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Optimal utilization of HIV services under the Community Clients-Led Antiretroviral Delivery Model. A cross-sectional study in a low-resources, high-burden district in central Uganda

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Abstract

Background:
Differentiated service delivery models, including Community Client-Led ART Delivery (CCLAD), are central to optimizing HIV care in resource-limited settings by improving access, retention, and health system efficiency. Despite national scale-up in Uganda, evidence on real-world utilization of CCLAD remains limited. This study assessed the level of utilization of CCLAD services and identified factors associated with optimal utilization among people living with HIV (PLHIV) in rural central Uganda.

Methods:
A facility-based analytical cross-sectional study was conducted among 238 adult PLHIV enrolled in CCLAD at Mityana District Hospital. Participants were selected using systematic random sampling from the CCLAD register. Data were collected using a structured, interviewer-administered questionnaire. Optimal utilization was defined as receipt of at least four of six core HIV services. Data were analyzed in Stata 17 using descriptive statistics and modified Poisson regression to estimate adjusted prevalence ratios with 95% confidence intervals.

Results: A majority of the participants were female (55.9%) with a median age of 44 years (interquartile range [IQR]: 35-52 years). Participants were largely stable with a median duration on ART of 14 years (IQR: 11-17 years). The median CCLAD duration was 4 years (IQR: 3-6 years). Overall, 95.0% of optimally utilized CCLAD services. Factors positively associated with utilization included absence of perceived disclosure risk (aPR=9.04; 95% CI: 1.67-19.03), no privacy concerns (aPR=7.31; 95% CI: 1.65-12.39), preference for multi-month dispensing (aPR=2.65; 95% CI: 1.94-4.07), and absence of ARV stock-outs (aPR=2.76; 95% CI: 1.93-3.34). Distance ≥5 km (aPR=0.14; 95% CI: 0.11-0.29) and lack of transport cost savings (aPR=0.16; 95% CI: 0.07-0.38) were negatively associated.

Conclusion:
CCLAD demonstrates high utilization of core HIV services in rural Uganda; however, gaps in clinical consultation and service integration persist. Addressing stigma, improving supply chain reliability, enhancing accessibility, and integrating comprehensive services are critical to optimizing CCLAD service utilization.

Background

The global scale-up of the universal “test and treat” policy has substantially increased the number of people living with HIV (PLHIV) requiring lifelong antiretroviral therapy (ART), placing unprecedented demand on health systems, particularly in resource-limited settings [1]. In response, differentiated service delivery (DSD) models have emerged as a cornerstone of contemporary HIV care, aiming to align service intensity with patients’ clinical stability while optimizing health system efficiency [2,3]. In sub-Saharan Africa (SSA), where the HIV burden remains disproportionately high, health systems are frequently characterized by overcrowded clinics, long waiting times, and constrained human resources [4]. These structural challenges have catalyzed the adoption of innovative service delivery models, including community-based ART approaches such as Community ART Groups (CAGs), which have demonstrated feasibility and effectiveness in countries such as Mozambique and Malawi [5].

Uganda, with an estimated 1.4 million adults living with HIV and high ART coverage (approximately 90%) alongside substantial viral suppression rates (82%), has made significant progress toward epidemic control [6,7]. The Ministry of Health (MOH) has been at the forefront of DSD implementation, integrating differentiated ART service delivery models (DSDMs) into national guidelines as early as 2017 [8,9]. DSD frameworks prioritize facility-based care for unstable patients, while enabling stable individuals to receive less frequent, decentralized, and patient-centered services. Within this context, Community Client-Led ART Delivery (CCLAD) was introduced as a key community-based DSD model designed to enhance retention in care, reduce patient costs, and improve service accessibility by leveraging peer-led ART distribution mechanisms [8,10]. The CCLAD model is an expansion of the Community ART delivery model with less human resource needs, use of lay persons, increased community participation and ownership using appropriate technology. Central to the function of this model are the professional health workers and expert clients stable on ART. The CCLAD model comprises of client groups living in the same community. Members take turns to pick up ARVs at the health facility and distribute them among the other group members in the community. They manage their own health and share experiences about living positive with HIV [11–13].

Despite widespread policy endorsement and national scale-up including investments in health worker and peer-leader training, evidence on real-world utilization of CCLAD remains limited. Understanding utilization of CCLAD is critical to reflect service availability, access and acceptability. In Uganda, emerging programmatic data suggest a substantial gap between eligibility and utilization of CCLAD services. For instance, in Mityana district, although approximately 80% of ART clients are clinically stable and eligible for community-based models, only about 10% are enrolled in CCLAD, far below the national target of 60% [10,14,15]. This discrepancy highlights critical implementation bottlenecks and suggests missed opportunities to optimize patient-centered care. Limited utilization of CCLAD may contribute to persistent health system inefficiencies, reduced patient empowerment, and suboptimal adherence, ultimately undermining viral suppression outcomes. Given the centrality of DSD models in achieving sustained HIV epidemic control, there is an urgent need for context-specific evidence on factors influencing utilization of CCLAD services. Such evidence is essential to inform targeted interventions, guide programmatic improvements, and support data-driven decision-making among program implementers. Therefore, this study aimed to determine the level of utilization of CCLAD services and identify factors associated with utilization among eligible HIV clients in rural central Uganda.

Methods

Study Design and Study Setting

This study employed a facility-based analytical cross-sectional design using quantitative methods to assess factors associated with utilization of services under the CCLAD model among people living with HIV in rural central Uganda. A cross-sectional approach was selected to enable simultaneous estimation of utilization levels and examination of associations between explanatory variables and the outcome within a defined population at a single point in time, providing an efficient and cost-effective design for health systems research. The analytical component facilitated identification of independent predictors of service utilization while the quantitative methodology enabled robust statistical inference through standardized measurement

and modeling of variables. The study was conducted at Mityana District Hospital, a public general hospital funded by the Uganda Ministry of Health, located approximately 77 km west of Kampala in Mityana District. The district is predominantly rural, with agriculture as the main economic activity, and is characterized by dispersed populations that rely on differentiated service delivery models such as CCLAD to improve ART utilization. Mityana District, with an estimated population of over 300,000, is bordered by Kiboga, Nakaseke, Wakiso, Mubende, Mpigi, Butambala, and Gomba districts, and is served by a network of public health facilities implementing HIV care and treatment services, including community-based ART delivery models. Conducting the study in this setting provided a relevant context for evaluating utilization of CCLAD services in a typical rural Ugandan health system environment with ongoing scale-up of differentiated HIV service delivery interventions.

Study Population and Sample Size

The study population comprised adult PLHIV enrolled in the CCLAD model at Mityana General Hospital in rural central Uganda. Eligible participants were individuals aged ≥ 18 years, on antiretroviral therapy (ART) for at least 12 months, actively registered in the CCLAD program with documented clinical records, and who provided informed consent. We excluded individuals without verifiable ART records or those unable to provide reliable responses. The sample size was determined using the Kish (1965) formula for a single population proportion, assuming a prevalence (p) of 50% in the absence of prior local estimates, a 95% confidence level (Z = 1.96), and a margin of error of 5%, yielding an initial sample size of 384. Given the finite source population of 563 CCLAD members, a finite population correction was applied, resulting in a final sample size of 238 participants. This sample was considered sufficient to provide precise and reliable estimates of factors associated with utilization of services under the CCLAD model.

Sampling Procedures

A sampling strategy combining purposive and probability-based techniques was employed to ensure both contextual relevance and representativeness. At the first stage, Mityana Hospital was purposively selected as an early adopter with documented underperformance in the implementation of the CCLAD model. In the second stage, study participants were selected using systematic random sampling from the CCLAD register of eligible clients. The sampling frame comprised 563 HIV-positive clients enrolled in the CCLAD model, from which a sample of 238 participants was drawn. A sampling interval (k) of 2 was calculated (563/238), and a random starting point was selected to ensure equal probability of selection. Subsequently, every second client on the register was included until the desired sample size was achieved. Selected participants were contacted via telephone to confirm eligibility and schedule interviews. This approach minimized selection bias while maintaining operational efficiency and ensured that the final sample was representative of clients enrolled in the CCLAD model at the facility

Data Collection

Data were collected using a structured, researcher-administered questionnaire among adults receiving HIV care under the community client-led ART delivery (CCLAD) model at Mityana Hospital in rural central Uganda. Eligible participants were identified from clinic registers with support from clinicians and consecutively approached during routine visits. Trained research assistants obtained written informed consent after providing standardized information on study objectives, procedures, risks, and rights of participants. The questionnaire, developed from existing literature and aligned to the study objectives. The tool was pretested among HIV clients at Kiryokya Health Centre IV to assess clarity, feasibility, and administration time, and refined accordingly. Content validity was established through expert review, yielding a high content validity index (CVI = 0.95), while internal consistency reliability was confirmed using Cronbach's alpha (α = 0.91). Data collectors underwent standardized training on study procedures, ethics, and interviewing techniques, and field activities were closely supervised by the principal investigator. Completed questionnaires were reviewed daily for completeness and consistency, with immediate feedback and corrective action where necessary, to ensure high data quality. Data collection continued until the target sample size of 238 participants was achieved.

Data analysis

Completed questionnaires were double-entered in EpiData (version 7) with verification against source documents to minimize entry errors. Cleaned datasets were exported to Stata (version 17; StataCorp, College Station, TX, USA) for analysis. The outcome variable, optimal utilization of CCLAD model service was measured using 6 parameters that included receiving: comprehensive clinical evaluation, clinical consultations in a year, assessment for adherence, viral load testing, reproductive health commodities, counselling and health education sessions. outcome what was determined as whether the client utilised at 4 (66.7%) of the services under the CCLAD model. Descriptive statistics were used to summarize participant characteristics using frequencies and percentages. Bivariate analyses were conducted for categorical variables to determine candidate variables for the multivariate model at 80% confidence interval. Given that the outcome was a binary measure, multivariable logistic regression was used. Backward final model building was done to estimate adjusted odds ratios (aORs) at 95% confidence intervals with variables that had a $p < 0.20$ at bivariate level. Model robustness was assessed using the Hosmer Lemeshow goodness-of-fit test, and multicollinearity was evaluated using variance inflation factors (VIFs), with a threshold of > 10.

Results

Demographic Characteristics of the Study Participants

Among 238 participants enrolled in the CCLAD model in rural central Uganda (Table 1), Participants were predominantly female (55.9%) with a median age of 44 years (interquartile range [IQR]: 35–52 years). The majority (76.9%) had only primary education, 86.9% were engaged in informal employment, and 68.9% reported a monthly income below UGX 25,000. Slightly more than half were single (54.2%) with 52.5% residing ≥ 5 km from a health facility. Participants were largely stable with a median duration on ART of approximately 14 years (IQR: 11–17 years). The median CCLAD duration was 4 years (IQR: 3–6 years).

Table 1
Demographic Characteristics of the Study Participants.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	105	44.12
	Female	133	55.88
Age (years)	19–34	39	16.39
	35–50	140	58.82
	51–66	52	21.85
	67–75	07	02.94
Area of Residence	Rural	180	75.63
	Urban	58	24.37
Highest Level of Education	None	14	05.88
	Primary	183	76.89
	Secondary	38	15.97
	Tertiary	03	01.26
Marital Status	Single	129	54.20
	Married	109	45.80
Religion	Catholic	119	50.00
	Protestant	86	36.13
	Moslem	19	07.98
	Others	14	05.88
	Unemployed	16	06.72
Occupation	Informal Employment	207	86.97
	Formal Employment	15	06.30
Average monthly income	< 25,000 /=	164	68.91
	25,000–50,000 /=	59	24.79
	> 50,000 /=	15	06.30
Distance from home to facility	Less than 5km	113	47.48
	5km or more	125	52.52
Duration on ART	< 10 Years	48	20.17
	10–19 Years	174	73.11

Variable	Category	Frequency (n)	Percentage (%)
	> 20 Years	16	06.72
Duration in CCLAD	1–2 Years	48	20.17
	3–4 Years	114	47.90
	5–7 Years	76	31.93
Average monthly income	< 25,000 /=	164	68.91
	25,000–50,000 /=	59	24.79
	> 50,000 /=	15	06.30

Level of utilization of HIV Services under CCLAD Model

Table 2 shows that utilization of HIV services under the CCLAD model was consistently high across most core service components. Nearly all participants reported receiving comprehensive clinical evaluation (98.3%, 234/238), adherence assessment (99.2%, 236/238), viral load sample collection at recommended intervals (98.7%, 235/238), and counselling and health education sessions (98.7%, 235/238). In contrast, utilization of clinical consultation services was substantially lower, with only 18.1% (43/238) reporting having received clinician-led consultations. Use to reproductive health commodities was, reported by 70.6% (168/238). Overall, 95.0% (226/238) of participants had utilized at least four key HIV services, reflecting a high level of integrated service delivery under the CCLAD model.

Table 2
Level of utilization of various services under CCLAD Model

	Outcome evaluation parameter	Category	Frequency (n)	Percentage (%)
1	Received comprehensive clinical evaluation	Yes	234	98.32
		No	04	01.68
2	Received clinical consultations service	Yes	43	18.07
		No	195	81.93
3	Assessed for adherence to medication	Yes	236	99.16
		No	02	00.84
4	Sample for viral load testing taken	Yes	235	98.74
		No	03	01.26
5	Received reproductive health commodities	Yes	168	70.59
		No	70	29.41
6	Received counselling and health education sessions	Yes	235	98.74
		No	03	01.26
	Overall utilization of at least 4 services	Yes	226	94.96
		No	12	05.04

Multivariate modified Poisson regression to determine factors independently associated with optimal utilization of services under the CCLAD Model.

In the final adjusted analysis shown in table 3, participants who did not perceive CCLAD membership as a risk to unintentional disclosure of their HIV status were significantly more likely to utilise services compared with those who perceived it as risky (adjusted prevalence ratio [aPR] 9.04, 95% CI 1.67–19.03; p = 0.011). Similarly, individuals who reported no concerns about privacy were more likely to utilise CCLAD services (aPR 7.31, 95% CI 1.65–12.39; p = 0.019). Participants who did not report saving transport costs were significantly less likely to utilise CCLAD services (aPR 0.16, 95% CI 0.07–0.38; p = 0.003). In contrast, those who preferred multi-month ART refills were significantly more likely to utilise services (aPR 2.65, 95% CI 1.94–4.07; p = 0.018) and those residing more than 5 km from CCLAD distribution points were significantly less likely to utilise services (aPR 0.14, 95% CI 0.11–0.29; p = 0.017). Absence of ARV stock-outs was independently associated with higher utilisation (aPR 2.76, 95% CI 1.93–3.34; p = 0.012).

Table 7
Multivariate analysis of factors significantly associated with utilization of services under the CCLAD model in Mityana district.

Variables	Category	Utilized Services		cOR (95% CI)	P value	aOR (95% CI)	P value
		No, (%)	Yes (%)				
Perceived risk of disclosure	Yes	1(1.7)	58 (98.3)	1.00		1.00	
	No	11(6.1)	168(93.9)	2.03 (1.90–2.97)	**0.001**	9.04(1.67–19.03)	**0.011**
Has fears of privacy	Yes	10(4.3)	221(95.7)	1.00		1.00	
	No	2(28.6)	5(71.4)	1.05(1.02–1.09)	**0.001**	7.31(1.65–12.39)	**0.019**
Saves of transport cost	Yes	11(6.7)	152(93.3)	1.00		1.00	
	No	1(1.3)	74(98.7)	1.08(1.03–1.13)	**0.001**	0.16 (0.07–0.38)	**0.003**
Prefer multi-month refills	Yes	11(4.8)	218(95.2)	1.00		1.00	
	No	1(11.1)	8(88.9)	1.06(1.02–1.09)	**0.001**	2.65(1.94–4.07)	**0.018**
Distance to the distribution point	Less than 5km	11(8.3)	120(91.7)	1.00		1.00	
	More than 5km	1(1.0)	103(99.0)	0.78(0.02–0.84)	**0.006**	0.14(0.11–0.29)	**0.017**
ARV stock out	Yes	3(42.9)	4(57.1)	1.00		1.00	
	No	9(3.9)	222(96.1)	1.68(0.88–3.20)	0.113	2.76(1.93–3.34)	**0.012**

Discussion of results

This study demonstrates a consistently high level of utilization of HIV services under the CCLAD model in Mityana District, with 95% of participants accessing at least four core service components in the past one year. Near-universal uptake of adherence assessment, viral load monitoring, counselling, and clinical evaluation indicates that community-based differentiated service delivery (DSD) models can sustain essential elements of HIV care outside conventional facility settings. However, the markedly lower utilization of clinician-led consultations and moderate uptake of reproductive health commodities suggest that while decentralization improves continuity of ART services, it may inadvertently constrain access to more specialized or integrated services. The high utilization observed in this study exceeds earlier reports from Uganda and the region, including findings from Mulago National Referral Hospital [13,16]. The finding suggests a progressive optimisation of the CCLAD model in this setting. Consistent with prior evidence, the model's emphasis on peer-led delivery, adherence support, and decentralised ART distribution likely explain this good

performance [5,17]. Nonetheless, the observed gaps in clinical consultation and reproductive health integration highlight the need for deliberate service integration within community platforms.

The study further identifies a set of demand and supply-side determinants shaping utilization of CCLAD services. Perceived risk of unintended HIV status disclosure emerged as a significant factor, with individuals who did not perceive such risk being substantially more likely to utilize services. This aligns with a body of evidence identifying stigma and disclosure concerns as persistent impediments to engagement in community-based HIV care [18]. Similarly, concerns around privacy significantly influenced utilization. While some studies suggest that community-based models may be less preferred in contexts where privacy is highly valued [19], the present findings indicate that when confidentiality is assured, such models can achieve high uptake even in resource-limited settings. These results also reinforce the importance of patient-centred care approaches that prioritize individual preferences, autonomy, and perceived safety [20].

Our study also found that participants who did not experience transport cost savings from the CLLAD were significantly less likely to utilise services compared to those who perceived the model as cost saving. This finding is consistent with prior studies demonstrating that DSD models reduce patient-incurred costs, particularly transport thereby improving retention and engagement [21,22]. Conversely, persistent financial barriers may undermine the intended equity gains of community-based models [23,24]. Preference for multi-month dispensing was positively associated with utilisation, this finding emphasises the role of service convenience and reduced visit frequency in enhancing acceptability. This supports existing evidence that flexible ART delivery models aligned with patient preferences improve adherence and continuity of care [2,25].

Geographic accessibility remains a significant structural determinant in this setting. This study reveals that participants residing more than 5 km from distribution points were less likely to utilise services. This finding underscores shows that physical proximity continues to shape healthcare access, particularly in rural and peri-urban contexts. Distance-related barriers may reflect broader inequities in service distribution and infrastructure, which negatively affect adherence and long-term treatment outcomes [26–28]. These results suggest the need for further decentralisation through additional community distribution points or mobile outreach may be necessary to optimise coverage.

At the health system level, reliable ARV supply emerged as a significant enabler of service utilisation. Participants who had not experienced stock-outs were significantly more likely to utilise services. This is consistent with evidence that supply chain disruptions undermine patient trust, continuity of care, and programme effectiveness [29–31]. Persistent stock-outs have been widely documented as a barrier to DSD implementation in sub-Saharan Africa [32,33]. This finding highlight the need for consistent supply of logistics to support DSD models.

Strengths and limitations

The study demonstrates important strengths, notably the high observed access to CCLAD services provides valuable real-world evidence of the model's effectiveness in routine HIV care. Its comprehensive assessment of multiple determinants offers clear insights into both facilitators and barriers with programmatic

relevance. However, findings should be interpreted with caution due to several limitations. The reliance on self-reported data introduces potential recall bias. The single-facility setting limits generalizability, and restriction to clients already enrolled in CCLAD may have introduced selection bias, potentially overestimating access.

Conclusion

In conclusion, this study demonstrates that the CCLAD model in Mityana District achieves high utilization of core HIV services as a differentiated service delivery approach for sustaining ART care at community level. However, gaps in access to clinician-led services and reproductive health integration indicate that decentralization alone is insufficient to ensure comprehensive care. Utilization is influenced individual perceptions particularly fear of disclosure and privacy concerns, transport cost savings, and service preferences in addition to geographic accessibility and. These findings highlight that while CCLAD enhances accessibility and continuity of care, its optimal performance depends on strengthening service integration, ensuring consistent supply chains, addressing stigma-related barriers, and expanding geographically accessible delivery points. A more patient-centred and system-responsive approach is therefore critical to maximize the effectiveness and equity of community-based HIV service delivery models.

Abbreviations

DSDM ; Differentiated ART Service Delivery Models, **PLHIV;** People Living With HIV, **ART;** Antiretroviral Therapy; **CCLAD**; Community Client-led ART delivery, ARVs; Antiretroviral Drugs, **CAG;** Community ART Group.

Declarations

Ethical considerations.

Approval to conduct for this study was obtained from the Uganda Martyrs University faculty of Health Sciences Research Committee, with additional administrative clearance granted by chief administrative officer of Mityana District and the principal medical superintendent of Mityana general Hospital prior to data collection. Written and verbal informed consent was obtained from all participants after providing detailed information about the study objectives, procedures, potential risks, and benefits, as outlined in the participant information sheet; participants were also given contact details of the research team for further inquiries. Participation was entirely voluntary, and respondents were informed of their right to decline participation or withdraw from the study at any point without any consequences to their access to care or services. Strict measures were implemented to ensure confidentiality and anonymity: no personal identifiers were collected, and unique serial codes were used in place of names. All data were securely stored in password-protected systems accessible only to the principal investigator, with safeguards in place throughout data collection, handling, and analysis.

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Conflict of interest

No conflict of interest declared.

Availability of data

Data used in this study is available upon request from the corresponding author

Authors contribution

MK designed the study, conducted data collection, cleaned and analyzed data and drafted the manuscript DLE supervised all stages of the study from conceptualization of the topic to manuscript writing, JD and ML, reviewed the manuscript and provided guidance for publication. All authors unanimously agreed on the journal to submit the article.

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