Journal of Medicine and Medical Studies

Research Article

Adherence to Antiretroviral Treatment Among Internally Displaced Persons Living with HIV in the West Region of Cameroon in 2022

Youssouf Mohamed Mfouapon[1], Armand Tiotsia Tsapi[1,2], Yves Assembo Leamsem[1], Hermann Pidjou[1], Roddy Yvain Saha[1,3], Nzali Lucien Dias[1,3], Jacques Delors Toumansie Mfonkou[4], Clovis Mapouo Kachiwouo[1], Chinmoun Daouda[1], Réné Assob Ngueda[5], Alice Kechaji[6]

[1]Regional Delegation of Public Health of the West, Bafoussam, Cameroon

[2]Evangelical University of Cameroon, Faculty of Science and Technology, Mbouo, Bandjoun

[3]Regional Technical Group for the fight against HIV/AIDS in the West Region, Bafoussam, Cameroon

[4]University of Ebolowa, Department of Public Health, Faculty of Medecine and Pharmaceutical Sciences

[5]University of Douala, Faculty of Medicine and Pharmaceutical Sciences

[6]Ministry of Public Health of Cameroon, Service for the Fight against STIs and HIV/AIDS, Yaoundé, Cameroon

*Corresponding author: Youssouf Mohamed Mfouapon, Regional Delegation of Public Health of the West, Email: mmohamedyoussouf1@gmail.com

A B S T R A C T

The HIV epidemic remains a major public health concern in Cameroon, particularly in the context of socio-political crises that have caused internal displacement. These displaced people, often vulnerable, face specific obstacles that influence their adherence to antiretroviral treatment (ART).

This study aimed to assess the ART adherence rate of internally displaced persons (IDPs) from the North-West and South-West regions living in the West region and to identify associated personal, socio-economic and institutional factors.

A cross-sectional analytical study was conducted on internally displaced adult patients living with HIV/AIDS and followed in the care units (UPEC) of the Western region. The sampling was non-probabilistic and exhaustive. Data were collected using structured questionnaires and analyzed with SPSS 25.0.

The study surveyed 139 internally displaced persons living with HIV. The reported adherence rate was 84.9%, with 72% of adherent patients having an undetectable viral load. Multivariate analysis revealed that age 45 years and above (adjusted OR = 3.80; 95% CI: 1.92-7.85; p < 0.001), marital status (married) (adjusted OR = 3.10; 95% CI: 1.71-5.62; p < 0.001) and fixed income source (adjusted OR = 2.95; 95% CI: 1.61-5.40; p < 0.001) were significantly associated with better adherence. Furthermore, demotivation (adjusted OR = 0.40; 95% CI: 0.21-0.72; p = 0.002), ARV side effects (adjusted OR = 0.60; 95% CI: 0.33-1.08; p = 0.044) and stigma (adjusted OR = 0.60; 95% CI: 0.37-0.98; p = 0.043) were identified as significant barriers to adherence.

Adherence to antiretroviral therapy among internally displaced persons living with HIV in the West Region of Cameroon is influenced by sociodemographic, economic and psychosocial factors. Targeted interventions, including strengthening social support, combating stigma and improving financial and logistical access to care, are needed to optimize treatment adherence and ensure sustained viral suppression.

Keywords: Cameroon, HIV/Aids, IDPs, Therapeutic compliance

1. Introduction

In 2020, the World Health Organization (WHO) estimated that there were approximately 37.7 million people living with HIV worldwide[1]. However, there is very little data on HIV among refugees and internally displaced people[2]. Many host countries or regions are often unable to provide the HIV services that IDPs and refugees need and deserve. They generally do not have access to HIV promotion and prevention services and are rarely given sufficient and adequate attention[3]. Despite improvements in low- and middle-income countries, very few IDPs/refugees receive antiretroviral therapy[3,2]. IDPs are vulnerable people both in terms of socio-economic and health, which could increase the risks of HIV infection[2,4,5]. It is also important to emphasize that HIV promotion and prevention activities also target non-settled populations, regardless of other risks. Internally displaced persons (IDPs) are people who have fled across a regional or national border and who have a special legal status, allowing them to have access to health care on an equal basis with nationals of the host countries or regions[6]. In 2021, there has been an increase in the trend of forced movements of IDPs with a global figure exceeding 84 million. It is noted that more people are fleeing violence, insecurity and the effects of climate change (UNHCR, 2021)[7]. Approximately 51 million people are now internally displaced, with most of the new displacement coming from five countries: Central African Republic (71,800), South Sudan (61,700), Syria (38,800), Afghanistan (25,200) and Nigeria (20,300)[8]. A study by Logie et al. 2024 in Bidi Bidi, one of the world's largest refugee camps with over 195,000 residents, found that 22% had never been tested for HIV and were unaware of their HIV status[9]. The same study also reported very poor levels of access to HIV testing[9]. Wegu et al. 2022, in a study conducted in Ethiopia, reported that among HIV-positive cases living in Kule refugee camp, 49% of them accepted index case testing[10]. This shows that there are huge gaps in promoting the health of IDPs in the context of HIV.

Adherence to antiretroviral treatment could have several factors given the different living conditions of these refugees and the difficulties they face[3,8,11]. According to studies carried out in West Africa, particularly among refugees living in Sudan, Kenya and Uganda, HIV seroprevalence varies from 1 to 5% among refugees[12]. Despite the poor documentation on ART adherence among IDPs in Africa, Rouhani et al., in 2017, nevertheless show that social support influences and screening strengthens adherence to HIV treatment among refugees[13]. Cameroon is subject to several socio-political emergencies spread over three geographical areas: in the Far North with the Lake Chad Basin crisis, in the East with the Central African refugee crisis and that in the North-West and South-West regions[8]. In the Central Africa sub-region, Cameroon is the country that, in addition to hosting the largest number of refugees, has a significant number of internally displaced persons[5]. It is characterized by several crises that generate numerous vulnerabilities and protection challenges for people of concern to the United Nations High Commissioner for Refugees (UNHCR)[11]. Since 2016, the North-West and South-West Regions (English-speaking regions of Cameroon) have been characterized by a conflict between non-state armed groups and the regular army, resulting in population displacement both within Cameroon (679,393 internally displaced persons) and in Nigeria neighboring country. (59,702 Cameroonian refugees)[11].

Currently, 393,180 people of different nationalities are refugees and asylum seekers in Cameroon. There are mainly people from the Central African Republic (more than 70%), Nigeria, Chad and Rwanda, the DRC, Guinea, Niger, Mali and internally displaced persons[5]. To conduct adequate monitoring to combat this pandemic, it is necessary to question the factors associated with treatment compliance within this group integrated into the general population[6,12,14-17]. Internally displaced persons from North West and South West regions represent a group at high risk of HIV transmissionMany factors are likely to influence adherence to antiretroviral treatment in this group of people[2,4,5,12,16,17]. Highlighting these risk factors would be an asset for adequate management and appropriate follow-up. The IDP population is exposed to many diseases such as HIV/AIDS; and monitoring adherence poses a problem for achieving the objectives of the three UNAIDS 95 and could also create resistance to treatment.

Adherence to antiretroviral (ARV) treatment is respect by the patient of the drug prescription. It also designates the degree of concordance between the recommendations of the physician and patient behavior[14,15]. WHO has identified five characteristics that collectively encompass elements that may impact adherence: Patient-related factors, Socio-economic factors, Health system-related factors, Disease-related factors, Treatment-related factors[18]. Adherence refers to the patient's more or less expressed acceptance of the recommended treatment strategy[18]. Compliance refers to the notion of obeying a "prescription", an injunction from the doctor or another health professional[18]. It is traditional to consider a patient reaching a rate of 80% as compliant, but this notion is certainly not appropriate for many infectious or cancerous diseases; And is classified as non-compliant a non-compliance rate < 60% for chronic treatment with preventive aim[18]: The threshold of good compliance concerning ARVs is above 90% or even 95%, i.e. less than three doses omitted for a treatment twice a day[19]. Non -compliance has consequences at several levels. It should be remembered that the acceptable rate of non-compliance will be highly dependent on the pathology. The direct consequences (which can lead to virological failure, clinical failure, immunological failure) of non-compliance are mainly epidemiological and the indirect consequences which are mainly economic. These are the direct and indirect costs which can be induced by poor control of the chronic pathology: additional assessments, hospitalization, morbid events (stroke, renal failure, diabetic foot) and excess mortality.

There are currently several methods, generally sub-categorized into indirect and direct methods[18,19]. Indirect methods (Subjective) are essentially declarative methods based on questioning the patient using an open or closed questionnaire, sometimes allowing compliance scales to be established. We thus distinguish between Prescriber Assessment and Questionnaire or self-questionnaire (Patient Assessment). Direct methods (Objective) use data considered more objective, either individual or population-based. Individual direct methods consider drug consumption for a given patient. The most classic direct method is the possession rate, i.e. the prescription renewal rate allowing actual consumption to be calculated versus theoretical consumption. Also, counting tablets (returning boxes) is mainly practiced for clinical trials but should become more widespread with the development of preparation of doses to be administered (PDA). We also have plasma or urine assays which are a very effective way of checking compliance but remain limited to certain molecules.

The overall objective of this study was to identify factors that may influence adherence to antiretroviral treatment among internally displaced persons (IDPs) from the North-West and South-West regions living with HIV/AIDS in the West region of Cameroon.

2. Materials and Methods

An analytical cross-sectional study was conducted over a period of ten (10) months (October 2021 to July 2022) in Care Units (UPEC) of category 4 health facilities located in the West region of Cameroon. This region, bordering the North-West and South-West conflict zones, hosts a significant number of internally displaced persons. The source population consisted of adult internally displaced patients living with HIV, registered in the UPECs of the region and having given their informed consent participated in the study. Included in the study were HIV-positive patients aged over 18, internally displaced and followed in the UPECs of the West region.

Our sample size was obtained in a non-probabilistic and exhaustive manner. Data collection was done using a semi-open questionnaire, administered face to face to the target patients of the survey. The questionnaire was structured in two parts: the first provided information on socio-demographic characteristics and the second on factors associated with therapeutic compliance. The data used to highlight the compliance of displaced persons came from their medical records, which were consulted exclusively by the health personnel of the department; to ensure confidentiality.

Data were analyzed using SPSS software version 25. Relative and absolute frequencies were calculated for qualitative variables; and median and interquartile range were calculated for quantitative variables. The estimation of the correlation coefficient allowed to determine the relationship between the quantitative variables; while the cross-tabulation allowed to highlight the marginal and conditional distributions. The Chi-square and logistic regression tests were used to explore the associations between variables.

3. Results

A total of 139 participants were recruited, thus allowing an in-depth analysis of sociodemographic characteristics, therapeutic adherence rate and associated factors.

3.1. Characteristics of participants

Table 1 shows that the study population was predominantly female (67%) and patients aged 45 years and older (37.4%). Of the participants, 50.4% were married and 61.2% had only completed primary school. Furthermore, 64.7% of the participants did not have a fixed income.

3.2. Compliance rate

Out of the 139 participants in the study, 118 indicated adherence, yielding a reported adherence rate of 84.9%. Among them, 72% had an undetectable viral load, confirming good clinical adherence.

Among participants, in terms of distribution, adherence was higher among women (67%), married patients (55%) and those 45 years of age and older (41%). Additionally, adherence rates were higher among those with a fixed source of income than among those without a steady source of income. These results highlight significant variations in adherence between groups,

highlighting the impact of sociodemographic and economic factors on therapeutic adherence.

Table 1: Characteristics of participants.

Variables	Categories	Staff (n)	Percentage n %
Gender	Female	93	66.9
	Male	46	33.1
Age group (years)	[15 ; 25]	12	8.6
	[25 ; 35]	29	20.9
	[35 ; 45]	46	33.1
	[45; 72]	52	37.4
Marital status	Bachelor	41	29.5
	Bride	70	50.4
	Divorcee	8	5.8
	Widower	20	14.4
School level	Primary	85	61.2
	Secondary	47	33.8
	Superior	7	5
Occupation	Unemployed	14	10.1
	Trader/ craftsman/ farmer	78	56.1
	Student	8	5.8
	Worker	39	28.1
Fixed income source	Yes	49	35.3
	No	90	64.7

Table 2 : Distribution of compliance according to sociodemographic groups.

Characteristics	Categories	Observer n(%)	Non-observant n(%)
Age	[15; 25]	8 (5.8%)	4 (2.9%)
	[25; 35]	20 (14.4%)	9 (6.5%)
	[35; 45]	42 (30.2%)	4 (2.9%)
	[45; 72]	48 (34.5%)	4 (2.9%)
Genre	Feminine	79 (56.8%)	14 (10.1%)
	Masculine	39 (28.1%)	7 (5.0%)
Statute matrimonial	Single	35 (25.2%)	6 (4.3%)
	Bride)	65 (46.8%)	5 (3.6%)
	Divorcee)	6 (4.3%)	2 (1.4%)
	Widower	12 (8.6%)	2 (1.4%)
Fixed income source	Yes	45 (32.4%)	4 (2.9%)
	No	73 (52.5%)	17 (12.2%)

3.3. Factors associated with adherence

Some factors were significantly associated with adherence at the 5% threshold in this study. Patients aged 45 years and older had a significantly higher probability of being adherent compared with younger adults, with an adjusted odds ratio of 3.80 (95% CI: 1.92-7.85; p < 0.001), suggesting that older age is associate to adherence. This result is probably due to greater social stability and awareness of the need for therapeutic monitoring. Marital status is also an important factor, with married patients having a significantly higher probability of being adherent (adjusted OR = 3.10; 95% CI: 1.71-5.62; p < 0.001). This phenomenon may be attributed to the moral and logistical support provided by the spouse, which promotes better adherence to treatment. Participants with a fixed source of income showed better adherence (adjusted OR = 2.95; 95% CI:

1.61-5.40; p < 0.001), highlighting the importance of financial stability in reducing barriers to accessing care. This stability helps overcome challenges such as the cost of consultations and travel. Undetectable viral load was strongly associated with adherence, with an adjusted OR of 3.90 (95% CI: 2.20-6.85; p < 0.001). This confirms that adherence to treatment is crucial for HIV control and for achieving an undetectable viral load, a key indicator of viral suppression. Patient demotivation was identified as a major barrier to adherence (adjusted OR = 0.40; 95% CI: 0.21-0.72; p = 0.002). Demotivated patients are less likely to adhere to treatment, highlighting the importance of psychosocial support to maintain patient engagement. ARV adverse effects also negatively impact adherence, with an adjusted OR of 0.60 (95% CI: 0.33–1.08; p = 0.044). Although this effect is less frequent (4.3%), it remains significant, highlighting the need to actively monitor side effects and adapt treatments according to patients' needs. Finally, stigma was associated with poorer adherence (adjusted OR = 0.60; 95% CI: 0.37–0.98; p = 0.043), indicating that social factors play a crucial role in treatment adherence. Stigma can discourage patients from adhering to treatment and it is essential to integrate interventions to address this stigma and improve acceptance of HIV in communities.

Table 3 : Factors associated with compliance.

Postman	Categories	Raw gold	95% CI (crude OR)	OR adjusted	95% CI (adjusted OR)	p-value
Gender	Male	1	-	-	-	-
	Female	1.05	[0.89 - 1.24]		-	-
Age (range)	[15 ; 25]	1	-	1	-	-
	[25 ; 35]	2.5	[1.12 - 5.57]	2.3	[1.01 - 5.24]	0.04
	[35 ; 45]	3.75	[1.82 - 7.72]	3.2	[1.51 - 6.80]	0.01
	[45 ; 72]	4.5	[2.12 - 9.56]	3.8	[1.92 - 7.85]	<0.001
Marital Status	Single	1	-	1	-	-
	Married	3.25	[1.82 - 5.82]	3.1	[1.71 - 5.62]	<0.001
	Divorcee)	1.75	[0.65 - 4.72]	1.6	[0.58 - 4.42]	0.35
	Widower	2.2	[1.01 - 4.79]	2.05	[0.97 - 4.36]	0.06
School level	Primary	1	-	-	-	-
	Secondary	1.45	[0.89 - 2.35]	-	-	-
	Superior	2.1	[0.92 - 4.80]	-	-	
Viral load	Detectable	1	-	1	-	-
	Undetectable	4.25	[2.50 - 7.23]	3.9	[2.20 - 6.85]	<0.001
Personal factors	No demotivation	1	-	1	-	-
	Demotivation	0.35	[0.19 - 0.65]	0.4	[0.21 - 0.72]	0.002
	No side effects	1	-	1	-	-
	Side effects	0.55	[0.31 - 0.96]	0.6	[0.33 - 1.08]	0.04
Sociocultural factors	Social support available	1	-	1	-	-
	No social support	0.5	[0.28 - 0.90]	0.55	[0.30 - 1.00]	0.04
Economic factors	Fixed income	1	-	1	-	-
	No fixed income	0.3	[0,17 - 0,55]	0,35	[0,19 - 0,65]	<0,001
	Distance acceptable	1	-	1	-	-
	Distance excessive	0,5	[0,28 - 0,90]	0,55	[0,30 - 1,00]	0,04

4. Discussion

4.1. Sociodemographic profile of IDPs

A total of 139 patients were enrolled in our study, with a mean age of 40.88 ± 12.70 years (range: 6 to 72 years). This mean age is close to the results of F. Ollivier et al. in 2005 at the Yaoundé University Hospital [20] a study has been carried out at Yaoundé University Hospital. It documented and studied the follow up of 231 patients under tri-therapy at the time of the study (December 2003, of Mbopi-Keou et al. in 2012 at the Dschang district hospital[21] and of Emmanuel Essomba et al. in 2015 at the Laquintinie hospital in Douala[22] where the mean ages were 38.9, 41 and 43 years, respectively. This mean is higher than that of Lanièce et al. in 2003 in Senegal, where the mean age was 38 years[23]. The higher mean age in our study could be explained by the fact that patients followed in these different structures live in cities in border regions, where access to care and information on HIV may be more present.

The most represented age group was [45; 72] years, with 37.4% (52/139) followed by [35; 45] years with 33.1% (46/139). This distribution is different from that of Emmanuel Essomba et al., where the age group of 30 to 44 years was the most represented with 49.2%[22]. Female patients were the most represented in the sample, with a sex ratio equal to 0.46. This ratio is similar to those of Emmanuel Essomba et al., (0.54)[22] and Mbopi-Keou et al. (0.40)[21], but lower than that of Lanièce et al., in 2003 in Senegal (1.1)[23]. This ratio may be justified by the fact that HIV/AIDS patients who regularly attend hospital for follow-up are predominantly female, reflecting the increased involvement of women in health care in HIV settings.

Among the 139 patients surveyed, 70 (50.4%) were married, 41 (29.5%) single, 20 (14.4%) widowed and 8 (5.8%) divorced. These data differ from those reported by Lanièce et al.[23], Ollivier et al.[20], Emmanuel Essomba et al.[22] and Mbopi-Keou et al.[21], where respectively 44%, 61%, 32.7% and 43% of patients were married or living with a partner. This result highlights a diversity in the marital situations of patients, which could influence their access to care and their social support.

Regarding education, 61.2% of participants had only completed primary school, 33.8% had completed secondary school and 5% had completed higher education. This finding is similar to that of Mbopi-Keou et al., where 90.4% of patients had a primary or secondary level of education[21]. However, it differs from the study of Emmanuel Essomba et al. where secondary and higher education levels were the most represented, respectively with 56.0% and 20.2%[22]. A low educational level can limit the understanding of the issues related to therapeutic compliance, making therapeutic education essential for this population.

5. Assessment of compliance

5.1. Subjective assessment of compliance

Of the 139 patients surveyed, 118 (84.9%) reported being compliant with their antiretroviral treatment and 21 (15.1%) non-compliant. These results are similar to those obtained by Mbopi-Keou et al., in 2012 at the Dschang district hospital, where the reported compliance rate was 80.2%[21]. They are also similar to those reported by Zoungrana-Yameogo et al. in 2020 in Burkina Faso, where the compliance rates were 86.6% in the group of pregnant women, 73.1% in the group of non-pregnant women and 72% in the group of men and Lanièce et al., where the compliance rate was 91%[23]. These results are in line with recent improvements in medication intake, with reduced daily doses of ARVs and better communication between healthcare staff and patients.

In bivariate analysis, a statistically significant association was observed between regular medication intake and therapeutic adherence (p = 0.008), as well as between the number of times the patient did not take their medication and therapeutic adherence (p < 0.001). These results are consistent with those of Emmanuel Essomba et al., who also found that non-adherence was linked to several factors, including forgetfulness, prescription management and variations in CD4 counts[22].

5.2. Objective assessment of compliance

Objective assessment showed that 72% of compliant patients had an undetectable viral load for the first measured viral load (p < 0.001). For viral load 2, 45% of compliant patients had an undetectable viral load. In bivariate analysis, these associations were statistically significant (p < 0.001), confirming the direct link between adherence and viral suppression. These results are similar to those of Lanièce et al. in Senegal, who showed that patients with adherence greater than 90% had an undetectable viral load[23].

6. Factors Associated with Adherence to Antiretroviral Treatment

6.1. Determinants of compliance

In univariate analysis, age 45 years and older was significantly associated with better compliance (p = 0.001). In bivariate analysis, patients aged [45-72] years were the most compliant, with a number of 48 (41%). These results are consistent with those of Mbopi-Keou et al.[21], where older patients were significantly more compliant and with those of Emmanuel Essomba et al.[22], where patients over 60 years old had better compliance than those aged 30 to 44 years.

Multivariate regressions strengthened this association with an adjusted OR = 3.80 (95% CI: 1.92-7.85; p < 0.001) for patients aged 45 years and older, confirming that advanced age is an important protective factor for therapeutic adherence.

Marital status was also significantly associated with adherence (p = 0.022). Married patients were more adherent, representing 55% of adherent patients. This result is consistent with those of Essomba et al.[22], where widowed patients were more adherent than single patients. Multivariate analysis showed that married patients had an adjusted OR of 3.10 (95% CI: 1.71-5.62; p < 0.001), which highlights the importance of marital support for better adherence.

Patient occupation also influenced adherence (p = 0.008). Patients with occupations such as traders, craftsmen, farmers and workers had better adherence. This finding is similar to that of Zoungrana-Yameogo et al., [24], where adherence was significantly associated with occupation. In multivariate analysis, traders/craftsmen/farmers and workers had an adjusted OR of 2.50 (95% CI: 1.30-5.17; p = 0.004), confirming that occupation allows patients to have better economic stability and, therefore, to better follow their treatment.

6.2. Personal factors associated with adherence

The most frequently reported personal factors as barriers to adherence were forgetfulness (45%), travel (42%), long-term treatment (24%) and demotivation (11%). In bivariate analysis, a significant association was found between adherence and demotivation (p = 0.002) as well as between adherence and ARV adverse effects (p = 0.044). These results are similar to those of Mbopi-Keou et al.[21], where forgetfulness and mobility were identified as major barriers to adherence. Multivariate analysis showed that demotivation and ARV side effects were still significantly associated with adherence, with an adjusted OR of 0.40 (95% CI: 0.21-0.72; p = 0.002) for demotivation and an adjusted OR of 0.60 (95% CI: 0.33-1.08; p = 0.044) for adverse effects.

6.3. Socio-cultural factors associated with compliance

Stigma was significantly associated with poorer adherence (p = 0.043). In bivariate analysis, a statistically significant link was found between stigma and therapeutic adherence. These results are different from those of Lanièce et al[26], Mbopi-Keou et al[21] and Essomba et al[22], where no emphasis was placed on socio-cultural factors influencing adherence. Multivariate analysis showed that stigma remained a factor of non-adherence, with an adjusted OR of 0.60 (95% CI: 0.37-0.98; p = 0.043). This result highlights the negative impact of socio-cultural perception of HIV, particularly in semi-rural and rural areas and the need for community interventions to reduce this stigma.

6.4. Institutional (health system) factors associated with adherence

Univariate analyses found associated factors such as distance to health facilities (61%), drug shortage (21%) and poor reception at the hospital (11%). In bivariate analysis, a significant link was found between therapeutic compliance and drug shortage (p = 0.007) as well as between compliance and reception at the UPEC level of HIV-positive patients in the hospital (p = 0.005). These results are similar to those of Lanièce et al.[23] and Essomba et al[22], where the availability of drugs and reception in health facilities play a crucial role in therapeutic compliance. Multivariate regressions revealed that drug shortage and quality of reception remained significant factors, with adjusted ORs of 2.30 (95% CI: 1.12-4.73; p = 0.02) and 1.85 (95% CI: 1.10-3.09; p = 0.02) respectively.

6.5. Economic factors associated with compliance

The most recurrent economic factors identified were lack of financial means to travel (55%), polymedication (21%) and lack of money for food (17%). In bivariate analysis, no significant association was found with these factors. However, these results are similar to those of Mbopi-Keou et al.,[21] and Essomba et al[22], who also identified lack of financial resources as a potential barrier to adherence.

7. Conclusion

The level of adherence to antiretroviral treatment among internally displaced persons from the North-West and South-West regions living with HIV/AIDS in the West-Cameroon region is 84.9%. Forgetfulness, travel, long-term treatment, depression, demotivation, refusal to accept the serological status, adverse effects of ARVs and difficulties in getting used to them have been identified as personal factors associated with therapeutic adherence. Socio-cultural factors such as; stigmatization, lack of family support, living alone at home and not sharing HIV status with those around them are associated with this therapeutic adherence.

To improve adherence and ensure sustained viral suppression, it is essential to implement targeted strategies, such as combating stigma, strengthening patients' economic capacities and improving the quality of care offered in treatment units. These efforts, combined with continuous therapeutic education and consistent availability of ARVs, will maximize the impact of HIV/AIDS programs in this particular context.

8. Limits and perspectives

This study has some methodological limitations. First, the assessment of adherence relies partly on self-reports from patients, which may introduce social desirability and recall biases. Second, the cross-sectional design of the study does not allow for tracking temporal variations in adherence, which limits the analysis of long-term dynamics. Finally, although the sample is representative of IDPs living with HIV in the West region, the results cannot be generalized to other regions or contexts in Cameroon.

To overcome these limitations, longitudinal studies should be considered to better understand the fluctuations in adherence over time and the factors that influence its evolution. In addition, the combined use of biological indicators (such as viral load) and electronic devices to measure adherence could strengthen the reliability of the data. Finally, specific interventions should be implemented to reduce stigma, improve patients' social and financial support and ensure consistent access to medications, in order to strengthen efforts to achieve viral suppression goals.

9. Recommendation

- Strengthen therapeutic education to raise awareness among patients of the importance of ART.
- Psychosocial support: involving families and community groups to reduce stigma.
- Accessibility policy: facilitating access to care through mobile services or transport subsidies.
- Continuous monitoring: include digital tools to remind doses and track compliance.

10. Acknowledgments

Ethical considerations

To ensure respect for the human person, to avoid discrimination and stigmatization; all participants had signed an informed consent form carefully explained and translated into the language they master best. In addition, participation in the interview was voluntary and the confidentiality of the information collected was guaranteed to the participants.

Conflicts of interest

The authors declare that they have no conflicts of interest related to this study.

Authors' contributions

These authors contributed equally to this work; YMM, ATT, YA, AK, Study design, conceptualization; YMM, ATT, , investigation; YMM, ATT, YA, HP, RYS, NLD, data collection and management; YMM, ATT, YA, HP, RYS, NLD, methodology; YMM, ATT, YA, formal analysis, data analysis and data interpretation; YMM, ATT, YA, HP, RYS, NLD, CD, AK, supervision; YMM, ATT, YA, AK writing original draft; all authors contributed to article review and editing and publishment approval.

Funding

11. References

1. Komura D, Ishikawa S. Machine learning methods for histopathological image analysis. Comput Struct Biotechnol J, 2018;16(Feb): 34-42.

2. Shandera W. "An analysis of global HIV prevalence among refugees, asylum seekers and migrants, using the US Bureau of the Census databank," International Journal of Infectious Diseases, 2016;5(April): 556.

3. Ross J, Cunningham CO, Hanna DB. HIV outcomes among migrants from low- and middle-income countries living in high-income countries: a review of recent evidence. Curr Opin Infect Dis, 2018;31(1): 25-32.

4. Savory J, Pu PH, Sunderman FW, Jr. A biuret method for determination of protein in normal urine. Clin Chem, 1973;14(12): 1160-1171.

5. Bekele BB. The prevalence of macro and microvascular complications of DM among patients in Ethiopia 1990-2017: Systematic review. Diabetes & Metabolic Syndrome: Clin Res Reviews, 2019;13(1): 672-677.

6. Mendelsohn JB, Marian Schilperoord, Paul Spiegel, et al. "Is forced migration a barrier to treatment success? Similar HIV treatment outcomes among refugees and a surrounding host community in Kuala Lumpur, Malaysia," AIDS and Behavior, 2014;18(June): 323-334.

7. Ravicz M, Bernadette Muhongayire, Stella Kamagaju, et al. "Using Intervention Mapping methodology to design an HIV linkage intervention in a refugee settlement in rural Uganda," AIDS Care, 2022;34(4): 446-458.

8. Gurcan MN, Boucheron LE, Can A, et al. Histopathological image analysis: A review. IEEE Rev Biomed Eng, 2009;2(Oct): 147-171.

9. Logie CH, Moses Okumu, Miranda Loutet, et al. "Contextualizing HIV testing experiences within the HIV prevention cascade: qualitative insights from refugee youth in Bidi Bidi refugee settlement, Uganda," BMC Public Health, 2024;24(Sept): 2599.

10. Wegu Y, Sileshi T, Melis T. "Assessment of Index Case Family Testing Among Adults Attending Art Clinic at Kule Refugee Camp, Southwest Ethiopia: 2021," HIV AIDS (Auckl), 2022;14(Jan): 13-21.

11. Fogha JVF, Noubiap JJ. La lutte contre la COVID-19 au Cameroun nécessite un second souffle. Pan Afr Med J, 2020;37(1): 14.

12. Serbessa MK, Mariam DH, Kassa A, et al. "HIV / AIDS among pastoralists and refugees in north-east Africa: a neglected problem AJAR," Afican Journal of AIDS Research, 2016;15(1): 45-54.

13. Rouhani A, O'Laughlin KN, Faustin ZM, et al. "The role of social support on HIV testing and treatment adherence: A qualitative study of HIV-infected refugees in southwestern Uganda," Global Public Health, 2017;12(8): 1051-1064.

14. Kim MS. Proteinuria. Clin Lab Med, 1988;8(3): 527-540.

15. LRF Ollivier J, N'Kam M, Midoungue C. "Study on Compliance with Antiretroviral Treatments At The University Hospital Of Yaoundé (CAMEROON)," Cairn. Info, 2005;17(4): 559-568.

16. AlSalman H, Al-Rakhami MS, Alfakih T, et al. Federated learning approach for breast cancer detection based on DCNN. IEEE Access 2024;12(March): 40138.

17. Stram M, Gigliotti T, Hartman D, et al. Logical Observation Identifiers Names and Codes for laboratorians. Arch Pathol Lab Med, 2020;144(2): 229-239.

18. Abdullah L, Margolis S, Townsend T. Primary health care patients' knowledge about diabetes in the United Arab Emirates, 2001;7(4-5): 662-670.

19. Higby K, Suiter CR, Phelps JY et al. Normal values of urinary albumin and total protein excretion during pregnancy. Am J Obstet Gynecol, 1994;171(4): 984-989.

20. Belsti Y, Akalu Y, Animut Y. Attitude, practice and its associated factors towards Diabetes complications among type 2 diabetic patients at Addis Zemen District hospital, Northwest Ethiopia. BMC Public Health, 2020;20(May): 1-11.

21. Mbopi-Kéou FX, Dempouo DL, Monebenimp F. "[Study of factors related to adherence to antiretroviral therapy among patients followed at HIV/AIDS Unit in the District Hospital of Dschang, Cameroon]," Pan Afr Med J, 2012;12(June): 55.

22. Essomba EN, Adiogo D, Koum DCK, et al. "[Factors associated with non-adherence of adults infected with HIV on antiretroviral therapy in a referral hospital in Douala]," Pan Afr Med J, 2015;20(April): 412.

23. Komura D, Ishikawa S. Machine learning methods for histopathological image analysis. Comput Struct Biotechnol J, 2018;16(Feb): 34-42.

24. Zoungrana-Yameogo WN, Fassinou LC, Ngwasiri C, et al. "Adherence to HIV Antiretroviral Therapy Among Pregnant and Breastfeeding Women, Non-Pregnant Women and Men in Burkina Faso: Nationwide Analysis 2019-2020," Patient Prefer Adherence, 2022;16(April): 1037-1047.