Scientific Research Publishing

Advances in Infectious Diseases, 2025, 15(4), 810-841
https://www.scirp.org/journal/aid
ISSN Online: 2164-2656
ISSN Print: 2164-2648

Factors Influencing Antiretroviral Therapy Completion among HIV-Positive Mothers at Mbale Regional Referral Hospital, Uganda

David Damba[1], Lili Silumesii[1*], Winnie Damba[2]

[1]Department of Physiotherapy, DDT College of Medicine, Gaborone, Botswana
[2]Gaborone University College, Gaborone, Botswana
Email: dambaphysio@gmail.com, *silumesiilili@gmail.com, dambawinniez@gmail.com

How to cite this paper: Damba, D., Silumesii, L. and Damba, W. (2025) Factors Influencing Antiretroviral Therapy Completion among HIV-Positive Mothers at Mbale Regional Referral Hospital, Uganda. *Advances in Infectious Diseases*, **15**, 810-841.
https://doi.org/10.4236/aid.2025.154060

Received: March 7, 2025
Accepted: December 27, 2025
Published: December 30, 2025

Copyright © 2025 by author(s) and Scientific Research Publishing Inc.
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).
http://creativecommons.org/licenses/by/4.0/

Open Access

Abstract

Introduction: Antiretroviral therapy (ART) is a lifelong treatment that transforms HIV and AIDS into manageable conditions, significantly improving the quality of life for people living with HIV and AIDS (PLWHA). **Objective:** This study aimed to assess factors influencing ART completion among HIV-positive mothers at Mbale Regional Referral Hospital in Uganda. **Methodology:** A descriptive cross-sectional design was used, involving 246 respondents selected through consecutive sampling. Data were analysed using SPSS. **Results:** Of 231 mothers, 223 (96.5%) completed ART uptake before birth, equating to 97% completion. Individual factors significantly influencing completion included age ($\chi^2 = 15.732$, $p = 0.001$), occupation ($\chi^2 = 18.220$, $p = 0.001$), marital status ($\chi^2 = 13.003$, $p = 0.005$), and income ($\chi^2 = 12.322$, $p = 0.015$). Institutional barriers were distance to health services ($\chi^2 = 7.800 - 8.482$, $p \leq 0.005$) and perceived ARV side effects ($\chi^2 = 4.109$, $p = 0.043$). **Conclusions:** The results demonstrate a high ART completion rate among mothers attending Mbale Regional Referral Hospital, with 97% completing the uptake of ART services before birth. Key factors were socio-demographic (age, occupation, marital status and income) and structural (distance to healthcare and side effect concerns). **Recommendations:** The authors recommend implementing age-sensitive peer support groups and policies to mobilise HIV-positive mothers, improving socioeconomic conditions, reducing travel barriers through additional ART-equipped health facilities, and addressing institutional challenges by enhancing proximity to services and patient education on ARV side effects.

Keywords

Antiretroviral Therapy Completion, HIV-Positive Mothers, ART Adherence, Mbale Regional Referral Hospital, Uganda

1. Introduction

1.1. Background

Antiretroviral Therapy (ART) involves the use of anti-HIV medications to treat individuals infected with the Human Immunodeficiency Virus (HIV) [1]. This consists of a combination of medications designed to achieve optimal viral suppression, impede the advancement of HIV illness, and avert the transmission of HIV to others [2]. Antiretroviral therapy is recommended by the World Health Organisation (WHO) for all pregnant and breastfeeding women living with HIV to prevent the vertical transmission of the virus, as stated in the 2013 guidelines [3].

In 2023, an estimated 39.9 million individuals worldwide were living with HIV. Among this population, approximately 20.5 million were women aged 15 and older, while men in the same age group comprised around 18 million. Every year, approximately 1.3 million of these women become pregnant [4] [5]. From a biological perspective, women are at a higher risk of HIV infection compared to men due to the larger mucosal surface area that is susceptible to exposure to the virus during intercourse [6]. This considerable disparity highlights the pressing need for targeted healthcare interventions and support mechanisms to effectively address the specific challenges encountered by this at-risk population during maternal care [7].

Globally, the uptake of antiretroviral therapy among pregnant women living with HIV has significantly increased, rising from 44% in 2010 to 82% in 2018. This enhancement in ART coverage has been crucial in achieving a notable 41% reduction in vertical transmission rates during the same period [8]. In Uganda, a steady increase in antiretroviral therapy coverage for HIV patients has also been observed, with approximately half of the estimated 1.5 million individuals living with HIV receiving treatment by 2015. This rise is primarily attributed to targeted testing in high-risk populations, enhanced patient linkage to care, the launch of the Option B+ programme in 2013 and the initiation of treatment for all children living with HIV beginning in 2014 [9]. The World Health Organisation introduced Option B+ as a strategy for the prevention of mother-to-child transmission (PMTCT) of HIV, offering significant clinical and programmatic advantages for both maternal care and perinatal HIV prevention. Unlike earlier PMTCT regimens, Option B+ simplifies delivery by initiating lifelong antiretroviral therapy for all HIV-positive pregnant and breastfeeding women, regardless of their clinical stage or CD4 count, making it more effective in reducing mother-to-child transmission rates. Following WHO's recommendation, Uganda and other resource-limited countries adopted Option B+ as the standard of care to eliminate vertical transmission of HIV. Despite its proven efficacy, the implementation of Option B+ has faced challenges, particularly in low-resource settings, where poor adherence to lifelong ART and low retention rates among pregnant and postpartum women remain significant obstacles to achieving optimal programme out-

comes [10].

To achieve optimal treatment outcomes, adherence to ART must reach 95%. Despite the advancements that have made HIV a manageable chronic illness, research indicates that adherence levels among people living with HIV (PLWH) in Uganda remain low, with only 66% reporting the desired adherence outcomes [11]. This gap highlights the ongoing challenges in ensuring effective treatment and prevention strategies within this vulnerable population. Uganda has a robust network of health services offering antiretroviral therapy to individuals living with HIV across both public and private sectors. An example is The AIDS Support Organisation (TASO), which was established in 1987 as Uganda's first structured community response to the AIDS epidemic. This organisation provides various forms of support, including nursing care, counselling, educational assistance, and information on AIDS, as well as material aid for those impacted by the disease [12]. In 2011, the Ministry of Health, Uganda, reported a resurgence of the HIV epidemic, with a prevalence rate of 7.3% among the adult population. In the same year, the Uganda AIDS Commission (UAC) introduced the National Strategic Plan (NSP) for 2011/2012-2014/2015 to coordinate a multisectoral response to HIV and AIDS, focusing on prevention, care and treatment, social support, and systems strengthening. To implement this plan, the UAC developed the National Priority Action Plan (NPAP) for 2011/2012-2012/2013, which outlined key activities and included a monitoring and evaluation framework. Additionally, the UAC established the Uganda Investment Case (IC) for HIV and AIDS for 2015-2025, prioritising high-impact strategies based on local epidemiology. The NSP was intended to guide national efforts during the first five years of this ten-year investment case [13]. In the public sector, Mbale Regional Referral Hospital, located in Mbale municipality, Uganda, approximately 224.2 kilometres from Kampala, plays a crucial role in providing various healthcare services, including ante-natal care. This hospital serves multiple districts, such as Tororo and Kumi, among others [14].

In sub-Saharan Africa, antiretroviral therapy for HIV patients is primarily provided through urban programmes, creating significant barriers for low-income individuals in rural areas. This results in considerable inequalities in ART access, as many rural residents struggle to obtain necessary healthcare. Efforts to expand ART services in these regions, including Uganda, are further hindered by a lack of trained healthcare professionals [15]. Furthermore, a study identified additional barriers that hinder access to antiretroviral therapy, including the unavailability of treatment facilities in specific locations, particularly in low-income settings. Inadequate hospital infrastructure for administering ART also plays a significant role in limiting access. Additionally, individuals encounter high costs related to travel, opportunity costs, and social expenses, which further complicate their ability to receive treatment. Compounding these challenges are fears of side effects, stigma, and discrimination, as well as insufficient social support, all of which significantly impede access to ART [16].

Early attrition following the initiation of ART poses a substantial challenge to the effectiveness of ART programmes in resource-limited settings. A recent report analysing aggregate data from national programmes suggests that retention in care in sub-Saharan Africa is alarmingly low, with estimates indicating that only 75.2% of patients remain engaged in care after 12 months [17]. Given these multifaceted challenges, addressing the factors influencing ART completion among HIV-positive mothers at Mbale Regional Referral Hospital is not only crucial for improving individual health outcomes but also essential for advancing public health goals and reducing mother-to-child transmission of HIV across Uganda.

1.2. Statement of the Problem

Despite the availability of ART for HIV-positive mothers, completion rates remain suboptimal at Mbale Regional Referral Hospital. This poses significant risks, including increased maternal viral loads, higher rates of mother-to-child transmission, and poorer health outcomes. While ART programmes have expanded, the specific individual and institutional factors influencing ART completion in this setting are not well understood. Addressing these factors is critical to improving adherence, enhancing maternal and child health outcomes, and achieving public health goals.

1.3. Significance of Study

The Ministry of Health, Uganda, has systems in place to track ART utilisation, yet many mothers do not consistently engage with these services, leading to increased death rates. The significance of this study is rooted in its focus on identifying the individual and institutional factors that affect ART completion among HIV-positive mothers at Mbale Regional Referral Hospital. Uganda is also on track to achieve the 95-95-95 target by 2030, as set by the World Health Organisation and the Ministry of Health [18]. By examining barriers to ART adherence among HIV-positive mothers, the research aims to inform targeted interventions designed to enhance treatment engagement, address stigma, and improve access to ART services [19], ultimately leading to improved health outcomes for mothers and their infants. The study also highlights the importance of understanding the perspectives and experiences of mothers [18]. The findings will provide critical insights for healthcare providers and policymakers, enabling them to address the unique challenges faced by this population. Additionally, the study supports public health efforts to enhance the prevention of mother-to-child transmission (PMTCT) of HIV in Uganda, ensuring that HIV-positive mothers receive the necessary treatment to maintain their health and prevent transmission to their children, thereby fostering a more effective healthcare environment that promotes sustained ART adherence.

1.4. Research Questions

1) What is the completion rate of ART uptake among HIV-positive mothers

attending Mbale Regional Referral Hospital?

2) What are the individual factors that influence the completion of ART among HIV-positive mothers attending Mbale Regional Referral Hospital?

3) What are the institutional factors that influence the completion of ART among HIV-positive mothers attending Mbale Regional Referral Hospital?

1.5. Objectives

Main objective:

To assess the factors influencing completion of antiretroviral therapy services among HIV-positive mothers attending Mbale Regional Referral Hospital, Mbale District, Uganda.

Specific objectives

1) To explore the completion rate of ART uptake among HIV-positive mothers attending Mbale Regional Referral Hospital.

2) To assess individual factors that influence the completion of ART among HIV-positive mothers attending Mbale Regional Referral Hospital.

3) To identify the institutional factors that influence the completion of ART among HIV-positive mothers attending Mbale Regional Referral Hospital.

1.6. Scope of the Study

Subject Scope: The study encompasses all HIV-positive mothers receiving ART services at Mbale Regional Referral Hospital.

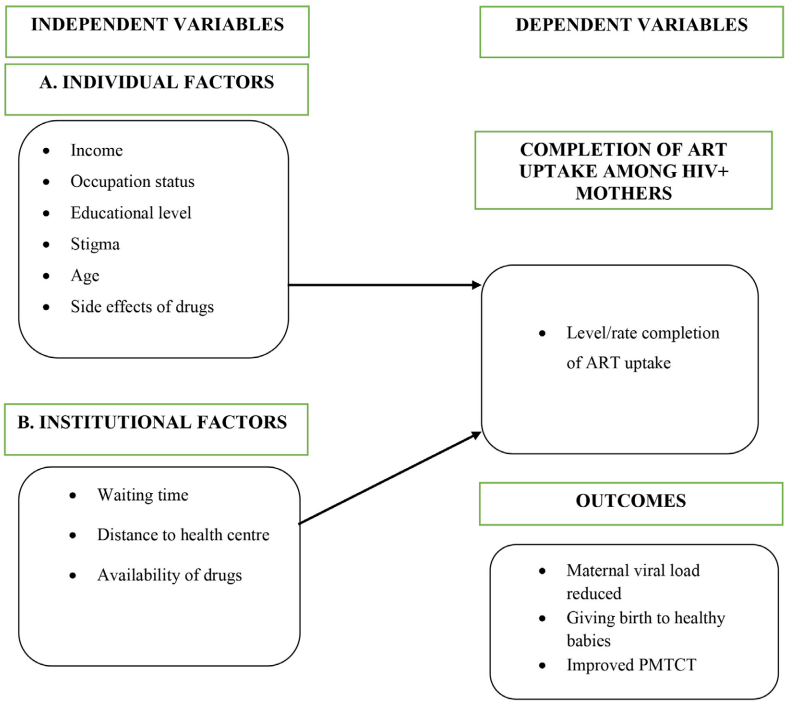
Geographical Scope: The research was conducted at Mbale Regional Referral Hospital, located in Mbale District, eastern Uganda. This facility serves a diverse population from several surrounding districts, including Dusia, Budaaka, Bukwo, Butaleja, and Manafwa. The hospital is approximately 224 km northeast of Kampala, Uganda's capital, and is a key public health institution funded by the Ministry of Health.

Time Scope: Data collection for this study occurred over two months, from October to November 2017. During this period, the researchers investigated the factors influencing HIV-positive mothers' engagement with ART services and gathered insights from healthcare workers at Mbale Regional Referral Hospital.

1.7. Conceptual Framework

Conceptual Framework on Factors Influencing Continuous ART Services among HIV+ Mothers

This study investigates how individual factors like income, stigma, and education, alongside institutional factors such as waiting times, distance to health centres, and drug availability, influence the completion of ART uptake among HIV-positive mothers. The dependent variable is whether HIV-positive mothers complete the recommended course of ART or not.



Conceptual framework of HIV/AIDS mothers attaining ART services adopted from UNICEF, 2016 [20], and WHO and UNICEF, 2012 [21]

2. Methodology

2.1. Research Design and Rationale

A descriptive and analytical cross-sectional study design was employed. This design was chosen to provide a snapshot of the factors associated with ART completion at a single point in time. A quantitative data collection method was used to gather structured information suitable for statistical analysis. This approach allows for efficient data collection and the identification of associations between variables. The cross-sectional design enabled the collection of data on potential determinants and outcomes simultaneously, offering a comprehensive understanding of the factors influencing ART completion among HIV-positive mothers.

2.2. Study Setting

The study was conducted at Mbale Regional Referral Hospital, located in Mbale District, Uganda. This hospital was selected because it is a major healthcare provider in the region, offering a comprehensive package of HIV prevention, treatment, care, and support services. Being the primary government health facility in the district with ART services, it serves a diverse population of HIV-positive mothers, making it an ideal setting for this study.

2.3. Study Population

2.3.1. Target Population

The target population comprised all HIV-positive mothers attending Mbale Regional Referral Hospital.

2.3.2. Accessible Population

The accessible population included all HIV-positive mothers attending Mbale Regional Referral Hospital during the study period.

2.3.3. Study Participants

The study involved several categories of participants:

- HIV-positive mothers who had withdrawn from ART services, to understand the reasons for their withdrawal.
- HIV-positive mothers currently attending ART services, to gather insights into factors that may influence withdrawal.
- Healthcare workers (counsellors, midwives, doctors, and nurses) involved in providing ART services, to obtain their perspectives on the challenges and facilitators of ART completion.
- Carers of HIV-positive mothers, to assess the social support provided to the mothers.

2.4. Sampling Strategy

2.4.1. Sample Size Determination

The sample size was calculated using Corcoran's formula (1977):

$$n = \frac{t^2 P(q)}{d^2}$$

$$\frac{(1.96)^2 (0.20)(0.80)}{(0.05)^2}$$

where:

- t = value for selected alpha level of 0.025 in each tail = 1.96. (The alpha level of 0.05 indicates the level of risk the researcher is willing to take; the true margin of error may exceed the acceptable margin of error).
- (p) = 20% of the people living with HIV receive ARVs by 2015, according to the Uganda AIDS Commission [13].
- (q) = (1 − P).
- n = desired calculated sample size.
- d^2 = Minimum allowed error 0.05%.
- n = 246 as the calculated sample size.
- The population of the study comprised a total of 246 participants.

2.4.2 Sampling Technique

A convenience consecutive sampling method was employed. This non-random technique involved selecting participants based on their availability and accessibility during their scheduled visits to the clinic within the study period. All eligible mothers who consented to participate were included in the study.

2.5. Selection Criteria

2.5.1. Inclusion Criteria

- All HIV-positive mothers aged 18 years and above.

- Mothers who had been initiated on ART services and were receiving ARVs from the time of their positive diagnosis.

2.5.2. Exclusion Criteria

- HIV-positive mothers enrolled in ART services but who were too ill or weak to respond.

2.6. Study Variables

The study examined the following variables:

- **Independent Variables:** Individual factors (e.g., income, occupation, age, marital status, stigma) and institutional factors (e.g., waiting time, distance to the facility, drug availability).
- **Dependent Variable:** Completion of ART uptake among HIV-positive mothers.

2.7. Data Collection Instruments and Procedures

2.7.1. Data Collection Instruments

- **Semi-structured Questionnaires:** Used to collect data from HIV-positive mothers and their caregivers. The questionnaire included both closed-ended and open-ended questions, written in English and translated into Lugisu to ensure comprehension. The English version is available in **Appendix 1**.
- **Interview Guides:** Used for in-depth interviews with healthcare workers. The guide consisted of 10 questions related to the study variables, available in **Appendix 2**.

2.7.2. Data Collection Procedures

- **Recruitment of Research Assistants:** Four research assistants (two males and two females) with a minimum of a bachelor's degree in a medical field were recruited and trained. The training focused on research ethics, data collection methods, and data management.
- **Semi-structured Interviews:** Administered to mothers attending ART services and their caregivers, allowing respondents to choose appropriate answers.
- **In-depth Interviews:** Conducted with doctors, nurses, counsellors, and midwives to gather detailed explanations and probe for additional information. Interview guides were used as checklists to ensure all relevant topics were covered.
- **Pre-testing of Instruments:** The questionnaires and interview guides were pre-tested at Mbale Regional Referral Hospital to ensure clarity, validity, and reliability.

2.8. Data Management and Analysis

2.8.1. Data Management

- Data was entered into EPI data 3.1 to minimise data entry errors.

- The entered data was then exported to Statistical Package for Social Sciences (SPSS) version 16 for analysis.
- Data was recoded, categorised, and sorted to facilitate analysis.

2.8.2. Data Analysis

- Qualitative Data: Qualitative data from the in-depth interviews was summarised and analysed using thematic analysis, following the steps outlined by Powell & Renner [22]. This involved:
- Familiarisation with the data through repeated reading and listening.
- Focusing on the research questions to guide the analysis.
- Coding and categorising the data based on the study objectives.
- Identifying connections within and between categories.
- Interpreting the data and using quotations to support findings.
- **Quantitative Data:** Quantitative data was analysed using SPSS version 16 to generate descriptive statistics (frequencies, percentages, means) and inferential statistics (chi-square tests, t-tests, regression analysis) to determine the associations between variables.

2.9. Measurement of Variables

2.9.1. Individual Factors

Measured using the following indicators:

- Income: Categorised into ranges (between <50,000/month and ≥400,000/month in Ugandan Shillings).
- Occupation: Categorised as self-employed, employed, full housewife or pensioner.
- Age: Grouped into categories (≤19, 20 - 35, 36 - 50, ≥51).
- Marital Status: Categorised as single, married, cohabiting, separated/widowed.
- Stigma: Assessed using a binary response (yes/no) to the question, "Do you experience any shame or fear when accessing healthcare services?"
- Level of Education: Categorised as primary, secondary, tertiary, or no formal education.

2.9.2. Institutional Factors

Measured using the following indicators:

- Waiting Time: Categorised as long or short periods.
- Distance to the Facility: Categorised as long or short.
- Availability of Drugs: Assessed by asking about the accessibility of ARVs and the types of drugs taken.

2.9.3. Completion of ART

Measured using the following indicators:

- Waiting Time: Categorised as long or short periods.
- Distance to the Facility: Categorised as long or short.
- Availability of Drugs: Assessed by asking about the accessibility of ARVs and

the types of drugs taken.

2.10. Validity and Reliability of Research Instruments

2.10.1. Validity

The validity of the questionnaires and interview guides was ensured through expert review by the research supervisor and a specialist in the field.

2.10.2. Reliability

The reliability of the research instruments was ensured by pre-testing at Mbale Regional Referral Hospital.

2.11. Ethical Considerations

Ethical approval was obtained from the Research Ethics Committee of Cavendish University Uganda and the administration of Mbale Regional Referral Hospital. An introductory letter was presented to the hospital management to seek permission to conduct the study. Informed consent was obtained from all participants before their inclusion in the study. Participants were assured of confidentiality and their right to withdraw from the study at any time. To ensure confidentiality, all patient identifiers were removed from the data collected, and participants were assigned codes. Only authorised personnel had access to the data, which was stored securely.

In this study, specific results from in-depth interviews with healthcare workers have not been disclosed to prioritise participant confidentiality and privacy. Responses were aggregated, and all identifiers were removed to ensure anonymity. This decision aligns with ethical research practices, as the focus is on broader trends rather than individual responses. Informed consent was obtained, and participants were assured their data would be used responsibly and respectfully.

2.12. Dissemination of Results

The results of this research were submitted to the School of Postgraduate Studies, the Faculty of Science and Technology, the administration of Mbale Regional Referral Hospital, and the State Ministry of Health. Findings will also be disseminated through peer-reviewed publications and conference presentations.

3. Results

This chapter presents a detailed analysis obtained from the data collected from the study with interpretation and illustration of the study findings. A total of 235 HIV-positive mothers were interviewed from a sample of 246, achieving a 96% response rate.

3.1. Participant Characteristics

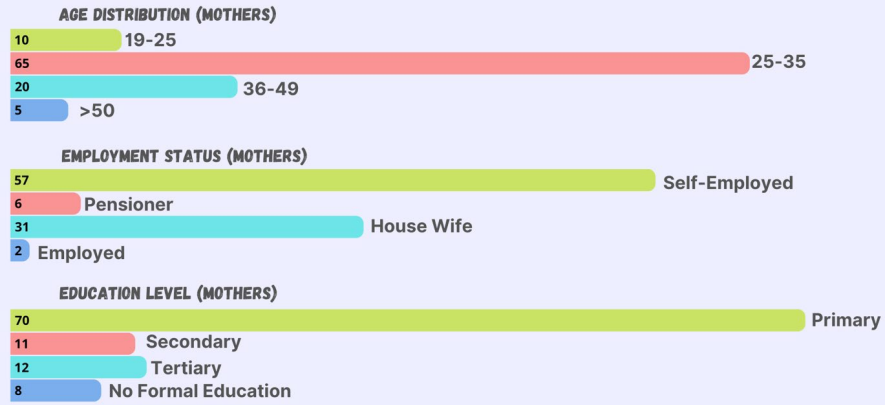
Table 1 and Figure 1 below provide an overview of the demographic characteristics of the study respondents.

Table 1. Demographic characteristics of respondents.

Variable	Categories	Frequency	Percentage (%)
Age of the respondents	19 - 25	23	9.8
	26 - 35	153	65.1
	36 - 49	47	20.0
	50 and above	12	5.1
Occupation of the respondents	Self-employed	137	56.8
	Pensioner	15	6.2
	Full housewife	75	31.1
	Employed	4	1.7
Highest education attended	Primary	171	70
	Secondary	26	11
	Tertiary institution	30	12
	No formal education	19	8
Level of spouse education	Primary	141	58.5
	Secondary	16	6.6
	Tertiary institution	44	17.0
	No formal education	34	14.1
Marital status	Married	170	72.3
	Single	35	14.9
	Cohabiting	4	1.7
	Widow/separated/widower	26	11.1
Income per month (Ugandan Shillings)	Less than 50,000	33	16.2
	50,001 - 100,000	57	27.9
	100,001 - 200,000	38	18.6
	200,001 - 400,000	47	23.0
	More than 400,000	29	14.2

Table 1: The demographic profile of respondents reveals critical insights into the socio-economic context influencing ART completion. The predominance of mothers aged 26 - 35 years (65.1%) aligns with Uganda's reproductive health trends, where this age group constitutes a high-risk cohort for HIV transmission due to biological and social vulnerabilities. However, the under-representation of older mothers (5.1%) suggests potential gaps in healthcare access or stigma affecting older women's engagement with ART services. The employment pattern–56.8% self-employed versus 1.7% formally employed–highlights the economic precarity of this population, where informal work may limit financial stability and access to healthcare resources. Education levels, with 70% of mothers and 58.5% of spouses completing only primary education, underscore systemic barriers to health literacy and decision-making capacity, which could indirectly affect adherence to life-

long ART regimens. Notably, only 8% of mothers and 6.6% of spouses had completed secondary education, reflecting a broader educational disparity that may exacerbate challenges in navigating complex healthcare systems or interpreting treatment guidelines. These findings collectively underscore the need for targeted interventions that address age-specific vulnerabilities, economic instability, and low educational attainment to enhance ART retention among HIV-positive mothers in resource-constrained settings.



(Customised design adapted from Canva.com by Pitstud, created for non-commercial, educational research purposes).

Figure 1. Summary of key demographic characteristics.

This demographic profile in **Figure 1** paints a picture of the HIV-positive mothers in our study. While **Figure 1** reinforces the demographic patterns observed in **Table 1**, its visual representation highlights how these characteristics intersect to create a vulnerable yet resilient cohort. The age distribution (26 - 35 years) and self-employment status (56.8%) collectively underscore a population balancing reproductive responsibilities with informal economic roles, where time and financial constraints may inadvertently strain ART adherence. The educational attainment (70% primary education) further contextualises the need for simplified, non-textual health communication to bridge gaps in health literacy. This synthesis of socio-economic factors through **Figure 1** underscores the necessity of context-specific interventions, such as mobile health reminders for self-employed mothers or peer-led education, that align with participants' lived realities.

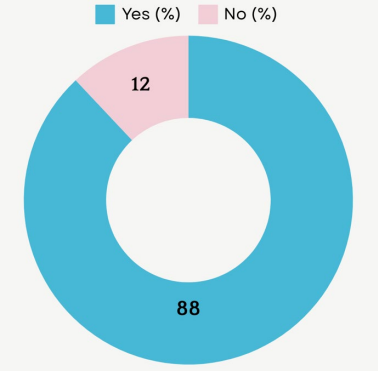
3.2. Attendance Trends in ART Services for HIV-Positive Mothers at MRRH

Table 2. Attendance of ART services at MMRH.

Attended	Frequency	Percentage (%)
Yes	204	88
No	27	12
Total	231	100

Table 2 and Figure 2 highlight the attendance of HIV-positive mothers for ART services at MRRH, providing insight into the level of engagement with these essential healthcare services.

Table 2: The high attendance rate of HIV-positive mothers at Mbale Regional Referral Hospital (88% actively engaged) reflects a commendable commitment to ART adherence, likely influenced by Uganda's Option B+ programme and institutional support mechanisms. However, the 12% non-attendance rate signals systemic gaps in retention strategies, potentially linked to intersecting challenges such as distance to healthcare facilities, stigma, or socio-economic constraints (e.g., competing responsibilities for self-employed mothers).



(Customised design adapted from Canva.com by Olha Kozachenko, created for non-commercial, educational research purposes).

Figure 2. ART service attendance.

Figure 2: The visual representation in Figure 2 contextualises these findings, highlighting the need for targeted interventions to address barriers among non-attenders while reinforcing existing strengths in service delivery. For instance, decentralising ART services or integrating peer support networks could mitigate logistical and psychosocial barriers, ensuring equitable access to lifelong therapy.

3.3. Completion Rate of ART Among HIV-Positive Mothers at MRRH

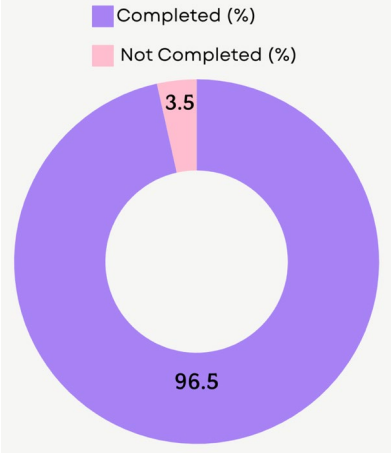
Table 3 and Figure 3 below outline the uptake of ART services among HIV-positive mothers. It presents key statistics regarding the percentage of mothers initiating ART, highlighting variations in uptake based on demographic factors and service accessibility.

Table 3. Uptake of ART services among HIV positive mothers at MRRH.

Variable	Categories	Frequency	Percentage (%)
Completion of ART service uptake before birth	Completed	223	96.5
	Not completed	8	3.5

Table 3: The near-universal completion of ART uptake (223 mothers; 96.5%)

among HIV-positive mothers at MRRH underscores the effectiveness of Uganda's Option B+ programme in driving pre-delivery adherence. This achievement aligns with national efforts to eliminate MTCT, particularly in hospital settings where structured support systems likely mitigate barriers such as stigma or logistical challenges. However, the residual 3.5% non-completion rate signals persistent gaps, potentially linked to individual-level factors (e.g., perceived side effects or socio-economic constraints) that require targeted interventions to ensure universal coverage.



(Customised design adapted from Canva.com by Olha Kozachenko, created for non-commercial, educational research purposes).

Figure 3. ART completion among HIV-positive mothers.

Figure 3: The visual representation in **Figure 3** reinforces the strong correlation between consistent ART service attendance and timely initiation of therapy. The dominant segment of mothers who completed ART uptake before childbirth may reflect the success of institutional strategies in promoting adherence, such as streamlined antenatal care integration and peer support networks. Conversely, the smaller segment of non-completers highlights the need to address systemic barriers (e.g., decentralising ART services or enhancing patient education) to strengthen retention. Together, these findings emphasise that sustained engagement in ART services is critical for maximising the benefits of PMTCT programmes, particularly in resource-constrained settings where attrition risks undermine long-term outcomes.

3.4. Individual Factors Influencing the Completion of ART among HIV-Positive Mothers at MRRH

Table 4 presents the results of chi-square analyses examining the association between individual-level factors and the completion of ART uptake among HIV-positive mothers at MRRH. The table highlights statistically significant relationships between ART completion and key demographic variables.

Table 4. Individual factors affecting ART uptake completion among HIV-positive mothers at MRRH.

Variable	Categories	Completed	Not Completed	X^2	P-value
Age	19 - 25	19 (8.5)	4 (50)	15.732	**0.001**
	26 - 35	145 (65)	4 (50)		
	36 - 49	47 (21.1)	0 (0)		
	50 and above	12 (5.4)	0 (0)		
Occupation	Self-employed	137 (62.6)	0 (0)	18.220	**0.001**
	Pensioner	15 (6.8)	0 (0)		
	Full housewife	63 (28.8)	8 (100)		
	Employed	4 (1.8)	0 (0)		
Attended any formal education	Yes	211 (94.6)	8 (100)	0.454	0.500
	No	12 (5.4)	0 (0)		
Highest education attained	Primary	159 (74)	8 (100)	2.782	0.249
	Secondary	26 (12.1)	0 (0)		
	Tertiary	30 (14)	0 (0)		
	No formal education	0 (0)	0 (0)		
Level of spouse education	Primary	133 (60.5)	8 (100)	5.116	0.164
	Secondary	16 (7.3)	0 (0)		
	Tertiary	41 (18.6)	0 (0)		
	No formal education	30 (13.6)	0 (0)		
Marital status	Married	162 (72.6)	4 (50)	13.003	**0.005**
	Single	35 (15.7)	0 (0)		
	Cohabiting	4 (1.8)	0 (0)		
	Widow/separated/widower	22 (9.9)	4 (50)		
Income per month	Less than 50,000	33 (17.2)	0 (0)	12.322	**0.015**
	50,001 - 100,000	57 (29.7)	0 (0)		
	100,001 - 200,000	34 (17.7)	4 (50)		
	200,001 - 400,000	39 (20.3)	4 (50)		
	More than 400,000	29 (15.1)	0 (0)		
Ashamed of attending healthcare services	Yes	15 (6.7)	0 (0)	0.575	0.448
	No	208 (93.3)	8 (100)		

Table 4: The statistically significant associations between ART completion and demographic factors—age (χ^2 = 15.732, p = 0.001), occupation (χ^2 = 18.220, p = 0.001), marital status (χ^2 = 13.003, p = 0.005), and monthly income (χ^2 = 12.322, p = 0.015)—underscore the critical role of individual-level socio-economic determinants in shaping adherence outcomes. Younger mothers, those in informal em-

ployment, unmarried women, and individuals with lower incomes may face compounded challenges, such as limited financial autonomy, social stigma, or competing responsibilities, which hinder consistent engagement with ART services. These findings align with broader evidence that health literacy and structural inequities disproportionately affect vulnerable subgroups, necessitating tailored interventions that address age-specific vulnerabilities, economic instability, and marital status-related barriers to foster equitable access to lifelong therapy.

3.5. Regression Analysis of Individual Factors Influencing ART Completion among HIV-Positive Mothers in MRRH

Table 5 presents the results of a multivariate logistic regression analysis examining the independent associations between individual-level factors and the completion of ART uptake among HIV-positive mothers at MRRH. Unlike the bivariate analyses presented earlier, this model adjusts for potential confounding variables to identify the factors that remain significantly associated with ART completion when considered simultaneously.

Table 5. Multivariate analysis of individual factors associated with ART uptake completion among HIV-positive mothers at MRRH.

		B	S.E.	Wald	df	Sig.	Exp (B)	95.0% C.I. for EXP(B)	
								Lower	Upper
Occupation				0.000	4	1.000			
	Self-employed	0.000	2.077E4	0.000	1	1.000	1.000	0.000	-
	Pensioner	0.000	2.068E4	0.000	1	1.000	1.000	0.000	-
	Full housewife	0.000	2.262E4	0.000	1	1.000	1.000	0.000	-
	Employed	19.545	2.010E4	0.000	1	0.999	3.077E8	0.000	-
	Constant	−21.203	2.010E4	0.000	1	0.999	0.000		

a. Variable(s) entered on step 1: IF2.

b. The stepwise procedure stopped because removing the least significant variable resulted in a model that had already been tested, indicating that no further improvement could be made.

Table 5: After adjusting for potential confounders, none of the individual factors assessed—such as age, occupation, marital status, or income—were found to have a statistically significant association with the completion of ART uptake among HIV-positive mothers. This finding suggests that while these factors may show preliminary associations, their influence on ART completion is likely mediated by other unmeasured variables or broader systemic factors. For instance, challenges such as distance to healthcare facilities, stigma, and healthcare infrastructure limitations may play a more dominant role in shaping ART adherence outcomes. These results highlight the importance of focusing on structural and

contextual barriers, rather than solely individual-level characteristics, when designing interventions to improve ART uptake and retention among HIV-positive mothers.

3.6. Institutional Factors Influencing the Completion of ART among HIV-Positive Mothers at MRRH

Table 6 presents the results of chi-square analyses examining the relationship between institutional factors and the completion of ART uptake among HIV-positive mothers at MRRH. This table highlights key aspects of healthcare access and delivery that significantly influence ART adherence in this population.

Table 6. Distribution of institutional factors influencing completion of ART uptake among HIV-positive mothers.

Variable	Categories	Yes	No	X^2	P-value
Always waiting for service delivery at healthcare centres	Yes	15 (7.6)	0 (0)	0.657	0.418
	No	182 (92.4)	8 (100)		
Duration of waiting for healthcare service delivery	Less than 30 minutes	50 (41.3)	4 (50)	0.232	0.630
	More than 30 minutes	71 (58.7)	4 (50)		
Healthcare service far from your place	Yes	95 (47.5)	8 (100)	8.482	**0.004**
	No	105 (52.5)	0 (0)		
Distance of the health centre to house	Short	112 (50.2)	0 (0)	7.800	**0.005**
	Far	111 (49.8)	8 (100)		
Availability of drugs	Availability	121 (79.6)	8 (100)	2.024	0.155
	Not available	31 (20.4)	0 (0)		
Availability of ARVs at the Health Centre	Availability	208 (100)	4 (100)		
	Not available	0 (0)	0 (0)		
Perceived side effects of ARVs	Yes	178 (79.8)	4 (50)	4.109	**0.043**
	No	45 (20.2)	4 (50)		

Table 6: After conducting chi-square analyses, significant associations were identified between ART completion and key institutional factors, including the perceived distance of the health service from the respondent's residence (χ^2 = 8.482, p = 0.004), the actual distance of the health centre to the respondent's house (χ^2 = 7.800, p = 0.005), and perceived side effects of ARVs (χ^2 = 4.109, p = 0.043). These findings highlight the critical role of healthcare accessibility and patient perceptions in shaping ART adherence among HIV-positive mothers at MRRH. The significant impact of geographical factors suggests that proximity to healthcare facilities remains a substantial barrier, particularly for mothers residing in remote areas. Similarly, concerns about ARV side effects reflect gaps in patient education and counselling, which may deter consistent engagement with ART services. Ad-

dressing these challenges through decentralised service delivery, improved transportation support, and enhanced communication strategies about ARV safety could strengthen adherence rates and optimise outcomes within PMTCT programmes.

3.7. Regression Analysis for Institutional Factors Influencing the Completion of ART Uptake among HIV-Positive Mothers at MRRH

This final section presents the results of a regression analysis examining the association between institutional factors and ART completion among HIV-positive mothers at MRRH. A multivariable logistic regression model was used to assess the independent effect of several institutional variables on ART completion while controlling for potential confounders. The results of this analysis are presented in Table 7.

Table 7. Multivariable logistic regression analysis of institutional factors associated with ART completion among HIV-positive mothers at MRRH.

		B	S.E.	Wald	Df	Sig.	Exp(B)	95.0% C.I. for EXP(B)	
								Lower	Upper
Healthcare service far from your place	Yes	−19.645	4.874E3	0.000	1	0.997	0.000	0.000	.
	Constant	18.087	4.874E3	0.000	1	0.997	7.160E7		

a. Variable(s) entered on step 1: INS3.

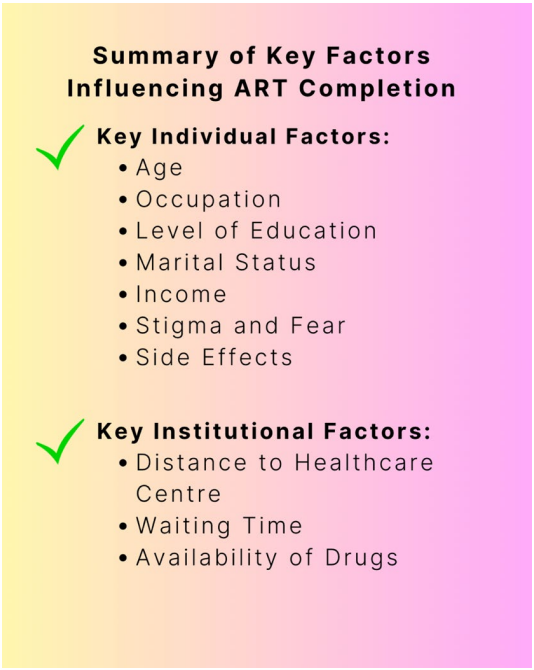
b. The stepwise procedure stopped because removing the least significant variable resulted in a model that had already been tested, indicating that no further improvement could be made.

Table 7: After adjusting for potential confounders in the multivariable logistic regression analysis, none of the institutional factors, such as distance to healthcare facilities, waiting times, or availability of medications, showed statistically significant associations with ART completion among HIV-positive mothers at MRRH. This finding suggests that while these factors may influence adherence in isolation, their effects may be mitigated or overshadowed by other unmeasured variables or broader systemic factors. For example, patient-level determinants such as health literacy, socio-economic status, or psychosocial support could play a more critical role in shaping adherence behaviours. Additionally, this result highlights the complexity of ART completion dynamics, further emphasising the need for interventions that address multiple layers of barriers (individual, institutional, and structural) to optimise adherence and retention within PMTCT programmes.

3.8. Summary, Interaction and Mediation Analysis

In summary, Figure 4 provides an overview of the key factors influencing the up-

take and completion of ART among HIV-positive mothers at Mbale Regional Referral Hospital. The findings are categorised into individual and institutional factors, highlighting the interplay between personal circumstances and systemic barriers in ART adherence.



(Customised design adapted from Canva.com by Vasya Kobelev, created for non-commercial, educational research purposes).

Figure 4. Key factors influencing ART completion.

Figure 4 illustrates how individual factors such as age, occupation, marital status, and income, alongside institutional factors like distance to healthcare facilities, perceived side effects of ARVs, and access to health services, collectively influence ART uptake and completion among HIV-positive mothers. This summary underscores the need for targeted interventions addressing both personal and structural challenges to improve ART adherence.

The interplay of socio-economic and institutional factors in shaping ART completion is evident across multiple analyses. For example, monthly income (Table 4) and distance to healthcare facilities (Table 6) both independently correlate with adherence, suggesting a potential interaction where economic constraints amplify the impact of geographical barriers. Mothers in informal employment (56.8% self-employed, Table 1) with lower incomes may face compounded challenges: limited financial autonomy could restrict transportation access to distant facilities, while competing economic responsibilities (e.g., childcare, informal work) strain time for clinic visits. This aligns with Table 6's finding that perceived and actual distance significantly predict ART completion.

Similarly, health literacy gaps, rooted in low educational attainment (70% primary education, Table 1), may mediate the relationship between perceived side

effects (Table 6) and ART adherence. Mothers with limited education may misinterpret ARV side effects due to poor health literacy, exacerbating fears and reducing adherence. This pathway is reinforced by Table 4's association between marital status and ART completion, as unmarried mothers (who may lack spousal support) may face heightened psychosocial barriers that intersect with educational disparities.

These inferred interactions underscore the necessity of multilevel interventions: decentralising ART services to reduce distance-related barriers (Table 6) while addressing health literacy through simplified, non-textual communication (e.g., visual aids, peer-led education). For instance, integrating mobile health reminders for self-employed mothers (Table 1) could mitigate time constraints, while community-based support networks could buffer the effects of marital status-related stigma (Table 4).

4. Discussion, Limitations, Conclusion and Recommendations

4.1. Discussion

According to Fonsah *et al.* (2017), non-adherence was defined as missing an ART refill for more than 48 hours, a threshold previously associated with suboptimal viral suppression in sub-Saharan Africa [23]. Our study revealed a notably high ART uptake completion rate of 96.5% (223 out of 231) among HIV-positive mothers at Mbale Regional Referral Hospital, indicating that nearly 97 out of every 100 mothers successfully initiated ART before childbirth. This demonstrates a commendable level of engagement with ART services within this population. However, even with this encouraging result, efforts should be directed towards reaching a 100% utilisation rate to prevent mother-to-child transmission. Our finding contrasts with a systematic review [24] which highlighted significant challenges in linking women who test HIV-positive during pregnancy to ongoing HIV care. Further, research in Mwanza, Tanzania [25] found that a substantial proportion of women identified as HIV-positive during pregnancy were not assessed for Highly Active Antiretroviral Therapy (HAART) eligibility during pregnancy or in the early postpartum period. These discrepancies highlight the importance of continued efforts to improve linkage to care, assessment for treatment eligibility, and prevention of loss to follow-up from the point of HIV diagnosis onwards. Watson-Jones *et al.* (2012) specifically suggest initiating HAART at the antenatal clinic, improving counselling and linkages between PMTCT and adult HIV treatment services, and reducing stigma surrounding disclosure of HIV results as beneficial strategies for enhancing the ongoing care of HIV-positive pregnant women [25].

HIV-related stigma impedes intervention efforts, causing delayed testing, reduced care engagement, and poorer treatment adherence. This stigma manifests visibly as enacted discrimination but also subtly through personal beliefs. Internalised stigma reflects self-stigmatisation through acceptance of negative beliefs, while anticipated stigma involves expecting prejudiced attitudes from others [26].

For instance, women with lower income levels or those in stigmatised occupations may often face compounded stigma that limits their ability to access healthcare services without fear of judgement or discrimination.

Age emerged as an important factor influencing ART adherence, with our study revealing that older women between the ages of 26 and 49 were more adherent compared to their younger counterparts. However, the impact of age is nuanced. For example, research in Malawi revealed that younger patients and single women were more likely to be non-adherent or drop out by day 360. While there were no significant differences in occupation, education level, or marital status among pregnant women who were adherent versus those who were not, being separated was associated with a decreased likelihood of adherence to Option B+ compared to married women [27]. Another study in Cameroon found better treatment adherence among older participants (over 40), who experienced fewer days of non-adherence compared to younger ones. Furthermore, the length of non-adherence following an ART regimen change predicted future adherence: shorter initial periods of non-adherence correlated with better long-term adherence, while longer periods predicted poorer adherence. However, this study noted that neither age nor education independently influenced overall ART adherence [23].

In our study, while bivariate analyses revealed significant associations between individual-level factors (age, occupation, marital status, and income) and ART completion, subsequent multivariate regression analysis demonstrated that these associations were not statistically significant after controlling for potential confounders. This highlights the importance of considering the complex interplay of factors influencing ART uptake. For instance, the apparent association between age and ART completion may be mediated by socioeconomic factors, such as access to resources [28] and social support networks. This is consistent with findings that gender power relations, including unequal access to resources and decision-making authority, significantly impact health outcomes for women in Uganda [29].

Similarly, the influence of occupation and marital status may be intertwined with cultural norms and gender dynamics within the Ugandan context, as societal expectations around women's roles often limit their autonomy and decision-making power regarding health care. For example, women involved in sex work in Kampala, Uganda, face heightened gender inequities that exacerbate their vulnerability to poor health outcomes due to stigma, economic dependence, and limited access to supportive networks [30].

In many sub-Saharan African communities, men often hold influential roles as decision-makers within their families and societies. Consequently, their choices significantly impact the health and well-being of their family members, for better or worse [31]. The involvement of male partners in the healthcare of HIV-positive mothers significantly influences adherence to antiretroviral therapy (ART) and overall health outcomes. A community-based study across 26 communities in Cameroon, Côte d'Ivoire, South Africa, and Zambia revealed that only 36.4% of

976 HIV-infected women completed the PMTCT cascade, which includes antenatal care visits, HIV testing, receiving results, and initiating maternal and infant prophylaxis. The study emphasises the significance of early HIV diagnosis, revealing that women diagnosed before pregnancy are more likely to complete the PMTCT cascade, which includes starting and maintaining ART. Additionally, awareness of a partner's HIV status is crucial; women who know their partner's status tend to engage more in PMTCT services and adhere to ART. To help improve outcomes, the authors advocated for integrated, patient-centred interventions that enhance access to care and address barriers throughout the PMTCT process [32]. Male partner involvement not only enhances the uptake of PMTCT services but also fosters a supportive environment that improves adherence to treatment regimens.

A level-one study investigating social and structural determinants of household support for ART adherence in low- and middle-income countries acknowledged the critical role of social context in shaping health-related behaviours and influencing the success of interventions, drawing on socio-ecological theory. The study noted the importance of household dynamics as a micro-environment within socio-ecological models, pointing out that households can provide various forms of support to PLWH, such as practical assistance, emotional encouragement, and the sharing of information. It further highlighted that households fostering open communication, supporting disclosure, and engaging in prevention efforts can be described as "HIV competent", thereby creating a health-enabling environment that facilitates ART adherence and promotes preventive behaviours [33].

Income levels also play a critical role in ART adherence [19]. Economic constraints can limit access to healthcare services and transportation, directly affecting consistent engagement with ART programmes. Financial insecurity often exacerbates the challenges faced by HIV-positive mothers, making it difficult for them to attend regular appointments or afford associated costs.

Additionally, health facilities situated at considerable distances from patients' homes, the accessibility of health centres, and the perceived side effects of antiretroviral medications were identified as significant institutional factors affecting ART uptake among HIV-positive mothers at Mbale Regional Referral Hospital. Situated in Mbale District in eastern Uganda, this hospital serves a wide population from neighbouring districts such as Dusia, Budaaka, Bukwo, Butaleja, and Manafwa. The limited number of vehicles operating at irregular times means that if a mother misses her transport option, she may have to wait until the next day or hour for another means of transportation to get to MRRH. These findings point to the critical role that institutional factors play in shaping patient experiences and outcomes within ART programmes. Furthermore, such barriers reflect the complex relationship between healthcare accessibility and ART adherence, highlighting broader structural challenges that can undermine efforts to ensure consistent treatment for HIV-positive mothers. However, contrasting evidence from other studies conducted in Uganda suggests that distance may not always act as a barrier

to accessing HIV care. For instance, researchers found that among patients LTFU, those living farther from clinics were more likely to re-establish care at alternative sites. This trend was attributed to the decentralisation of ART services in Uganda, which saw a significant increase in rural treatment sites, from a single ART provider in southwest Uganda in 2000 to over 60 sites by 2009. This decentralisation likely reduced geographic barriers by bringing services closer to patients [34].

A study highlighted that ART is associated with various side effects, ranging from mild issues like fatigue and gastrointestinal discomfort to more severe complications such as lactic acidosis and metabolic disorders. These adverse effects can significantly impact a patient's adherence to treatment, often leading to discontinuation or non-compliance. Although newer ART regimens have reduced the incidence of severe side effects, managing both short- and long-term toxicities remains essential for maintaining adherence and achieving effective viral suppression [35]. Likewise, our study demonstrates that side effects are a significant factor influencing ART adherence. The findings reveal that the burden of side effects negatively impacts ARV uptake among HIV-positive mothers in Mbale, highlighting the importance of addressing these challenges within ART programmes to improve adherence and health outcomes.

Access to ART has significantly improved across sub-Saharan Africa in recent years, with millions of people now receiving treatment. An earlier study by Kipp *et al.* (2012) highlighted that while ART has become increasingly available in sub-Saharan Africa, significant disparities persist in rural areas, where much of the population resides. In Uganda, despite improvements in ART provision, major gaps remain due to a shortage of trained healthcare professionals. This limits the consistent availability and accessibility of ART services in these areas. Involving community members in delivering high-quality ART care could address these challenges by ensuring routine follow-ups and improving the distribution of medications, thereby alleviating the burden on clinical staff [15]. Strengthening community-based approaches is crucial to ensuring the consistent availability of ART drugs and improving treatment access for underserved rural populations.

Waiting time significantly affects the uptake and adherence to ART among pregnant women in Uganda. Long waiting periods at healthcare facilities can discourage patients from seeking timely care or lead them to miss appointments altogether. In the context of our study, where a percentage of respondents reported consistently waiting for service delivery, with some waiting over 30 minutes, these delays can contribute to frustration and decreased motivation to adhere to treatment regimens. For example, a scoping review by Nwagbara *et al.* (2024) found that overcrowding, staff shortages, and inefficient administrative systems contribute significantly to extended waiting times in primary healthcare facilities in South Africa. These delays often result from high patient volumes, inadequate infrastructure, and poor time management among staff, which collectively create bottlenecks in service delivery [15]. Another study emphasised that long waiting times can lead to patient dissatisfaction and reduced adherence to treatment, as

overcrowding and resource constraints hinder timely access to care [36]. To address waiting times in rural Uganda, feasible strategies include implementing basic appointment scheduling systems to manage patient flow and reduce overcrowding, as well as introducing simple triage protocols [37] [38] to prioritise patients based on urgency. Engaging community health workers to assist with routine follow-ups and patient education can alleviate the burden on healthcare providers while improving service delivery. Additionally, decentralising ART services through community-based drug distribution points or outreach programmes can bring services closer to patients, reducing congestion at health facilities. Finally, modest investments in staffing, such as training and deploying more nurses or clinical officers, can enhance efficiency and ensure timely service delivery.

These intersecting factors highlight the need for integrated approaches that address both structural and cultural barriers to improve health outcomes for women. Therefore, ensuring every HIV-positive mother successfully navigates the pathway from diagnosis to sustained ART adherence requires integrated patient-centred interventions that prioritise accessible care, minimise loss to follow-up, and address individual challenges throughout the pregnancy and postpartum period.

Although our study demonstrates a high initial ART uptake, this does not guarantee sustained adherence over time. The challenges associated with distance, economic constraints, and side effects, as revealed in our findings (**Table 1**, **Table 4**, **Table 6**), are likely to compound in the postpartum period, potentially leading to decreased adherence and increased risk of vertical transmission. Sustaining adherence requires a multifaceted approach that addresses these persistent barriers and empowers women to remain engaged with ART services throughout their lives.

The complex interplay of individual, social, and institutional factors identified in our study underscores the need for a holistic, integrated approach to PMTCT programmes. Focusing solely on ART initiation without addressing the broader determinants of adherence is unlikely to yield sustainable results. For example, addressing stigma and promoting male involvement (as highlighted by [26] [31] [32]) can create a more supportive environment for women to adhere to ART, while decentralising ART services as suggested by [34] and improving transportation options can reduce geographical barriers. Ultimately, a comprehensive strategy is needed that empowers women to overcome the various challenges they face in accessing and adhering to ART.

Our findings suggest that while Uganda's Option B+ programme has been successful in achieving high ART uptake rates, sustained efforts are needed to ensure long-term adherence and retention in care. This requires a shift from a primarily clinic-based approach to a more community-centred model that leverages the resources and expertise of local communities. Community health workers can play a vital role in providing ongoing support and monitoring, identifying and addressing barriers to adherence, and linking women to necessary resources. By em-

powering communities to take ownership of the PMTCT programme, we can create a more sustainable and equitable system of care.

4.2. Limitations of the Study

This study faced limitations, including potential recall bias among participants and the cross-sectional design, which limits the ability to establish causality. Furthermore, as the questionnaire was developed by the research team and was not a previously validated tool, this introduces potential biases in the measurement of key variables. The absence of a validated questionnaire also limits the generalisability of our findings. It may not be possible to directly compare our results with those from other studies that used validated instruments, as the constructs measured may differ. Furthermore, findings from a single referral hospital may not fully represent all settings, though Mbale Regional Referral Hospital serves a wide population. Despite these limitations, this study provides insights into factors influencing ART completion, and future research using stronger designs and validated tools could build upon these findings.

4.3. Conclusion

In conclusion, this study demonstrates a high rate of antiretroviral therapy uptake completion among HIV-positive mothers at Mbale Regional Referral Hospital, with 97 out of every 100 successfully initiating treatment. While individual factors such as age, occupation, marital status, and income were initially associated with ART completion, their effects were not sustained after controlling for confounders, highlighting the complex interplay of determinants. Institutional barriers, including distance and perceived side effects, significantly affected ART uptake. To sustain and improve these outcomes, interventions should address structural barriers by decentralising ART services and providing transportation support. Community-based programmes and targeted health literacy initiatives are essential to address misinformation and foster patient empowerment. Ultimately, a multi-faceted approach is needed to ensure all HIV-positive mothers achieve sustained ART adherence and improved health outcomes.

4.4. Recommendations

Based on our findings, the following targeted interventions are recommended to address identified barriers to ART adherence among HIV-positive mothers in Mbale and similar settings:

1) Comprehensive Community ART Support Programmes:

- Age-appropriate peer support groups and ART clubs should be established and supported.
- Awareness campaigns should be designed to raise awareness about the benefits of ART services for both mothers and their children.

2) Decentralised and Accessible ART Services:

- Increase number of health facilities and ART service delivery points beyond

the main hospital to include health centres and outreach clinics in local communities to mitigate distance-related barriers.

3) Socio-Economic Empowerment Initiatives:

- Policymakers should collaborate with advocacy groups to develop supportive policies that promote mobilisation efforts for HIV-positive mothers seeking ART.

Improving Socioeconomic status by implementing vocational training and access to microfinance initiatives to empower women economically and enable them to access ART services more readily.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Pan American Health Organization (2020) Antiretroviral Therapy: Advancing HIV Treatment and Prevention. https://www.paho.org/en/topics/antiretroviral-therapy

[2] World Health Organization (2021) Treatment and Care in Adults Global HIV Programme. https://www.who.int/teams/global-hiv-hepatitis-and-stis-programmes/hiv/treatment/hiv-treatment-for-adults

[3] World Health Organization (2015) Guideline on When to Start Antiretroviral Therapy and on Pre-Exposure Prophylaxis for HIV. https://iris.who.int/bitstream/handle/10665/186275/9789241509565_eng.pdf#page=16.06

[4] World Health Organization (2024) HIV. https://www.who.int/data/gho/data/themes/hiv-aids

[5] World Health Organization (2022) Mother-to-Child Transmission of HIV. https://www.who.int/teams/global-hiv-hepatitis-and-stis-programmes/hiv/prevention/mother-to-child-transmission-of-hiv

[6] Murewanhema, G., Musuka, G., Moyo, P., Moyo, E. and Dzinamarira, T. (2022) HIV and Adolescent Girls and Young Women in Sub-Saharan Africa: A Call for Expedited Action to Reduce New Infections. *IJID Regions*, **5**, 30-32. https://doi.org/10.1016/j.ijregi.2022.08.009

[7] Matthews, L.T., Kaida, A., Kanters, S., Byakwagamd, H., Mocello, A.R., Muzoora, C., *et al.* (2013) HIV-Infected Women on Antiretroviral Treatment Have Increased Mortality during Pregnant and Postpartum Periods. *Aids*, **27**, S105-S112. https://doi.org/10.1097/qad.0000000000000040

[8] Sexton, H., Kumarendran, M., Brandon, Z., Shi, C., Kirtley, S. and Hemelaar, J. (2022) Adverse Perinatal Outcomes Associated with Timing of Initiation of Antiretroviral Therapy: Systematic Review and Meta-Analysis. *HIV Medicine*, **24**, 111-129. https://doi.org/10.1111/hiv.13326

[9] Boeke, C.E., Nabitaka, V., Rowan, A., Guerra, K., Kabbale, A., Asire, B., *et al.* (2018) Assessing Linkage to and Retention in Care among HIV Patients in Uganda and Identifying Opportunities for Health Systems Strengthening: A Descriptive Study. *BMC Infectious Diseases*, **18**, Article No. 138. https://doi.org/10.1186/s12879-018-3042-8

[10] Amone, A., Gabagaya, G., Wavamunno, P., Rukundo, G., Namale-Matovu, J., Malamba, S.S., *et al.* (2024) Enhanced Peer-Group Strategies to Support the Preven-

tion of Mother-to-Child HIV Transmission Leads to Increased Retention in Care in Uganda: A Randomized Controlled Trial. *PLOS ONE*, **19**, e0297652. https://doi.org/10.1371/journal.pone.0297652

[11] Nabunya, P., Bahar, O.S., Chen, B., Dvalishvili, D., Damulira, C. and Ssewamala, F.M. (2020) The Role of Family Factors in Antiretroviral Therapy (ART) Adherence Self-Efficacy among HIV-Infected Adolescents in Southern Uganda. *BMC Public Health*, **20**, Article No. 340. https://doi.org/10.1186/s12889-020-8361-1

[12] Hampton, J. (1993) TASO: Living Positively with AIDS. *Child World*, **20**, 20-22.

[13] Uganda AIDS Commission (2015) National HIV and AIDS Strategic Plan 2015/2016-2019/2020. https://uac.go.ug/media/attachments/2021/04/05/national-hiv-and-aids-strategic-plan-2015-2020.pdf#page=15.09

[14] Jimmy, M. and Geresom, I. (2020) Accessibility and Utilisation of Antenatal Care (ANC) Services among Pregnant Mothers Attending Antenatal Clinics. Case Study: Mbale Regional Referral Hospital, Mbale, Uganda. *International Journal of Scientific and Research Publications*, **10**, 41-91. https://doi.org/10.29322/ijsrp.10.12.2020.p10805

[15] Kipp, W., Konde-Lule, J., Saunders, L.D., Alibhai, A., Houston, S., Rubaale, T., *et al.* (2012) Antiretroviral Treatment for HIV in Rural Uganda: Two-Year Treatment Outcomes of a Prospective Health Centre/Community-Based and Hospital-Based Cohort. *PLOS ONE*, **7**, e40902. https://doi.org/10.1371/journal.pone.0040902

[16] Ankomah, A., Ganle, J.K., Lartey, M.Y., Kwara, A., Nortey, P.A., Okyerefo, M.P.K., *et al.* (2016) ART Access-Related Barriers Faced by HIV-Positive Persons Linked to Care in Southern Ghana: A Mixed Method Study. *BMC Infectious Diseases*, **16**, Article No. 738. https://doi.org/10.1186/s12879-016-2075-0

[17] Wandeler, G., Keiser, O., Pfeiffer, K., Pestilli, S., Fritz, C., Labhardt, N.D., *et al.* (2012) Outcomes of Antiretroviral Treatment Programs in Rural Southern Africa. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, **59**, e9-e16. https://doi.org/10.1097/qai.0b013e31823edb6a

[18] Global HIV Prevention Coalition (2024) HIV Positive Mothers Advised to Adhere to ART to Protect Their Breastfeeding Babies. https://hivpreventioncoalition.unaids.org/en/news/hiv-positive-mothers-advised-adhere-art-protect-their-breastfeeding-babies

[19] Habasa, H. (2023) Factors Associated with the Adherence to Anti-Retroviral Therapy Among Pregnant Mothers Attending the Art Clinic at China-Uganda Friendship Hospital, Naguru. A Descriptive Cross-Sectional Study. *Student's Journal of Health Research Africa*, **4**, 15.

[20] UNICEF (2017, May 30) Annual Results Report, 2016. HIV and AIDS. https://www.unicef.org/media/49131/file/2016arr_hivaids.pdf

[21] World Health Organization and UNICEF (2012, April) Global Monitoring Framework and Strategy for the Global Plan towards the Elimination of New HIV Infections among Children by 2015 and Keeping Their Mothers Alive (EMTCT). https://iris.who.int/bitstream/handle/10665/75341/9789241504270_eng.pdf?sequence=1

[22] Renner, M. and Taylor-Powell, E. (2003) Programme Development & Evaluation: Analyzing Qualitative Data. https://www.betterevaluation.org/sites/default/files/analyzing_qualitative_data.pdf

[23] Fonsah, J.Y., Njamnshi, A.K., Kouanfack, C., Qiu, F., Njamnshi, D.M., Tagny, C.T., *et al.* (2017) Adherence to Antiretroviral Therapy (ART) in Yaoundé-Cameroon: As-

sociation with Opportunistic Infections, Depression, ART Regimen and Side Effects. *PLOS ONE*, **12**, e0170893. https://doi.org/10.1371/journal.pone.0170893

[24] Ferguson, L., Grant, A.D., Watson-Jones, D., Kahawita, T., Ong'ech, J.O. and Ross, D.A. (2012) Linking Women Who Test HIV-Positive in Pregnancy-Related Services to Long-Term HIV Care and Treatment Services: A Systematic Review. *Tropical Medicine & International Health*, **17**, 564-580. https://doi.org/10.1111/j.1365-3156.2012.02958.x

[25] Watson-Jones, D., Balira, R., Ross, D.A., Weiss, H.A. and Mabey, D. (2012) Missed Opportunities: Poor Linkage into Ongoing Care for HIV-Positive Pregnant Women in Mwanza, Tanzania. *PLOS ONE*, **7**, e40091. https://doi.org/10.1371/journal.pone.0040091

[26] Treves-Kagan, S., Steward, W.T., Ntswane, L., Haller, R., Gilvydis, J.M., Gulati, H., *et al.* (2015) Why Increasing Availability of ART Is Not Enough: A Rapid, Community-Based Study on How HIV-Related Stigma Impacts Engagement to Care in Rural South Africa. *BMC Public Health*, **16**, Article No. 87. https://doi.org/10.1186/s12889-016-2753-2

[27] Mukosha, M., Chiyesu, G. and Vwalika, B. (2020) Adherence to Antiretroviral Therapy among HIV Infected Pregnant Women in Public Health Sectors: A Pilot of Chilenje Level One Hospital Lusaka, Zambia. *Pan African Medical Journal*, **35**, Article No. 49. https://doi.org/10.11604/pamj.2020.35.49.20078

[28] Okonkwo, P., Olatoregun, O.J., Abolarin, O. and Olajide, O. (2024) Barriers to Accessing Antiretroviral Treatment among Key Populations in Southwest Nigeria. *Cureus*, **16**, e59312. https://doi.org/10.7759/cureus.59312

[29] Morgan, R., Tetui, M., Muhumuza Kananura, R., Ekirapa-Kiracho, E. and George, A.S. (2017) Gender Dynamics Affecting Maternal Health and Health Care Access and Use in Uganda. *Health Policy and Planning*, **32**, 13-21. https://doi.org/10.1093/heapol/czx011

[30] Mbonye, M., Nalukenge, W., Nakamanya, S., Nalusiba, B., King, R., Vandepitte, J., *et al.* (2012) Gender Inequity in the Lives of Women Involved in Sex Work in Kampala, Uganda. *Journal of the International AIDS Society*, **15**, 1-9. https://doi.org/10.7448/ias.15.3.17365

[31] Kalembo, F.W., Yukai, D., Zgambo, M. and Jun, Q. (2012) Male Partner Involvement in Prevention of Mother to Child Transmission of HIV in Sub-Saharan Africa: Successes, Challenges and Way Forward. *Open Journal of Preventive Medicine*, **2**, 35-42. https://doi.org/10.4236/ojpm.2012.21006

[32] Dionne-Odom, J., Welty, T.K., Westfall, A.O., Chi, B.H., Ekouevi, D.K., Kasaro, M., *et al.* (2016) Factors Associated with PMTCT Cascade Completion in Four African Countries. *AIDS Research and Treatment*, **2016**, Article ID: 2403936. https://doi.org/10.1155/2016/2403936

[33] Campbell, L., Masquillier, C., Thunnissen, E., Ariyo, E., Tabana, H., Sematlane, N., *et al.* (2020) Social and Structural Determinants of Household Support for ART Adherence in Low- and Middle-Income Countries: A Systematic Review. *International Journal of Environmental Research and Public Health*, **17**, Article No. 3808. https://doi.org/10.3390/ijerph17113808

[34] Lankowski, A.J., Siedner, M.J., Bangsberg, D.R. and Tsai, A.C. (2014) Impact of Geographic and Transportation-Related Barriers on HIV Outcomes in Sub-Saharan Africa: A Systematic Review. *AIDS and Behavior*, **18**, 1199-1223. https://doi.org/10.1007/s10461-014-0729-8

[35] Kyajja, R., Muliira, J.K. and Ayebare, E. (2010) Personal Coping Strategies for Man-

aging the Side Effects of Antiretroviral Therapy among Patients at an HIV/AIDS Clinic in Uganda. *African Journal of AIDS Research*, **9**, 205-211. https://doi.org/10.2989/16085906.2010.530171

[36] Nwagbara, U.I., Hlongwana, K.W. and Chima, S.C. (2024) Mapping Evidence on the Factors Contributing to Long Waiting Times and Interventions to Reduce Waiting Times within Primary Health Care Facilities in South Africa: A Scoping Review. *PLOS ONE*, **19**, e0299253. https://doi.org/10.1371/journal.pone.0299253

[37] Swart, A., Muller, C.E. and Rabie, T. (2018) The Role of Triage to Reduce Waiting Times in Primary Health Care Facilities in the North West Province of South Africa. *Health SA Gesondheid*, **23**, 1-6. https://doi.org/10.4102/hsag.v23i0.1097

[38] Alamo, S.T., Wagner, G.J., Ouma, J., Sunday, P., Marie, L., Colebunders, R., *et al.* (2012) Strategies for Optimizing Clinic Efficiency in a Community-Based Antiretroviral Treatment Programme in Uganda. *AIDS and Behavior*, **17**, 274-283. https://doi.org/10.1007/s10461-012-0199-9

Appendices

Appendix 1: Questionnaire

1) Section A: Individual Factors

Please tick the most appropriate and, where required, fill in the space provided.

No	Questions	Responses
1	Age in years	1) 15 - 18 2) 19 - 25 3) 26 - 35 4) 36 - 49 5) ≥50
2	Occupation	1) Self-employed 2) Businessman 3) Pensioner
3	Marital status	1) Married 2) Single 3) Cohabiting 4) Widowed/separated/divorced
4	Did you attend any formal education?	1) Yes 2) No
5	If you attended formal education, what is the highest education level attained?	1) Lower primary (P.1 - P4) 2) Upper primary (P.5 - P.7) 3) Ordinary Sec level (S1-S4) 4) Advanced Sec level (S5-S6) 5) Tertiary Institution 6) None
6	About your spouse, what is his level of education?	1) Lower primary (P.1 - P4) 2) Upper primary (P.5 - P.7) 3) Ordinary secondary level (S1 - S4) 4) Advanced secondary level (S5 - S6) 5) Tertiary Institution 6) None
7	Family monthly income (in Ugandan shillings)	1) Less than 50,000 2) 50,001 - 100,000 3) 100,001 - 200,000 4) 200,001 - 400,000 5) 400,001 and above
8	Do you experience any shame or fear when accessing healthcare services?	1) Yes 2) No

2) Section B: Institutional Factors

Please tick the most appropriate and, where required, fill in the space provided.

9	Do you always wait for service delivery at healthcare centres?	1) Yes	2) No
10	How long do you wait for a healthcare service delivery?		
11	Is there distance to the healthcare centre from home?	1) Yes	2) No
12	How long do you travel to the healthcare centre?	1) Long	2) Short
13	Are ARV drugs available for you at the healthcare centres?	1) Yes	2) No
14	Are ARV drugs given to you at the healthcare centres?	1) Yes	2) No
15	What are the side effects of the ARV drugs?		

3) Section C: Completion of Art Uptake in Hiv-Positive Mother

Please tick the most appropriate and, where required, fill in the space provided.

16	Do you attend ART services in MRRH?	1) Yes	2) No
17	Did you attend ART services until you gave birth?	1) Yes	2) No
18	If you did not continue, how long did you have before birth?		
19	If you answered no in question (17), what were the factors contributing to the non-completion of ART services?		

Appendix 2: In-Depth Interview Questions for Healthcare Workers at MRRH

1. What challenges do you commonly observe among HIV-positive mothers regarding adherence to ART?
2. How do individual factors, such as income, education, or stigma, affect the ability of mothers to start and continue ART?
3. What role do you think family or community support plays in influencing ART adherence for HIV-positive mothers?
4. How does the distance to healthcare facilities impact mothers' ability to access and complete ART services?
5. What are the common concerns or barriers raised by mothers about ART during their visits?
6. How do waiting times at the health facility affect the willingness of mothers to continue accessing ART services?
7. What strategies or interventions have you observed to be effective in encouraging ART uptake and adherence among mothers?
8. How do you address issues related to the availability of ARV drugs when shortages occur?
9. What challenges do healthcare workers face in supporting HIV-positive mothers to adhere to ART?
10. What recommendations would you suggest to improve ART uptake and completion among HIV-positive mothers in your facility or community?