



## Original article

# A community-based peer-facilitated psychological and social support model to improve retention in care among Cameroonian adolescents perinatally infected with human immunodeficiency virus: A randomized controlled trial



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## ABSTRACT

**Background:** Psychological and social support for adolescents living with HIV remains undocumented and unaddressed in Central Africa. This study aimed at assessing effectiveness of a peer-facilitated community-based support model in improving retention in care among adolescents living with HIV and attending care in Chantal Biya Foundation, Yaounde, Cameroon.

**Materials and methods:** We conducted an analysis of adolescents aged 10–19 years old, perinatally infected with HIV, on follow-up in the Day Care Unit of a reference hospital in Yaounde, Cameroon, and enrolled in the IAS-CIPHER-2021/1214-ATE-SMAVI, a individually randomized controlled trial. While the control arm only received routine care in the health facility, the intervention arm, in addition, was assigned to an HIV association for sustained support model, including support groups, leisure workshops and home visits. Structured questionnaires, including validated French versions of mental health scales, were quarterly administered to the study participants in both study arms by trained healthcare providers. The main outcome was maintaining retention in care beyond the first 15-month period of the study start. Kaplan-Meier and Cox regression models were fitted to assess association between intervention and outcome. Hazard Ratio (HR) across categories of exposure variables were compared using Wald's test.  $p$ -value  $<0.05$  was considered significant.

**Results:** In total, 305 adolescents were recruited in the study at a median age of 15.2 years old, including 162 (53.1 %) females and 153 individuals in the intervention arm. Mental health troubles were prevalent: severe depression (26.9 %), high or very high anxiety (28.9 %), and low self-esteem (84.9 %). Noteworthy, all of the baseline characteristics were balanced irrelevant to the study arm. Probability of maintaining good retention in care beyond the first 15-month period of study start remained higher in the intervention arm (82.0 %

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[95 %CI: 73.7 %–88.4 %] versus the control arm (71.0 % [95 %CI: 63.2 %–78.1 %]), [cHR (95 %CI): 2.0 (1.1–3.3),  $p=0.044$ ].

**Conclusions:** Capacity should be built in terms of implementing community-based peer-facilitated support groups in local organizations providing care to adolescents living with HIV.

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## 1. Introduction

HIV is known to be transmitted sexually, perinatally, and parentally [1,2]. HIV can pass from a birthing parent with HIV to their child during pregnancy, childbirth, or breastfeeding, called perinatal (or vertical) transmission of HIV. Parenteral transmission of HIV is defined as that which occurs outside of the alimentary tract, such as in subcutaneous, intravenous, intramuscular, and intrasternal injections. Most often, HIV is transmitted during sexual intercourse through body fluids such as semen and vaginal fluids, known as sexual transmission of HIV. Almost 90 % of children or younger adolescents (0–14 years old) with HIV are infected through perinatal transmission [2]. Whilst sexual transmission accounts for most of the new HIV infections among older adolescents (15–19 years old) [3]. Differing psychological vulnerabilities were noticed among Psychosocial vulnerabilities have been observed to differ among adolescents living with HIV who acquired HIV perinatally compared to those who acquire it behaviorally [4]. While adolescents with perinatally-acquired HIV have been found to be significantly more likely to be adherent to antiretroviral therapy (ART), retained in healthcare, and to be treated well by clinic staff, those with behaviorally-acquired HIV have been noted to be more likely to be depressed, anxious, report internalized stigma, express suicidal ideation and report excessive substance use.

Adolescents are defined as people aged 10–19 years [5]. Due to improved access to ART, there is increasing survival of children perinatally infected with Human Immunodeficiency Virus (HIV) into adolescence, even into adulthood [6]. Most adolescents living with perinatally acquired HIV (ALHIV) reside in sub-Saharan Africa [7], some of whom are orphans or had lost their primary caregivers [8]. Thus there is rising recognition that they require social support to adjust socially and psychologically to living with HIV [9]. Retention in HIV health care services is a critical precursor to ART adherence and viral suppression [10], which limit the emergence of antiretroviral drug resistance, particularly important in resource-limited settings with restricted ART regimens' options [11–13]. Studies suggest that older adolescents are particularly at risk of poorer HIV outcomes during their transition from pediatric to adult HIV care [14]. During this period, ALHIV are at high risk of poor adherence to ART [15], disengagement from HIV care [16], immunological deterioration [17] and death [18,19]. HIV treatment outcomes in ALHIV may be improved by addressing the psychological and social challenges they face [20]. Social support is essential in achieving positive health outcomes among adolescents living with HIV [21–24]. Additionally, peer support groups have been shown to have a positive impact on disclosure, mental health and uptake of HIV services among adolescents [25]. They have been also identified as providing numerous benefits to adolescents including social acceptance, reciprocal support, and personal growth and empowerment [26]. However, the generalizability of these results seems limited due to differences in intervention and study designs [27]. Moreover, there is a paucity of research exploring social support in adolescents' HIV care in Central Africa, especially in Cameroon, where most of the existing studies tend to focus on clinical and biomedical outcomes (for example, virological response, retention and mortality), with little focus on the social support interventions specific to this group. As a result, social support for adolescents living with HIV remains undocumented and unaddressed in Central Africa.

The IAS-CIPHER-2021/1214-ATE SMAVI is a randomized controlled trial implementing a model of community-based peer-facilitated psychological and social support for ALHIV, aged 10 to 19 years, on ART and followed in a reference hospital in Yaounde, Cameroon ("Centre Mère et Enfant de la Fondation Chantal Biya à Yaoundé" ("CME-FCB")) [8]. This study aimed at assessing effectiveness of a community-based peer-facilitated psychological and social support model on improving retention in care among adolescents perinatally infected with HIV, on follow-up in the Day Care Unit of "CME-FCB". We hypothesized that retention in care among ALHIV would be improved by implementing sustained peer-facilitated community-based psychological and social support (support groups for adolescents, support groups for parents/guardians, leisure workshops, home visits). The peer-facilitated support groups offered psychosocial support services, adapting to adolescent needs for information and support.

## 2. Methods

### 2.1. Trial design

We conducted an analysis of participants enrolled in the IAS-CIPHER-2021/1214-ATE SMAVI which was a parallel randomized controlled trial study [8].

### 2.2. Participants

#### 2.2.1. Eligibility criteria for participants

The study participants were ALHIV aged 10–19 years old, living with perinatally acquired HIV, receiving ART, on follow-up in the Day Care Unit of the "CME-FCB" (that is ALHIV ever registered in the clinic), with written and signed parent/guardian's consent and ALHIV's assent. Noteworthy the intervention was designed to target the specific needs of ALHIV with perinatally-acquired HIV therefore we did not include ALHIV with behaviorally acquired HIV.

#### 2.2.2. Settings and locations for data collection and interventions

The study participants were selected among ALHIV on follow-up in the Day Care Unit of a referral hospital in Yaounde, Cameroon: the "Centre Mère et Enfant de la Fondation Chantal Biya à Yaoundé" ("CME-FCB"). The intervention was carried out in a community-based organization, that is "KidAid Cameroun", Yaounde, Cameroon.

Chantal Biya Foundation was created in 1994, aiming at providing assistance to disadvantaged social strata in support of the Cameroonian government's efforts. It is an apolitical, non-denominational, non-profit, humanitarian organization. It acts in the fields of health, social and education. In terms of health, Chantal Biya Foundation has several structures including the "CME-FCB".

The "CME-FCB" is a national referral hospital whose vocation is to provide care to women and children. The Pediatric Day Care Unit performs the prevention of mother-to-child transmission of HIV (pregnant women living with HIV, infants born to mothers living with HIV), the management of children living with HIV and the psychosocial monitoring of families living with HIV. There are almost 1300 children, adolescents and youths on ART.

### 2.3. Interventions

Participants were randomized 1:1 to two arms (control and intervention). Both arms were followed for 15 months. In both arms, medical follow-up visits were planned quarterly.

### 2.4. Control arm

The control arm benefited from routine care delivered at the health facility (management of opportunistic or intercurrent diseases, delivery of antiretroviral drugs, enhanced adherence counselling, HIV viral load monitoring, family-level interventions for adolescents and caregivers delivered by trained psychosocial counselors and including both separate and joint sessions for caregivers and adolescents to address mental issues detected in adolescents).

### 2.5. Intervention arm

The intervention arm, in addition to routine care delivered in the health facility ("CME-FCB"), excepted family-level interventions for adolescents and caregivers facilitated by trained psychosocial counselors, was assigned to a community-based organization, that is "KidAid Cameroun", in order to benefit from the community-based peer-facilitated support interventions. The intervention included the following activities: support groups for ALHIV (*support on life skills, disclosure of HIV status, medical confidentiality, search for adequate care services, adherence to antiretroviral treatment, fight against stigma, connection - scheduled twice quarterly per group under facilitation of peers-*), support groups for parents/guardians (*support on medical confidentiality, denial of the illness, disclosure of HIV status, self-image and external perceptions, sexuality, Gender-Based Violence, positive parenting, parent/guardian-adolescent communication, search for appropriate care services, adherence to antiretroviral treatment, fight against stigma - scheduled once every 6 months per group under facilitation of ALHIV peer-supporters -*), and leisure workshops (*- dance or painting or poetry or music - scheduled twice quarterly per group under the supervision of artists -*).

During the community-based programs' implementation, these ALHIV were grouped according to age range (10–14 or 15–19 years) and level of disclosure of HIV status. Homogeneous groups according to level of HIV status disclosure were organized in order to avoid sudden or accidental HIV status disclosure among adolescents who had not yet been disclosed. Adolescents "not disclosed" had never received any information in relation with HIV status. Adolescents "partially disclosed" were aware of the presence of a specific microbe in their body without any link with HIV mentioned. Adolescents "completely disclosed" knew the existence of a microbe called "HIV" in their body.

### 2.6. Outcomes monitoring

We hypothesized that the community support intervention would improve participants' retention in care. As the main outcome of the intervention was retention in care, several assessments were carried out during the follow-up of the participants. Four interviewers were recruited among the healthcare providers of the "CME-FCB" Day Care Unit. For all the selected study participants, a written assent was collected, and written informed consent was given by their parents/guardians. Thereafter, the interviewers conducted participants' and/or their parents/guardians' face to face interviews and collected data from medical records at the study enrolment, and thereafter repeated the data collection quarterly, in order to monitor sociodemographic, clinical and mental health outcomes. The mental health screening section of the questionnaire included validated French versions of the Multidimensional Anxiety Scale for Children (MASC) [28], the

Child Depression Inventory (CDI) [29], and the Coopersmith Self Esteem Inventory (SEI) [30].

### 2.7. Sample size

The sample size was calculated so as to be able to detect an improvement of at least 15 % in the retention in care of the intervention group compared with the control group. The formula below was used for calculating the minimum sample size [19]:

$$n = \left[ \{z_{1-\alpha} \sqrt{2\bar{\pi}(1-\bar{\pi})} - z_{\beta} \sqrt{\pi_1(1-\pi_1) + \pi_2(1-\pi_2)}\} / \Delta \right]^2$$

$$\bar{\pi} = (\pi_1 + \pi_2) / 2$$

We considered that the proportion of retention in care among adolescents living with HIV and receiving ART ( $\pi_1$ ) was approximately 80 % (first half 2020 report from the National AIDS Control Committee); and that retention in care would be improved by intervention by at least 15 % ( $\Delta$ ), so  $\pi_2 = 0.95$ ; the risk of type 1 error ( $\alpha$ ) was set at 5 %, so  $z_{1-\alpha} = 1.96$ ; the risk of type 2 error ( $\beta$ ) was also set at 5 %, so  $z_{\beta} = -1.645$ . By introducing these values into the formula above, we found  $n = 124$ . Assuming a level of non-response (attrition) of 20 %, the minimum sample size necessary was finally estimated at 150 ALHIV aged 10 to 19 years per arm in this study.

## 3. Randomization

### 3.1. Sequence generation

The recruitment of study participants lasted 3 months. The sampling frame was the list of ALHIV aged 10–19 years, perinatally infected with HIV, and followed in the "CME-FCB". Prior to the study start, the biostatistician chose adolescents eligible to participate in the study, using electronic (Excel software) probability sampling proportionally stratified by gender and age range (10–14 years, 15–19 years). Then, the choice of the study arm for each participant was proceeded at simple random, blinded to the interviewers. If a refusal to participate in the study was expressed or an eligible adolescent was not reachable, a replacement by the next ALHIV in the sampling frame eligible for the study, having the same sex and belonging to the same age range, was carried out.

### 3.2. Implementation

The interviewers were responsible for enrolling participants in the study. A community focal point, hired by "KidAid Cameroun", was responsible for contacting by telephone families of study participants selected for the intervention arm in order to invite them to attend the community-based peer-facilitated psychological and social support.

### 3.3. Blinding

The study arm was not mentioned in the medical file so that the interviewers, healthcare providers and study participants were not informed of the type of support assigned to other participants in the study.

### 3.4. Statistical methods

The quarterly monitoring values used were the nearest measurement within a  $\pm 1.5$  month-interval of each of the following times after study start: month 0 (M0), month 3 (M3), month 6 (M6), month 9 (M9), month 12 (M12), month 15 (M15).

### 3.5. Main outcome

The main outcome variable was *retention in care*, defined as compliance with the scheduled medical visit (including drugs' pick-up count, drugs' delivery, minimal medical check-up, and routine viral load testing if applicable), i.e. not having more than 3 months of interval from the scheduled medical visit date without having been received in person at the health facility. Retention in care was a binary variable, dichotomized as "Good retention in care" versus "Lost to follow-up (LTFU)".

The main endpoint for this study was probability of maintaining good retention in care without any LTFU beyond the first 15-month period of study start. In other words, if an ALHIV missed any visit up to 15 months of study start, he would be considered to have not achieved the retention outcome within 15 months of study start.

### 3.6. Baseline characteristics

Characteristics of the participants at study baseline included 1) the study arm presenting two categories ("Intervention arm" / "Control arm"), 2) the mental health characteristics according to validated French versions of the Multidimensional Anxiety Scale for Children (MASC) [28], the Child Depression Inventory (CDI) [29], and the Coopersmith Self Esteem Inventory (SEI) [30] (high or very high anxiety (MASC score  $\geq 60$ ; "Yes" / "No"); severe depression (CDI score  $\geq 20$ ; "Yes" / "No"); and low self-esteem (SEI score  $\geq 10$ ; "Yes" / "No")), 3) the **socio-demographic characteristics** (age ("10–14 years" / "15–19 years"), gender ("Male" / "Female"), school level ("No school attendance or primary school" / "Secondary school first cycle" / "Secondary school second cycle or high school"), functional refrigerator at home ("Yes" / "No"), television at home ("Yes" / "No"), tap water at home ("Yes" / "No"), electricity at home ("Yes" / "No"), and vital status of the parents ("None alive or father only alive or mother only alive" / "Both parents alive")), and 4) the **clinical characteristics** (HIV status disclosure ("Not disclosed" / "Partially disclosed" / "Completely disclosed"), ART duration ("0–10 years" / ">10 years"), and anchor antiretroviral drug ("Efavirenz or dolutegravir" / "Ritonavir-boosted lopinavir or ritonavir-boosted atazanavir")).

### 3.7. Descriptive and univariable analysis

Descriptive statistics were produced for all variables used in the analysis.

Kaplan–Meier estimators were used for time-to-event (LTFU) within the first 15-month period of study start. Date at study enrolment (T0) was used as the baseline. Data were right-censored before the date of the first event (LTFU) or before the date of death occurred before first LTFU, or at the last visit attended in person within the first 15 months of baseline (T0) if neither LTFU nor death occurred before this date. Kaplan–Meier curves were plotted to estimate the probability of maintaining retention in care without any LTFU beyond the first 15-month period of study start.

Univariate and multivariate Cox regressions were fitted respectively to assess association between main endpoint and exposure variables. Per-protocol analysis (exclusion of ALHIV in the intervention arm who did not attend any peer-facilitated community-based support program) was performed to compare study arms for main endpoint. The Hazard Ratio (HR) across categories of exposure variables, with a 95 % confidence interval, was reported and assessed using Wald's test. The variables associated with main endpoint in univariate analysis with  $p$ -values  $\leq 0.25$  were included in the initial multivariate model, and retained in the final multivariate model if  $p \leq 0.10$ , using backward elimination process.  $P$ -value  $< 0.05$  was considered significant. Stata (version 13) was used for all statistical analyses.

## 4. Ethical consideration

Prior to the IAS-CIPHER-2021/1214-ATE SMAVI trial launch, an Ethical Clearance was issued by the Regional Ethical Committee of Research for Human Health, Centre region, Cameroon; an Administrative Research Authorization was delivered by the Ministry of Public Health. Assents from study participants and written informed consent from parents/guardians were obtained before data were collected in private locations. Confidentiality was protected by removing all personal identifiers from the individual questionnaires.

## 5. Results and discussion

### 5.1. Results

#### 5.1.1. Participants flow

Of the 305 ALHIV enrolled in the study, 153 were assigned to intervention arm, of whom 126 (82.4 %) actually attended peer-facilitated community-based support (Fig. 1). The main reasons explaining non-attendance to community-based support programs in 27 ALHIV, recruited in the intervention arm, were long distance of home location from the headquarters of "KidAid Cameroun", and impossibility of inviting families due to erroneous telephone contacts.

No ALHIV died within the first 15 months of study start.

#### 5.1.2. Recruitment

The study participants were recruited from 30th November 2021 to 28th February 2022, and were followed-up from 30th November 2021 to 31st May 2023.

#### 5.1.3. Baseline data

In total, 305 ALHIV were recruited in the study at a median age of 15.2 years old (interquartile range: 12.0–17.5), including 162 (53.1 %) females (Table 1). Most of them (77.8 %) were not attending school or were attending primary school or secondary school first cycle. The majority (75.1 %) was receiving efavirenz- or dolutegravir-based cART. Almost two-thirds (65.9 %) of ALHIV were receiving cART for no more than 10 years. Television was available in the majority (90.5 %) of households; almost three quarters (71.8 %) of households were equipped with refrigerator; tap water was available in a little more than half (50.5 %) of households; electricity was available in most (87.9 %) of households. At least one parent died for 170 (55.7 %) ALHIV, and both parents were alive for 135 (44.3 %) ALHIV. HIV status disclosure was complete, partial and absent in 59 (19.4 %), 152 (49.8 %) and 94 (30.8 %) ALHIV respectively. Severe depression, High or very high anxiety, and low self-esteem were prevalent in 26.9 %, 28.9 %, and 84.9 % of ALHIV, respectively.

Noteworthy, all of the baseline characteristics were balanced irrelevant to the study arm (Table 1).

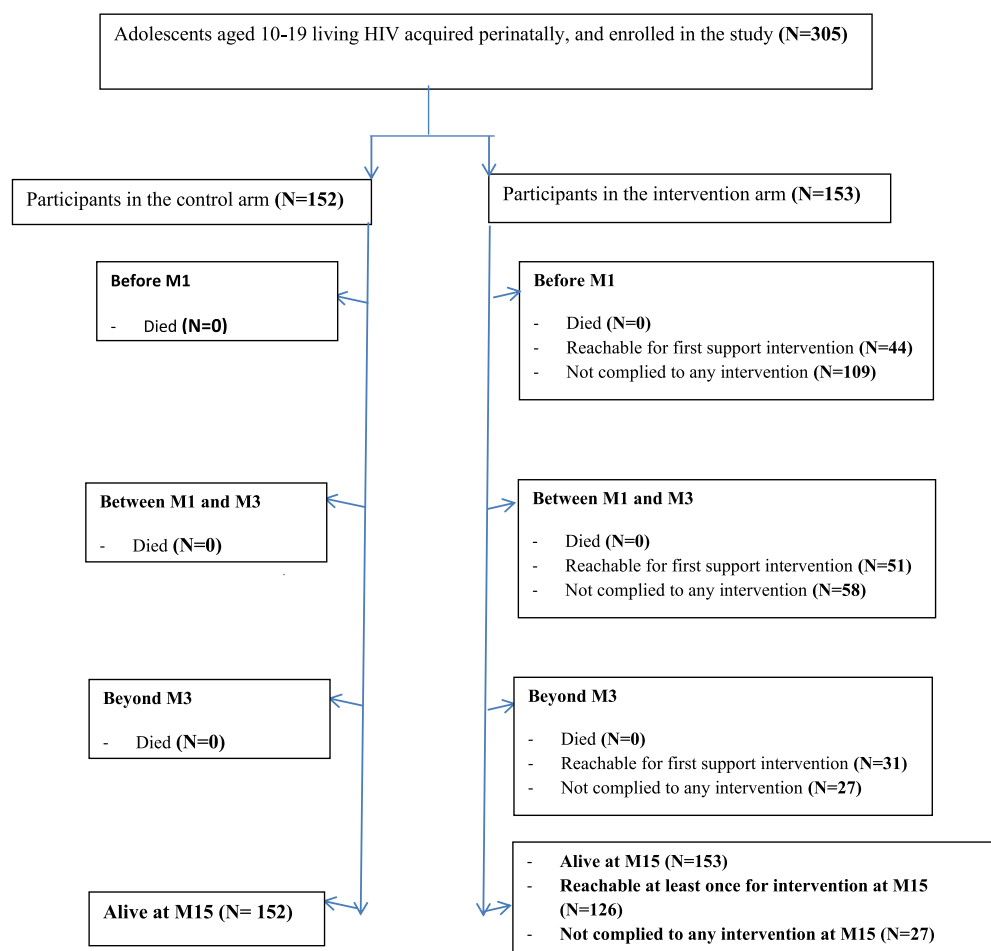
#### 5.1.4. Intervention results within the first 15 month-period of study start

Noteworthy, according to per-protocol analysis, 27 ALHIV in the intervention arm who did not attend any peer-facilitated community-based support program were excluded, that is 126 ALHIV were retained in the intervention arm for univariable and multivariable analysis.

Probability of maintaining good retention in care without any LTFU up to the first 15-month period of study start in the intervention arm was estimated at 82.0 % [95 % Confidence Interval (95 %CI): 73.7 %–88.4 %], versus 71.0 % [63.2 %–78.1 %] in the control arm (Fig. 2).

When considering univariable analysis, probability of maintaining good retention in care beyond the first 15-month period of study start was higher in the intervention arm [crude Hazard Ratio (cHR), 95 % Confidence Interval (95 %CI); significance degree (Wald test:  $p$ ): 2.0 (1.1–3.3),  $p=0.047$ ], and lower in ALHIV with both parents alive





**Fig. 1.** Flow chart of study participants, N=305 (IAS-CIPHER - 2021/1214-ATE SMAVI, Cameroon, 2022).

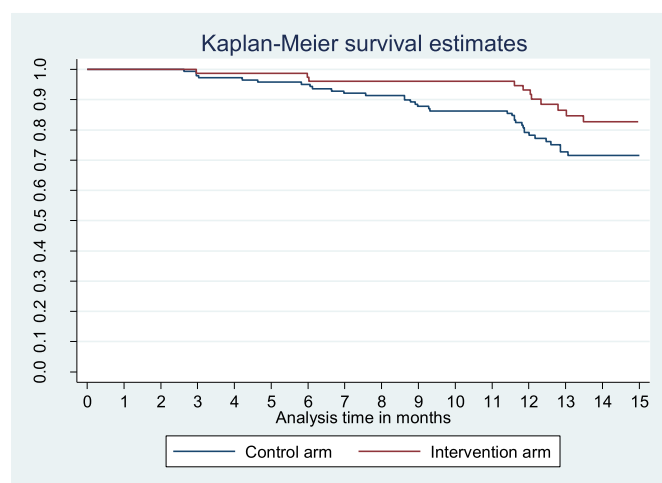
N, number of study participants; Mx, delay from ART initiation to the current visit, e.g. «M3» means «3 months after study start».

**Table 1**

Baseline characteristics in the whole study sample, N=305 (IAS-CIPHER - 2021/1214-ATE SMAVI, Cameroon, 2022).

| Baseline variable                                    | % (n) or median (IQR) |                     |                          | p     |
|------------------------------------------------------|-----------------------|---------------------|--------------------------|-------|
|                                                      | Whole sample (N=305)  | Control arm (N=152) | Intervention arm (N=153) |       |
| Female                                               | 53.1 (162)            | 52.6 (80)           | 53.6 (82)                | 0.866 |
| Age (in years)                                       |                       |                     |                          |       |
| 10–14                                                | 48.2 (147)            | 46.1 (70)           | 50.3 (77)                | 0.455 |
| 15–19                                                | 51.8 (158)            | 53.9 (82)           | 49.7 (76)                |       |
| Median (IQR)                                         | 15.2 (12.0 – 17.5)    | 15.4 (12.1 – 17.5)  | 15.4 (12.1 – 17.5)       |       |
| School level                                         |                       |                     |                          |       |
| No school attendance or primary school               | 36.1 (109)            | 37.5 (57)           | 34.0 (52)                | 0.624 |
| Secondary school first cycle                         | 41.7 (127)            | 42.1 (64)           | 41.2 (63)                |       |
| Secondary school second cycle or high school         | 22.2 (69)             | 20.4[31]            | 24.8[38]                 |       |
| Vital status of parents                              |                       |                     |                          |       |
| None alive or father only alive or mother only alive | 55.7 (170)            | 56.6 (86)           | 54.9 (84)                | 0.768 |
| Both parents alive                                   | 44.3 (135)            | 43.4 (66)           | 45.1 (69)                |       |
| Household equipped with television                   | 90.5 (276)            | 87.5 (133)          | 93.5 (143)               | 0.076 |
| Household equipped with refrigerator                 | 71.8 (219)            | 67.8 (103)          | 75.8 (115)               | 0.118 |
| Availability of tap water in the household           | 50.5 (154)            | 44.1 (67)           | 56.9 (87)                | 0.880 |
| Availability of electricity in the household         | 87.9 (268)            | 85.5 (130)          | 90.2 (138)               | 0.212 |
| Disclosure of HIV status                             |                       |                     |                          |       |
| Not disclosed                                        | 30.8 (94)             | 33.6 (51)           | 28.1 (43)                | 0.069 |
| Partially disclosed                                  | 49.8 (152)            | 43.4 (66)           | 56.2 (86)                |       |
| Completely disclosed                                 | 19.4 (59)             | 23.0[35]            | 15.7[24]                 |       |
| Duration on ART (in years)                           |                       |                     |                          |       |
| 0–10                                                 | 65.9 (201)            | 68.4 (104)          | 63.4 (97)                | 0.365 |
| >10                                                  | 34.1 (104)            | 31.6 (48)           | 36.6 (56)                |       |
| Anchor antiretroviral drug                           |                       |                     |                          |       |
| EFV or DTG                                           | 75.1 (229)            | 73.3 (116)          | 73.9 (113)               | 0.620 |
| LPV/r or ATV/r                                       | 24.9 (76)             | 23.7[36]            | 26.1 (40)                |       |
| High or very high anxiety                            | 28.9 (88)             | 27.6 (42)           | 30.1 (46)                | 0.639 |
| Severe depression                                    | 26.9 (82)             | 29.0 (44)           | 24.8[38]                 | 0.418 |
| Low self-esteem                                      | 84.9 (259)            | 85.5 (130)          | 84.3 (129)               | 0.767 |

N: Total number of subjects; n: Number of subjects in the variable category; %: Percentage; IQR: Interquartile Range; p: Chi-2 test; EFV: Efavir-enz; DTG: Dolutegravir; LPV/r: Ritonavir-boosted lopinavir; ATV/r: Ritonavir-boosted atazanavir; ART: Antiretroviral Therapy.



**Fig. 2.** Probability of retention in care for 15 months,  $N=278$  (IAS-CIPHER - 2021/1214-ATE SMAVI, Cameroon, 2022).  
ALHIV: Adolescents living with HIV.

[cHR (95 %CI): 0.6 (0.3–0.9);  $p=0.047$ ] (Table 2). In multivariable analysis, probability of maintaining good retention remained higher in the intervention arm [adjusted Hazard Ratio (aHR), 95 % Confidence Interval (95 %CI); significance degree (Wald test:  $p$ ): 2.0 (1.1–3.3),  $p=0.044$ ], and lower in ALHIV with both parents alive [aHR (95 %CI): 0.5 (0.2–0.8);  $p=0.015$ ]. There was no significant association between main endpoint and other exposures analyzed in this study.

## 6. Discussion

This study assessed effectiveness of a community-based peer-facilitated psychological and social support model in improving retention in care among Cameroonian ALHIV. Findings showed that attendance to community-based peer-facilitated support groups by ALHIV was associated with better retention in care (82.0 % [73.7 %–88.4 %] in the intervention arm, versus 71.0 % [63.2 %–78.1 %] in the control arm), consistent with other previous studies [20,23–25, 32–35]. The retention in care rate in the intervention arm of our study was similar to 80.0 % (79.4 %–80.6 %) estimate within 15 months of cART start in a South-African retrospective cohort study in

**Table 2**

Factors associated with maintaining retention in care (IAS-CIPHER - 2021/1214-ATE SMAVI, Cameroon, 2022).

| Baseline characteristic                                | N   | Cox regression of probability of maintaining retention 15 months of study start |       |                               |       |
|--------------------------------------------------------|-----|---------------------------------------------------------------------------------|-------|-------------------------------|-------|
|                                                        |     | Univariate analysis $N=278$                                                     |       | Multivariate analysis $N=278$ |       |
|                                                        |     | cHR (95 % CI)                                                                   | $p$   | aHR (95 % CI)                 | $p$   |
| Study arm                                              |     |                                                                                 |       |                               |       |
| Control                                                | 152 | 1                                                                               |       | 1                             |       |
| Intervention                                           | 116 | 2.0 (1.1–3.3)                                                                   | 0.047 | 2.0 (1.1–5.0)                 | 0.044 |
| Gender                                                 |     |                                                                                 |       |                               |       |
| Female                                                 | 148 | 1                                                                               |       | 1                             |       |
| Male                                                   | 130 | 0.7 (0.4–2.5)                                                                   | 0.192 | 1.6 (0.3–1.1)                 | 0.145 |
| Age (in years) at baseline                             |     |                                                                                 |       |                               |       |
| 10–14                                                  | 134 | 1                                                                               |       | 1                             |       |
| 15–19                                                  | 144 | 1.0 (0.4–2.0)                                                                   | 0.970 | 0.9 (0.5–1.7)                 | 0.753 |
| School level at baseline                               |     |                                                                                 |       |                               |       |
| Unschool or primary school                             | 101 | 1                                                                               |       |                               |       |
| Secondary school first cycle                           | 115 | 0.8 (0.4–1.7)                                                                   | 0.595 |                               |       |
| Secondary school second cycle or high school           | 62  | 1.1 (0.5–2.5)                                                                   |       |                               |       |
| Vital status of parents at baseline                    |     |                                                                                 |       |                               |       |
| None alive or father only alive or mother only alive   | 156 | 1                                                                               |       | 1                             |       |
| Both parents alive                                     | 122 | 0.6 (0.3–0.9)                                                                   | 0.047 | 0.5 (0.2–0.8)                 | 0.015 |
| Household equipped with televisor at baseline*         |     |                                                                                 |       |                               |       |
| No                                                     | 28  |                                                                                 |       |                               |       |
| Yes                                                    | 250 |                                                                                 |       |                               |       |
| Household equipped with refrigerator at baseline       |     |                                                                                 |       |                               |       |
| No                                                     | 75  | 1                                                                               |       |                               |       |
| Yes                                                    | 203 | 0.7 (0.6–1.7)                                                                   | 0.446 |                               |       |
| Availability of tap water in the household at baseline |     |                                                                                 |       |                               |       |
| No                                                     | 138 | 1                                                                               |       |                               |       |
| Yes                                                    | 140 | 0.7 (0.4–1.3)                                                                   | 0.275 |                               |       |
| Availability of electricity at baseline*               |     |                                                                                 |       |                               |       |
| No                                                     | 35  |                                                                                 |       |                               |       |
| Yes                                                    | 243 |                                                                                 |       |                               |       |
| Disclosure of HIV status at baseline                   |     |                                                                                 |       |                               |       |
| Not or partially disclosed                             | 223 | 1                                                                               |       | 1                             |       |
| Completely disclosed                                   | 55  | 1.7 (0.7–3.3)                                                                   | 0.217 | 1.7 (0.7–5.0)                 | 0.196 |
| ART duration (in years) at baseline                    |     |                                                                                 |       |                               |       |
| 0 – 10                                                 | 185 | 1                                                                               |       |                               |       |
| > 10                                                   | 93  | 0.8 (0.5–1.4)                                                                   | 0.558 |                               |       |
| Anchor antiretroviral drug                             |     |                                                                                 |       |                               |       |
| EFV or DTG                                             | 212 | 1                                                                               |       | 1                             |       |
| LPV/r or ATV/r                                         | 66  | 1.4 (0.7–2.5)                                                                   | 0.406 | 1.7 (0.7–3.3)                 | 0.271 |
| Anxiety at baseline                                    |     |                                                                                 |       |                               |       |
| Absent or moderate                                     | 197 | 1                                                                               |       | 1                             |       |
| High or very high                                      | 81  | 1.4 (0.7–3.3)                                                                   | 0.272 | 2.0 (0.8–5.0)                 | 0.098 |
| Depression at baseline                                 |     |                                                                                 |       |                               |       |
| Absent or moderate                                     | 203 | 1                                                                               |       | 1                             |       |
| Severe                                                 | 75  | 0.8 (0.5–1.7)                                                                   | 0.521 | 0.6 (0.3–1.4)                 | 0.228 |
| Self-esteem at baseline                                |     |                                                                                 |       |                               |       |
| Normal                                                 | 40  | 1                                                                               |       | 1                             |       |
| Low                                                    | 238 | 1.3 (0.5–2.5)                                                                   | 0.687 | 2.0 (0.7–5.0)                 | 0.191 |

N: Total number of subjects whose data were analyzed; 95 % CI: 95 % confidence interval;  $p$ : Significance level (Wald test); cHR: Crude Hazard Ratio; aHR: Adjusted Hazard Ratio; \*: Variable with unbalanced categories, not included in the analysis.

adolescents living with HIV [26]. However, both retention in care rate in the intervention and control arms of our study were higher than the 50.5 % (43.2 %-56.8 %) estimate within 12 months of cART in another South-African retrospective cohort study [36].

Although the retention in care of ALHIV reported in this study over a 15-month period falls short of the USAID 95–95–95 for 2030 target, there is hope that this retention in care rate can improve if urgent interventions and resources are directed to this vulnerable age group. A study on mental health of ALHIV (13–19 years) accessing treatment and care in Johannesburg health facilities found that being HIV is a predisposing factor to developing mental health challenges, which in turn negatively impacts on retention in care [37]. Furthermore, a recent qualitative study found that ALHIV drop out of care when they do not understand the reason for daily medication intake as a result of not being disclosed to living with HIV, and may need specific tailored interventions [38]. Noteworthy, descriptive statistics from our study showed a high prevalence of mental health symptoms and almost one third of ALHIV not disclosed to their own HIV status. However, peer-facilitated community-based activities integrated in the intervention arm of our study would have improved the mental health of ALHIV and disclosure to HIV status. Several potential mechanisms could explain how community-based peer-facilitated psychological and social interventions would improve retention in care in ALHIV, as demonstrated previously [26]. The peer-facilitated support groups offered psychosocial support services, adapting to adolescent needs for information and support. The leisure workshops may have favored expression of mental experiences in ALHIV, relieving them in part of HIV-related psychological burden. Further research is needed to determine optimal levels of support groups' attendance in terms of frequency and duration.

Surprisingly, ALHIV with both parents alive were less likely to maintain good retention in care. In contrast, a recent study conducted in the same study population demonstrated that having both parents alive was strongly associated with virologic control [29]. Findings from routine observation, in the "CME-FCB", of the practices of ALHIV's parents may explain this contradictory situation (unpublished data!). When both parents are alive, they use to overprotect their offsprings by organizing themselves to collect their offspring's medications in the health facility, arguing school's constraints. Thus, compared to orphaned ones, ALHIV with both parents alive attend the health facility less frequently without running out of medication.

This study presented some limitations. The findings of this study are to be applied to adolescents perinatally infected with HIV and enrolled in care, not necessarily to adolescents behaviorally infected with HIV. Although the contract between the study Principal Investigator and the study sponsor was planned to cover a period of 2 years, going from September 1, 2021 to August 31, 2023, including 18-month study participants' follow-up, the first tranche of funding was transferred late so that the study start was delayed for almost 3 months. Thus, the study participants were followed for 15 months, rather than 18 months as previously planned in the study's research protocol. Application of per protocol analysis, excluding 27 adolescents, recruited in the intervention arm but did not attend community-based support, would have induced risk of selection bias. However, the main reasons of their non-attendance, unrelated to intervention, contributed to reduce the relevant risk of selection bias. The similar distribution of study participants' baseline characteristics, irrelevant of the study arm, also reduced the risk of selection bias. A possible limitation in terms of blinding was due to the fact that the study participants were able to tell each other about the extra packages of care they were receiving, which may induce a training effect in the control arm. This well designed Randomized Controlled Trial study, with quarterly scheduled visits, made it possible to fit survival models in order to assess the probability of maintaining good retention in care among ALHIV.

## 7. Conclusions

This study added to evidence of the role of community-based peer-facilitated support groups, involving ALHIV or their parents/guardians, in improving retention in HIV care. This points to the need for guidelines and toolkits that support capacity-building and implementation of peer-facilitated clubs in community-based organizations providing care to ALHIV.

## Ethics approval and consent to participate

Prior to the IAS-CIPHER-2021/1214-ATE SMAVI trial launch, an Ethical Clearance (CE N° 2370/CRERSHC/2021) was issued by the Regional Ethical Committee of Research for Human Health, Centre region, Cameroon. Assents from study participants and written informed consent from parents or guardians were obtained before data were collected in private locations. Confidentiality was protected by removing all personal identifiers from the individual questionnaires.

## Trial registration unique identification number

"PACTR202401496790802", issued by the Pan African Clinical Trial Registry. retrospectively registered.

The authors confirm that all ongoing and related trials for this intervention are registered.

## Consent for publication

Not applicable for this section.

## Availability of data and materials

All of the individual participant data collected during the trial, after deidentification, and the study protocol will be available, beginning 36 months following the study end (August 31, 2023), with researchers who provide a methodologically sound proposal, to achieve aims in the approved proposal. Proposal should be directed to atebfranc@gmail.com. To gain access, data requestors will need to sign a data access agreement.

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## Authors' contributions

FAN participated in the study design and conception, the recruitment and follow up of HIV-infected adolescents, and the data analysis and the manuscript writing. JPYAN participated in the study design and conception, the recruitment and follow up of HIV-infected adolescents, the data analysis and the manuscript writing. RK participated in the study design and conception, the data analysis and the manuscript writing. JN participated in the study coordination and the manuscript writing. MTN participated in the study design and conception, the recruitment and follow up of HIV-infected adolescents, the data analysis and the manuscript writing. PN participated in the study design and conception, and the manuscript writing. MCT participated in the study design and conception, and the manuscript writing. EHB participated in the recruitment and follow up of HIV-infected adolescents. YAC participated in the manuscript writing. TAN participated in the study coordination. AK participated in the

study coordination and the manuscript writing. JNN participated in the study coordination. CIP participated in the manuscript writing. POKN participated in the study coordination. HBH participated in the study design, conception and coordination. PM participated in the study conception and manuscript writing. AF participated in the study design and conception, and the manuscript writing. ML participated in the study design and conception, and the manuscript writing. ACZKB participated in the study coordination. All authors read and approved the final manuscript.

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## Competing interests

The authors declare that they have no competing interests.

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