	
Don't know	54 (27%)	42 (21.50%)	96 (48%)	0.000
All your life	4 (2%)	96 (48%)	100 (50%)	
Associative support				
Yes	0 (0%)	29 (14.50%)	29 (14.50%)	0.000
No	58 (29%)	113 (56.50%)	145 (85.50%)	
Alcohol consumption				
Yes	26 (13%)	29 (14.50%)	55 (27.50%)	0.001
No	32 (16%)	113 (56.50%)	145 (72.50%)	
Problem swallowing some tablets				
Yes	23 (11.50%)	18 (9%)	41 (20.50%)	0.000
No	35 (17.50%)	124 (62%)	159 (79.50%)	
Follow-up of another treatment				
Yes	31 (15.50%)	17 (8.50%)	48 (24%)	0.000
No	27 (13.50%)	125 (62.50%)	152 (76%)	
Always eat before taking ART				
Yes	6 (3%)	82 (41%)	88 (44%)	0.000
No	52 (26.50%)	60 (30%)	112 (56%)	
Disruptive events after taking ART				
Yes	51 (25.50%)	70 (35%)	121 (60.50%)	0.000
No	7 (3.50%)	72 (36%)	79 (39.50%)	
Perception of the benefit of the treatment				
Yes	29 (14.50%)	132 (66%)	161 (80.50%)	0.000
No	29 (14.50%)	10 (5%)	39 (19.50%)	
Knowledge of the risks of non-compliance				
Yes	24 (12%)	117 (58.50%)	141 (70.50%)	0.000
No	34 (17%)	25 (12.50%)	59 (29.50%)	



Variables	Non-Compliance n (%)	Compliance n (%)	Total N (%)	p
Relationship with staff				
Good	28 (14%)	121 (60.50%)	149 (74.50%)	0.005
Average	29 (14.50%)	20 (10%)	49 (24.50%)	
Wrong	1 (0.50%)	1 (0.50%)	2 (1%)	
Opportunistic affections				
Tuberculosis	15 (7.50%)	8 (4%)	23 (11.50%)	0.000
Toxoplasmosis	1 (0.50%)	0 (0%)	1 (0.50%)	
Application	6 (3%)	12 (6%)	18 (9%)	
None	36 (18%)	122 (61%)	158 (79%)	
Total	58 (29%)	142 (71%)	200 (100%)	

## 4. Discussion

Two hundred patients were included in our study. We used two methods to measure compliance among refugees: the so-called subjective method based on patient declarations (self- questionnaire or patient evaluation) and the so-called objective method based on the regularity of prescription renewal (calculated compliance) which must be  $\geq 95\%$  of the medical prescription.

Our study shares the same methodological limitations as other work measuring compliance through questionnaires. These statements may be subject to recall bias or social conformism [12]. The cross-sectional approach also has limitations that do not allow us to observe the dynamics of compliance and the factors that drive it. At the end of our study, it appears that the average age of our population is 40.66 years with extremes of 20 and 68 years. The age group [13, 14] was the most represented (66.50%). This is probably because it is the most sexually active segment of the population. These results are in line with UNAIDS data [15] and are comparable to those of Moula and al. in the Central African Republic who found a median age of 32.50 years [16]. We observed a female predominance (70.50%) in our study population with a sex ratio of 2.39. These results are similar to those of Mbopi-kéou and al. who found a sex ratio of 2.46 and differ from those of Oumar and al. in Bamako, Mali who found a sex ratio of 1.7; Nziengui and al. in Libreville, Gabon who also had a W/M sex ratio of 1.7 and Antignac and al. in France who found a W/M sex ratio of 0.19 [17-19]. The only socio-demographic characteristics associated with compliance in the study were gender ( $P=0.003$ ) and marital status ( $P=0.04$ ) for reported compliance and marital status ( $P=0.000$ ) for calculated compliance which shows that single people are significantly more compliant than married people. These results are comparable to those of George Folefack and al. who found a statistically

significant association between non-compliance and patients' marital status ( $P=0.006$ ) through the combination of the two measurement methods (subjective and objective) [17].

There is significant variability in the socio-demographic characteristics associated with ART adherence across studies, which can be explained by the study method used and the difference in study populations. Spire B and al. found only age as the only socio-demographic variable associated with adherence. Elderly patients tend to remain more compliant than younger patients except that in our study we find a reported compliance of 46% in the young population versus 1.5% in the elderly population [18]. The most compliant patients in our study were women (52%). Different results were found by Ahmed and al. who found that men were the most observant (62.10%). In our context these results can be explained by the fact that the majority of our refugee patients are housewives and have more time to organise themselves to take their medication compared to men [19]. The results of this study show that a non-negligible fraction (87.5%) were nationals of the Central African Republic. This representativeness can be justified by the very high HIV prevalence rate (9.2% among women aged 40-44 and 6.9% among men aged 35-39), but the relationship between nationality and compliance is not statistically significant ( $P=0.43$ ). Results that can be compared with those of Moula and al. in the Central African Republic [13].

The reported level of compliance was significantly lower than the overall calculated compliance level (67.5% vs 71.0%,  $P=0.003$ ). Unanimous that there are several instruments for measuring compliance, and in order to compensate for this deficit, the authors recommend crossing at least one subjective method with an objective method, with a view to obtaining a more accurate approximation of patient compliance [20, 21]. Our study combined a subjective method (patient declaration) with an objective method (counting of prescriptions). Our patients reported overall compliance at 67.50%. This is lower than the study by Mbopi-Kéou and al. who found an 80.20% compliance rate of their patients but higher

than those of Andreo and al. in France, who found 58% compliance through the self-questionnaire method. One of the indicators of the evaluation of compliance is based on the period of time that patient's memory covers. In our study, it was 4 days, comparable to that used in the APROCO and MANIFF 2000 cohorts, whose memory efforts in their study lasted 4 days [18]. In terms of calculated compliance, we found 71%. These results are higher than those of Mbopi-Kéou who found a calculated adherence of 51.50%. The difference between these two methods was statistically significant ( $P < 0.0005$ ) [9].

The main obstacles to adherence mentioned by the refugees in our study were forgetting (47.50%), lack of food (31%), side effects of medication (13%), travel (9.5%), lack of willpower (8.5%), lack of money for transport (8.50%), illness (6.50%), not respecting taking times (6%), not having enough medication in the hospital (6%), being very busy (6%) and lack of importance (2.50%). In a longitudinal study conducted in Bamako in a hospital center, Oumar and al. showed that forgetting to take medication was the main cause of poor adherence to antiretroviral treatment [9]. Another study conducted in 2011 by Afionget and al. found occupation, forgetfulness and depression to be the main causes of non-compliance [6]. These results differ from those observed in Western countries where drug-related reasons are the main causes of non-compliance [21]. The patient's own commitment to treatment appears to be the main determinant of adherence, followed by institutional factors as illustrated by the effect of drug stock-outs and inappropriate prescriptions on adherence. Our survey shows that patients who consume alcohol tend to be less compliant (14.5%) than those who do not (53%). This difference is statistically significant ( $P = 0.006$ ). These results differ from those of George Folefack and al. who had a non-significant difference ( $P > 0.05$ ). In our study, there was no association between occupation, source of income and level of education. This is comparable to the study by Spire B and al. who found no association with gender, education and occupation. Follow-up of treatment other than ART is statistically significant with the reported adherence method ( $P = 0.001$ ), thus showing that taking another treatment does not promote good adherence. This was the case for Afionget and al. in Nigeria who showed that the use of herbal medicines is strongly associated with good adherence [21]. Similar results to those of Mbopi-Kéou and al. who showed that patients who used traditional treatment after starting ART appear to be less compliant than those who were exclusively on ART [9]. An association between support from family and friends and adherence is noted in this study with calculated adherence and this association is statistically significant ( $P = 0.000$ ). The APROCO cohort found that lack of social and family support was significantly associated with poor adherence [18]. Furthermore, in our study patients who perceived a marked improvement in their health status (84%) during the treatment process were more compliant (39.5%) than those who perceived a slight improvement according to calculated

compliance. This association of improvement in health status after initiation of ART treatment is statistically significant ( $P = 0.000$ ).

## 5. Limits of the Study

The study of compliance is the first limitation of this work because there is no reference method for compliance [12]. The use of two methods (objective and subjective) must be based on patient declarations [10]. The use of biological methods such as viral load measurement or anti-protease assays could guarantee the validity of our questionnaire [13, 14]. This raises the question of the reliability of the patient's answers. In order to limit memory bias, we assessed the refugees' adherence to antiretroviral treatment during the four and ten days preceding the survey, since the start of antiretroviral treatment. However, this does not exclude the possibility of memorisation bias (loss of information from the patient concerning compliance with his or her prescription since the start of ART). Finally, the limitations linked to the type of study (cross-sectional) and the measurement used to calculate compliance rates (average) mask the dynamism of compliance over time.

## 6. Conclusion

At the end of this study, the general objective of which was to determine the level of adherence of refugees living with HIV/AIDS in the Douala urban area, the most represented age group was that of 31-50 years old (66.50%) with a predominance of women (70.50%). 87.50% of the study population were Central African Republic nationals. An overall observance of 67.50% was found for declared observance among the refugee population and 71% for declared observance or to have an undetectable viral load, observance of 95% or more is required. Marital status is the only socio-demographic characteristic that is significantly associated with adherence using both the subjective (patient declaration) and objective (prescription renewal) methods of adherence; the year of diagnosis of HIV, the year of initiation of treatment, receipt of precise information on the disease, the importance of treatment, knowledge of the duration of treatment, knowledge of the side effects of ART, improvement in health since initiation of treatment, availability of staff, importance of treatment, alcohol consumption, The problem of swallowing certain tablets, the follow-up of another treatment, the presence of food before taking ART, embarrassing manifestations after taking ART, the perception of the benefit of the treatment, the knowledge of the risks of non-compliance, the relationship with staff are significantly associated with compliance according to the objective and subjective method. In view of the diversity of these factors, actions aimed at improving the level of compliance must take into account the strengthening of therapeutic education, the psychosocial care

of patients on ART treatment and the limitation of stock shortages.

## Abbreviations

AHTC	Accredited HIV/AIDS Treatment Center
ART	Antiretroviral Therapy (ART)
CU	Care Units
CDC	Center Control Diseases
DLH	Douala Laquintinie Hospital
HIV	Human Immuno Deficiency Virus
HCR	High Commissioner for Refugees
UNAIDS	United Nation Acquire Immuno Deficiency Syndrom
UNHCR	United Nations High Commissioner for Refugees
WHO	World Health Organisation

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## Author Contributions

**Ebong Serge Bruno:** Conceptualization, Data curation, Funding acquisition, Methodology, Project administration, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing

**Yemene Rodrigue:** Formal Analysis, Investigation, Methodology

**Tefe Tagne Robert:** Supervision

**Ekwi Damian Nsongmayi:** Visualization

**Edima H d ñe Carole:** Supervision

## Consent for Publication

Consent to publish has been obtained from all included persons in the study.

## Conflicts of Interest

The authors declare no conflicts of interest.

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