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# Factors associated with completion of intensive adherence counseling among people living with HIV at a large referral hospital in Uganda: a retrospective analysis

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## Abstract

**Background** Among people living with HIV (PLHIV) with unsuppressed viral load after six or more months of anti-retroviral therapy (ART), three intensive adherence counseling sessions (IAC) sessions are recommended. However, there is limited information about IAC completion rates. We investigated the factors associated with IAC completion among PLHIV with an unsuppressed viral load on first and second-line ART in mid-western Uganda.

**Methods** In this retrospective review of medical records, we abstracted routine HIV data between January 2018 and September 2019 at the Fort Portal Regional Hospital. IAC completion was the primary outcome measured as the receipt of  $\geq 3$  consecutive good ART adherence scores of  $\geq 95.0\%$  during the IAC sessions, spaced one month apart within three months. The modified Poisson regression analysis with robust standard errors was used to determine factors associated with the outcome, reported as risk ratio (RR) and 95% confidence interval (CI).

**Results** We studied 420 participants of whom 204 (48.6%) were aged 20–39 years (mean age,  $33.6 \pm 13.3$  years) and 243 (57.9%) were female. 282 (67.1%) participants completed their IAC sessions. Secondary or higher levels of education (Adjusted RR (aRR) 0.79, 95% CI 0.64–0.98), no follow-up for IAC (aRR 0.76, 95% CI 0.67–0.87), malnutrition (aRR 0.65, 95% CI 0.43–0.99) were associated with a lower likelihood of IAC completion while being in a separated/widowed or divorced relationship (aRR 1.23, 95% CI 1.01–1.49) was associated with a higher likelihood of IAC completion.

**Conclusions** We found a low IAC completion rate compared to the desired target of 100%. Nutritional support for malnourished PLHIV receiving IAC, follow-ups, and targeted health education on the importance of IAC are needed to improve the IAC completion rate.

**Keywords** Anti-retroviral therapy, Non-virologic suppression, Intensive adherence counseling, IAC completion

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## Background

In people living with human immunodeficiency virus (PLHIV), virological failure (viral load or VL  $\geq 1,000$  copies/ml after three or more intensive adherence counseling (IAC) sessions spaced one month apart) remains a public health problem [1–3]. In 2013, it was found that without IAC, more than half of PLHIV with initial high VL remained non-suppressed [4]. IAC is recommended for PLHIV with unsuppressed VL resulting from suboptimal ART adherence in order to support them address their ART adherence challenges by developing ART adherence plans aimed at achieving VL suppression. For this to happen, completion of all three IAC sessions is important. Research evidence indicates that more than 70% of PLHIV with an unsuppressed VL will achieve a suppressed VL after IAC [5–8]. The World Health Organization (WHO) recommends IAC and Uganda adopted the recommendation in 2016 and since then, IAC has been rolled throughout all ART-providing health facilities [9].

Evidence from existing studies shows varying IAC completion rates. Within SSA, one study reported a 22% IAC completion rate in Zambia and an 83% IAC completion rate in Zimbabwe [10, 11]. In Ethiopia, a completion rate of 46.8% was reported in one study but the barriers to IAC completion were not reported [12]. In Uganda, previous studies that focused on VL suppression among adults following IAC show mixed findings. Lukyamuzi et al. (2021) reported a 65.0% IAC completion rate and several health system challenges to IAC completion such as provider counseling skills, heavy workload due to big client load, privacy, lack of multi-disciplinary teams to address varied client challenges, and language barriers [2]. Birungi et al. (2020) and Ndikabona et al. (2021) reported a  $\geq 90$  IAC completion rate [13, 14] while Kikaire et al. (2021) reported a 33.5% IAC completion rate [15].

Analysis of HIV data at the Fort Portal Regional Referral ART clinic for the year 2018 showed a 67% IAC completion rate, which is lower than the 100% target [9]. The clinic has put in place measures such as health worker re-training and mentorship to improve IAC completion rates among PLHIV. However, these measures have not significantly improved the IAC completion rate as it has remained suboptimal across all age groups. Therefore, we investigate the patient-level factors associated with IAC completion among PLHIV at Fort Portal Regional Referral ART clinic. This evidence is crucial for improving health outcomes and reducing morbidity and mortality among PLHIV. In particular, it has the potential to contribute to refining IAC protocol, guiding policy decisions, and informing behavioral change mechanisms, and interventions aimed at improving ART adherence and enhancing its effectiveness.

## Methods and materials

### Study setting

This study was conducted at Fort Portal Regional Referral Hospital ART Clinic in Fort Portal City, South division in Kabarole District, Uganda. The hospital serves approximately 2 million people and has an estimated 8,070 PLHIV in care, all receiving ART. It is a referral hospital for the nine districts of Bundibugyo, Kabarole, Kamwenge, Kasese, Ntoroko, Kyegegwa, Kitagwenda, Bunyangabu, and Kyenjojo. The facility offers a wide range of specialized services, including obstetrics and gynecology, pediatrics, surgery, internal medicine, and radiology. In this facility, the management of PLHIV with unsuppressed VL involves different strategies based on their levels of viremia. For low-level viremia (201–999 copies/mL), PLHIV repeats VL tests in 3 months, along with IAC while for a high-level viremia (over 1,000 copies/mL), IAC is provided and a repeat VL test is done after achieving three consecutive good ART adherence ( $\geq 95\%$ ) assessments, with possible ART regimen changes if found to have a VL  $\geq 1,000$  copies/mL. Plasma VL is the most commonly used method for VL monitoring but dry blood spot (DBS) is equally used at some times. A multidisciplinary team of health workers comprising clinicians, counselors, and nurses among others collaborate to help PLHIV with unsuppressed VL address barriers to ART adherence and develop ART adherence improvement plans and strategies.

### Study design

In this retrospective review of medical records, we abstracted participant data from the HIV registers between January 2018 and September 2019.

### Data management

The data abstraction tool and semi-structured questionnaire were configured into Open Data Kit (ODK) and the data collection was done using Android smart mobile phone devices. The data were abstracted from the non-suppressed, Pre-ART, ART, and IAC registers by trained research assistants using a data abstraction tool, triangulated with data from the IAC forms and electronic medical records using an abstraction tool, and complemented with the administration of semi-structured questionnaire during their clinic visits following the identification of the participants from the existing records. The semi-structured interview was done during routine clinic visits for all participants identified from the records.

### Study population and eligibility criteria

We included all PLHIV with unsuppressed VL who had started and should have completed their IAC between January 2018 and September 2019. PLHIV who were active in HIV care at the time of the study were

considered. We excluded PLHIV with unsuppressed VL but were not started on IAC and those started on IAC but had transferred to health facilities as we could not ascertain their IAC completion status.

### Study variables and measurements

The independent sociodemographic factors included age, sex, CD4 count, WHO clinical stage, duration on ART, nutrition status, TB status, level of education, current or history of mental illness, alcohol/drug use, marital status, occupation, HIV serostatus disclosure, treatment supporter availability, employment, distance to the ART clinic, belonging to a social support group, reported medication side effects, monthly income in Uganda Shillings, reminder strategies, and mode of transport from home to the health facility. The outcome variable was IAC completion measured as receiving three or more consecutive good ART adherence scores of  $\geq 95.0\%$  during the IAC sessions, spaced one month apart within 3 months.

### Sample size estimation and data analysis

Being a retrospective review of medical records, we abstracted all available records within the study period so no sample size computation was needed. However, we computed and reported the statistical power based on the hypothesis that follow-up of participants during IAC sessions will increase IAC completion. The data analysis was conducted in Stata version 15 at the univariate, bivariate, and multivariable analysis levels. In a univariable analysis, we computed frequency and percentages for categorical data. In the bivariable analysis, tests of statistical significance such as the Chi-square test for larger cell counts ( $\geq 5$ ), Fisher's exact test for smaller cell counts ( $< 5$ ), and the student's t-test for numerical data were performed. Variables with  $p$ -value  $\leq 0.2$  at bivariable analysis were considered statistically significant for multivariable analysis together with socially and clinically relevant variables. We used the modified Poisson regression model for the unadjusted and adjusted analysis, reporting risk ratio (RR) with the corresponding 95% confidence interval (CI). The RR was preferred over the odds ratio (OR) because the outcome variable was frequent (more than 10%). The use of OR would overestimate the degree of association [16, 17]. A robust variance estimate was employed to control for mild violations of the assumptions of Poisson regression analysis as recommended [17]. The final multivariable regression model was parsimonious (had the lowest Akaike Information criteria). The level of statistical significance was taken as less than 5%.

### Quality control issues

We pre-tested the Open Data Kit (ODK) at the nearest health facility (Virika Hospital). Before data abstraction, all registers were checked for completeness and updated. To ensure data entry accuracy, skips, range, and legal values were used.

### Ethical issues

Ethical clearance was obtained from the Makerere University School of Public Health Higher Degrees Research and Ethics Committee (July 23, 2020, reference number: HDREC 2017/HD07/1965U). A waiver of informed consent was provided for secondary data. The confidentiality of study participants was ensured through the use of unique identification codes during the data abstraction and management process. For interviews, research assistants obtained informed consent from participants during routine clinic visits after explaining the study process, benefits, risks, and withdrawal of participation. Participants who could read and write provided informed consent by signing whereas those who could not, did so by thumbprinting. All research assistants received a 3-day training on data privacy, confidentiality of information, and responsible conduct of research. The data collected were safely secured and stored in a double password-protected laptop, accessible to the research assistants only. Overall, the study was conducted following the Declaration of Helsinki, which emphasizes the ethical principles for human subject research—beneficence, nonmaleficence, autonomy, and justice. Additionally, administrative permission was sought from the Hospital Director of Fort Portal Regional Referral Hospital.

### Reporting of findings

The reporting of the findings adhered to Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [18], a checklist to help authors report observational studies clearly and transparently.

## Results

### General characteristics of study participants by IAC completion

We studied 420 participants and found that 282 (67.1%) had completed IAC sessions (Table 1). The average time to IAC completion was 166.5 days (standard deviation [SD]=110.8) or 23.8 weeks (SD=15.8). Among those completing IAC, 62 (22.0%) did so within 90 days (timely IAC completion while the rest completed beyond the recommended 90-day period. Table 1 further summarizes the distribution of the participant characteristics by IAC completion.

Most participants that completed IAC were aged 20–39 years, were female, had ended at a primary level of education, were self-employed, earned between 4,000 UGX

**Table 1** Differences in IAC completion and patient factors

Characteristics	Levels	IAC completion		P-value
		Yes (n = 282)	No (n = 138)	
Age categories (years)	≤ 19	45 (16.0)	35 (25.4)	0.138
	20–39	142 (50.4)	62 (44.9)	
	40–50	73 (25.9)	30 (21.7)	
	> 50	22 (7.8)	11 (8.0)	
	Mean ± SD	33.6 ± 13.3	31.3 ± 15.0	
Sex	Male	118 (41.8)	59 (42.8)	0.942
	Female	164 (58.2)	79 (57.2)	
Level of education	None	37 (13.1)	10 (7.2)	0.050
	Primary	161 (57.1)	73 (52.9)	
	Secondary and above	84 (29.8)	55 (39.9)	
Marital status	None	83 (29.4)	60 (43.5)	0.015
	Married/cohabiting	129 (45.7)	53 (38.4)	
	Separated	70 (24.8)	25 (18.1)	
Type of employment	None	99 (35.1)	58 (42.0)	0.298
	Formal	25 (8.9)	16 (11.6)	
	Casual	45 (16.0)	20 (14.5)	
	Self	113 (40.1)	44 (31.9)	
Monthly income (Ugandan shillings)	None	70 (24.8)	47 (34.1)	0.212
	4000 to < 100,000	105 (37.2)	47 (34.1)	
	100,000 to < 300,000	59 (20.9)	27 (19.6)	
	≥ 300,000	48 (17.0)	17 (12.3)	
Smoking cigarettes	Yes	13 (4.6)	8 (5.8)	0.775
	No	269 (95.4)	130 (94.2)	
Drinks alcohol	Yes	81 (28.7)	44 (31.9)	0.581
	No	201 (71.3)	94 (68.1)	
TB status	Presumptive or TB disease	8 (2.8)	7 (5.1)	0.379
	No TB	274 (97.2)	131 (94.9)	
Malnourished	No	269 (95.4)	121 (87.7)	0.007
	Yes	13 (4.6)	17 (12.3)	
Privacy during IAC sessions	Yes	278 (98.6)	135 (97.8)	0.871
	No	4 (1.4)	3 (2.2)	
Is IAC beneficial?	Yes	273 (96.8)	134 (97.1)	1.000
	No	9 (3.2)	4 (2.9)	
Phone contact availability	Yes	268 (95.0)	125 (90.6)	0.124
	No	14 (5.0)	13 (9.4)	
Followed for IAC	Yes	114 (40.9)	31 (22.5)	< 0.001
	No	165 (59.1)	107 (77.5)	
Type of treatment supporter	Others	60 (21.3)	47 (34.1)	0.016
	Spouse	16 (5.7)	5 (3.6)	
	Self	206 (73.0)	86 (62.3)	
Experiences barriers to attending IAC sessions	Yes	5 (1.8)	5 (3.6)	0.408
	No	277 (98.2)	133 (96.4)	
Ashamed of being virally unsuppressed	Yes	72 (25.5)	36 (26.1)	0.997
	No	210 (74.5)	102 (73.9)	
HIV serostatus disclosure	No	11 (3.9)	3 (2.2)	0.524
	Yes	271 (96.1)	135 (97.8)	
Experiences stigma	Yes	19 (6.7)	13 (9.4)	0.437
	No	263 (93.3)	125 (90.6)	
Enrolled in a support group	No	272 (96.5)	128 (92.8)	0.153
	Yes	10 (3.5)	10 (7.2)	
Willing to attend IAC sessions	No	42 (14.9)	26 (18.8)	0.373
	Yes	240 (85.1)	112 (81.2)	

**Table 1** (continued)

Characteristics	Levels	IAC completion		P-value
		Yes (n = 282)	No (n = 138)	
Experienced drug side effects	Yes	21 (7.4)	16 (11.6)	0.220
	No	261 (92.6)	122 (88.4)	
Pre-IAC CD4 count (cells/ml)	< 2000	54 (26.1)	29 (24.6)	0.708
	200–500	92 (44.4)	49 (41.5)	
	> 5000	61 (29.5)	40 (33.9)	
	Mean ± SD	341.5 ± 421.0	353.8 ± 313.8	
Pre-IAC WHO clinical stage	III and IV	11 (3.9)	14 (10.1)	0.020
	I and II	271 (96.1)	124 (89.9)	
Duration of ART (years)	< 5	91 (32.3)	49 (35.5)	0.020
	5–10	142 (50.4)	63 (45.7)	
	> 10	49 (17.4)	26 (18.8)	
	mean ± SD	6.6 (3.4)	6.5 (3.6)	
ART regimen	First-line	254 (90.1)	124 (89.9)	1.000
	Second-line	28 (9.9)	14 (10.1)	
Distance from home to health facility (km)	> 10	92 (32.6)	51 (37.0)	0.091
	6–10	70 (24.8)	23 (16.7)	
	2–5	100 (35.5)	59 (42.8)	
	≤ 1	20 (7.1)	5 (3.6)	
	mean ± SD	59.7 ± 620.4	17.8 ± 28.8	
Waiting time for IAC at the health facility	> 5 h	5 (1.8)	2 (1.4)	0.542
	3–5 h	146 (51.8)	64 (46.4)	
	1–2 h	131 (46.5)	72 (52.2)	

(1) ART Anti-retroviral therapy; (2) CD4 Cluster of differentiation 4; (3) SD Standard deviation; (4) WHO World Health Organization

and less than 100,000 UGX per month, never smoked cigarettes or drunk alcohol, had no TB disease, and were well-nourished among others. Participants who completed IAC were similar in average age to those who had not completed IAC:  $33.6 \pm 13.3$  vs.  $31.3 \pm 15.0$  ( $p=0.120$ ). We observed statistically significant differences in IAC completion concerning marital status ( $p=0.015$ ), malnutrition ( $p=0.007$ ), follow-up for IAC ( $p<0.001$ ), treatment supporter type ( $p=0.016$ ), pre-IAC WHO clinical stage ( $p=0.020$ ), and duration on ART in years ( $p=0.020$ ). The participant's level of education demonstrated a borderline statistical significance ( $p=0.05$ ).

#### Factors associated with completion of IAC at multivariable analysis

In the unadjusted analysis (Table 2), IAC completion was more likely among participants aged 20–39 years (Unadjusted RR [RR] 1.24, 95% CI 1.00–1.53) and 40–50 years (RR 1.26, 95% CI 1.01–1.59) compared to those aged  $\leq 19$  years. However, IAC completion was not associated with being older than 50 years (RR 1.19, 95% CI 0.87–1.62). Marital status, namely being married/ or co-habiting (RR 1.22, 95% CI 1.03, 1.44) and separated or widowed/ or divorced (RR 1.27, 95% CI 1.06–1.53) was associated with a higher likelihood of IAC completion compared to being single or never married. Also, having a spouse as a treatment supporter (RR 1.36, 95% CI 1.01–1.82) or self-support (RR 1.26, 95% CI 1.05–1.51) was associated with

IAC completion compared to other types of treatment supporters. Conversely, IAC completion was not associated with attaining a primary (RR 0.87, 95% CI 0.74–1.04) or secondary and beyond levels of education (RR 0.77, 95% CI 0.63–0.94) compared to no formal education. Participants who were not followed up during IAC sessions were less likely to complete IAC compared to those who were followed up (RR 0.77, 95% CI 0.68–0.88), and participants who were malnourished were less likely to complete IAC compared to those who were well-nourished (RR 0.63, 95% CI 0.41–0.95).

In the multivariable analysis, IAC completion was significantly less likely among participants with secondary or beyond levels of education compared to those without any formal education (Adjusted risk ratio (aRR) 0.79, 95% CI, 0.64–0.98), those who were never followed up for IAC compared to those who were followed up (aRR 0.76, 95% CI 0.67–0.87), and those malnourished compared to those well-nourished (aRR, 0.65; 95% CI, 0.43–0.99) but more likely among those who had separated or were widowed or had divorced than among those single or never married (aRR 1.23, 95% CI, 1.01–1.49).

#### Statistical power analysis

Our data show 114 (78.6%) participants who had a follow-up during IAC completed their IAC sessions while 165 (60.7%) of those who had no follow-up during IAC completed their IAC sessions. At a 5% level of statistical



**Table 2** Factors associated with completion of IAC at multivariable analysis

Variables and level	Unadjusted analysis	Adjusted analysis
	RR (95% CI)	aRR (95% CI)
<b>Age categories in years</b>		
≤ 19	1	1
20–39	1.24* (1.00,1.53)	0.98 (0.76,1.26)
40–50	1.26* (1.01,1.59)	0.97 (0.74,1.27)
Above 50	1.19 (0.87,1.62)	0.95 (0.67,1.36)
<b>Educational level</b>		
None	1	1
Primary	0.87 (0.74,1.04)	0.90 (0.75,1.09)
Secondary and above	<b>0.77** (0.63,0.94)</b>	<b>0.79* (0.64,0.98)</b>
<b>Marital status</b>		
None/single	1	1
Married/cohabiting	1.22* (1.03,1.44)	1.13 (0.94,1.37)
Separated/widowed/divorced	<b>1.27* (1.06,1.53)</b>	<b>1.23* (1.01,1.49)</b>
<b>Followed up for IAC</b>		
Yes	1	1
No	<b>0.77*** (0.68,0.88)</b>	<b>0.76*** (0.67,0.87)</b>
<b>Type of treatment supporter</b>		
Others	1	1
Spouse	1.36* (1.01,1.82)	1.30 (0.92,1.83)
Self	1.26* (1.05,1.51)	1.19 (0.95,1.49)
<b>Malnourished</b>		
No	1	1
Yes	0.63* (0.41,0.95)	<b>0.65* (0.43,0.99)</b>

(1) Exponentiated coefficients; 95% confidence intervals in brackets; (2) \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; (3) RR Unadjusted risk ratio; (4) aRR Adjusted risk ratio

significance, the study had a 96% statistical power in detecting a statistically significant association between follow-up during IAC and the completion of IAC sessions.

## Discussion

We determined the factors associated with the completion of IAC at a large referral hospital in mid-western Uganda. Our data show a 67% IAC completion rate, with the associated factors being a secondary or higher level of education, followed up during IAC, malnutrition, and being in a separated, widowed, or divorced marital relationship. The IAC completion rate is lower compared with the Uganda Ministry of Health's recommended target of 100% [9]. Therefore, the low IAC completion is a barrier to achieving the recommended 95% and beyond viral load suppression among PLHIV on ART.

Previous studies in Uganda have reported 90.3% [13] and 92.4% [19] IAC completion rates, which is higher than the present IAC completion rate. Among PLHIV at military-managed health facilities in Uganda, a 33.5% IAC completion rate has been reported [15], which is lower than the IAC completion rate reported in our

study. However, comparable with our findings, one study reports a 65.0% IAC completion rate [2]. The differences in IAC completion rates could be attributed to contextual factors such as implementation fidelity and access to health facilities, and patient-level factors such as acceptability, appropriateness, and perceived relevance among others.

We found that a secondary or higher level of education is associated with a lower likelihood of completion of IAC sessions contrary to the findings of previous studies [20–23]. While individuals with higher levels of education are generally expected to better utilize existing health services, our finding contradicts this expectation and will require further examination of the likely contextual factors shaping IAC completion among the elite population via qualitative study. However, we postulate a few plausible explanations. Individuals with higher levels of education might have more time-demanding work schedules, making it difficult to complete their IAC sessions. Two previous studies report busy and conflicting work schedules as notable reasons for missed IAC appointments [24–26]. One approach to addressing this challenge would be to differentiate the delivery of IAC services, making it person-centered hence increasing the IAC completion rates.

In Uganda, differentiated service delivery models for ART have proved successful in improving retention and viral load suppression [27–30] and could therefore be leveraged to optimize IAC completion. Also, individuals with higher levels of education might be more concerned about their privacy and the stigma associated with HIV and other conditions and this might lead to avoidance of IAC sessions or even drop-out. Such individuals might be employing alternative strategies such as problem-focused coping hence reducing their reliance on IAC.

The data in this study show that IAC completion is more likely among participants who had separated, divorced, or are widowed compared to those single or never-married participants. The reasons for this finding remain unclear but previous studies conducted by Yathiraj et al. (2018) [31] and Sangaramoorthy et al. (2017) [32] found a higher prevalence of HIV-related stigma among PLHIV who are married compared to those single or never married [31, 32]. Therefore, PLHIV in a separated, widowed, or divorced relationship could have experienced less HIV-related stigma or could have been more cautious about their health compared to those single or never-married individuals hence the higher likelihood of completing IAC sessions. This finding could be exploited further in future research, perhaps through a qualitative research lens.

The finding that malnourished participants are less likely to complete IAC could be linked to poor attendance as reported in previous studies [2, 33]. Physical and

functional ability among malnourished individuals could have been relatively poorer compared to those well-nourished, resulting in care discontinuity and drop-out from the IAC program hence a lower IAC completion rate. Consistent with our explanation, studies [34–36] show that well-nourished (normal weight) individuals living with HIV have a decreased risk of loss to follow-up compared to malnourished (underweight) individuals. Food insecurity has been reported as a predictor of loss to follow-up in Senegal, West Africa [37]. Other studies in Uganda have equally reported that inadequate nutrition undermines patients' ART adherence, leading to higher rates of unsuppressed VL [19, 38]. Our findings might suggest a need to provide nutritional support to malnourished PLHIV in order to enhance IAC completion and VL suppression.

This study found that participants who were not followed up for IAC were less likely to complete IAC sessions compared to those who were followed up. This finding is in agreement with the findings of a study conducted at 14 clinics in Uganda, Kenya, and Tanzania that report a 22% increase in return to HIV care after follow-up [39]. In Lilongwe, Malawi, the 'Bring back-to-Care' project showed that early and active follow-up of PLHIV reduced loss to follow-up by 59% [40]. In Uganda, follow-up of PLHIV who missed their appointments for IAC sessions is done through phone calls and phone text messages within the first 3–7 days, while physical visits by health workers, expert clients, and peers at the community level are recommended after 7 days. Health workers use the IAC appointment book to identify such individuals and trace them using a client locator. This finding suggests a need to scale-up the follow-up of PLHIV who miss their clinic appointments in order to improve completion of IAC sessions.

### Study strength and limitations

The study's strengths include its adequate statistical power, enabling the detection of statistically significant differences in IAC completion in the population. We triangulated the data from patient files with that in the non-suppressed VL register and electronic medical records to minimize missing data and supplemented it with the administration of a semi-structured questionnaire. Nonetheless, there are some limitations. First, this study was conducted in a predominantly rural setting so the findings might not generalize to all health facilities in Uganda. Second, the data analyzed are for the period January 2018 to September 2019 so might not accurately reflect the most recent IAC completion rates or trends. Since IAC completion is understudied, further operational research should investigate the most recent IAC completion rates and provide the most up-to-date evidence. Our findings, therefore, provide a benchmark for

additional studies on this topic. Third, this was a single-site study so the findings might not be widely generalized. However, the study site is a regional referral health facility, serving the majority of PLHIV from all the districts in the region, including difficult and complex cases of HIV so provides good evidence of IAC completion in the region. Also, qualitative data to explore the barriers and facilitators to IAC completion have not been presented and should be a topic to explore in future studies. Overall, these limitations should be considered in the interpretation of the findings.

### Conclusions and recommendations

We found a low IAC completion rate when compared with the Uganda Ministry of Health's desired target of 100%. We recommend nutritional support for malnourished PLHIV receiving IAC, monthly follow-ups, and targeted health education on the importance of IAC to PLHIV in order to improve the IAC completion rate.

### Abbreviations

ART	Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
IAC	Intensive Adherence Counseling
PLHV	People living with HIV
VL	Viral load
WHO	World Health Organization

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### Authors' contributions

SPO, RS, and JNB: Study conception and design. SPO: Acquisition of data. SPO and JI: Analysis and interpretation of data. SPO and JI: Drafting of the manuscript. JI: Critical revision. SPO, JI, RS, and JNB: Final approval of the manuscript.

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### Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

### Declarations

#### Ethics approval and consent to participate

Ethical clearance was obtained from the Makerere University School of Public Health Higher Degrees Research and Ethics Committee (July 23, 2020). The confidentiality of study participants was ensured through the use of unique identification codes. As secondary data were retrieved and analyzed, the need for informed consent was waived by the ethics committee per the local research guidelines and regulations as it was logistically infeasible to trace all the participants. For interviews, research assistants obtained informed consent from participants during routine clinic visits after explaining the study process, benefits, risks, and withdrawal of participation. Participants who could read and write provided informed consent by signing whereas those who could not, did so by thumbprinting. Overall, the study was conducted following the Declaration of Helsinki, which emphasizes the ethical principles for human subject research—beneficence, nonmaleficence, autonomy, and justice. Additionally, administrative permission was sought from the Hospital Director of Fort Portal Regional Referral Hospital.

**Consent for publication**

Not applicable.

**Competing interests**

The authors declare no competing interests.

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