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Predictors of survival among older adults with HIV in Uganda's AIDS support organization centers of excellence (1987– 2023): a retrospective longitudinal study

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Abstract

Background The growing number of older adults living with HIV, facilitated by wider access to antiretroviral therapy (ART), presents unique challenges. This study aims to identify predictors of survival among older persons living with HIV receiving ART in Uganda's AIDS Support Organization Centers of Excellence (1987–2023). Understanding these predictors can inform effective clinical interventions to improve outcomes for this population.

Methods This study conducted a retrospective analysis of medical records from 11 TASO centers of excellence in Uganda (1987–2023). Using Cox proportional hazards regression, we identified factors associated with survival among older adults living with HIV. **T**ASO centers of excellence in Entebbe, Gulu, Jinja, Masaka, Masindi, Mbale, Mbarara, Mulago, Rukungiri, Soroti, and Tororo. Cox proportional hazards regression analysis identified factors influencing survival among older persons living with HIV (OPLHIV).

Results Of the 30,758 OPLHIV medical records analyzed (1987–2023), 72.5% were active on ART, 5.9% had died, 15.2% were lost to follow-up, and 5.6% transferred to other facilities. Survival was significantly associated with: gender (female, HR = 1.19, p < 0.001), marital status (married, HR = 0.99, p < 0.001; separated/divorced, HR = 0.85, p < 0.001), WHO clinical stage (II, HR = 1.66, p < 0.001), viral load (> 200 copies/ml, HR = 1.49, p < 0.001), and ART adherence (fair, HR = 0.94, p = 0.157).

Conclusion Key predictors of survival among Older Adults Living with HIV (OPLHIV) include: female gender, age 50–59, weight 51–70 kg, married status, viral load > 200 copies/ml, WHO HIV clinical stage II, paid employment, and ART adherence. To improve survival outcomes, consistent clinical screenings of WHO clinical stages, viral load, and ART adherence are essential. These measures can guide healthcare providers in making informed treatment decisions to enhance survival and quality of life for OPLHIV in Uganda.

Recommendations Strengthen routine monitoring of viral load, ART adherence, and WHO clinical staging. Provide targeted support to married and separated/divorced adults to improve their survival chances. Address gender

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disparities in care to enhance outcomes for females. Focus on maintaining ART adherence and viral suppression to reduce mortality risks.

Keywords Survival, Predictors, Older adults living with HIV

Introduction

The widespread use of antiretroviral therapy (ART) has substantially improved survival rates for adults living with HIV, with approximately 52.8% of adults globally benefiting from ART [1-3]. This increased survival has led to a demographic shift among persons living with HIV, driven by improved clinical outcomes, including reductions in opportunistic infections, chronic comorbidities, and overall mortality [4-7]. These factors contribute to a better quality of life for those on ART [4, 5]. In Uganda, the Population Health Impact Assessment report [7] echoes these trends, demonstrating an increasing prevalence of HIV among older age groups [8]. Among women, HIV prevalence is reported as: 13.6% for those aged 50-54 years, 8.9% for those aged 55-59 years, 6.0% for those aged 60-64 years, and 3.1% for women aged 65+ [8]. For men, the prevalence is: 10.0% among those aged 50-54 years, 8.5% among those aged 55-59 years, 8.3% among those aged 60-64 years, and 3.8% for men aged 65+ [9].

Despite these improvements, the availability of HIV services in Uganda continues to influence HIV infection trends. The number of adults living with HIV is projected to reach 1.2 million by 2025. However, progress is hindered by inadequate access to HIV prevention, treatment, and care services, and the lack of a cure. Addressing these barriers is crucial for maintaining and improving health outcomes for adults living with HIV [2, 3].

As the number of older adults living with HIV (\geq 50 years) grows due to increased availability and accessibility of antiretroviral therapy (ART), many older adults in Africa remain excluded from these services. Financial constraints, stigma, and social exclusion are significant barriers [10, 11]. While ART can prolong life expectancy, studies suggest that older adults with HIV experience shorter survival times and higher rates of AIDS progression compared to younger adults [10, 12]. However, those who achieve and maintain an undetectable viral load or remain virally suppressed can live longer, healthier lives, fully benefiting from ART advances [7, 13]. Despite ART's effectiveness, late diagnosis remains a significant challenge for older adults [14, 15]. Late diagnosis compromises treatment efficacy and increases the risks of HIV progression and comorbidities in older populations [16, 17]. Addressing these barriers and improving early diagnosis and treatment for older adults living with HIV is crucial for enhancing survival and quality of life [6, 18, 19].

Among older adults living with HIV, lower survival rates are primarily attributed to late diagnosis, delayed treatment initiation, and multiple comorbidities, which significantly reduce their chances of longevity [10, 14, 19–21]. These factors hinder the effectiveness of anti-retroviral therapy (ART), leading to accelerated disease progression and poorer outcomes compared to younger adults. Late diagnosis is particularly prevalent in regions like East Africa, Latin America and the Caribbean, and the Asia-Pacific, where older adults are more likely to be diagnosed at advanced disease stages [14, 22]. This trend emphasizes the need for targeted interventions [16, 23] promoting early testing and treatment for older populations in these regions, improving their survival rates and overall health outcomes.

In many countries, healthcare providers and even adults themselves often overlook the risk of HIV among older adults [22]. This perception contributes to a significant gap in testing and treatment for this population. Additionally, older adults may have a weaker immunological response to antiretroviral therapy (ART) and are more likely to experience clinical complications due to comorbidities like diabetes, high blood pressure, and other age-related conditions [10, 14]. To address these challenges, leveraging the extensive experience gained in the 40-year fight against HIV is crucial [7, 13]. This involves actively involving communities in service provision, mobilizing sufficient resources for equitable access to ART and other medical technologies, and empowering older adults living with HIV to enhance their survival chances [4, 24]. By promoting awareness, education, and accessible healthcare services, we can better support older adults in managing their health and navigating the complexities of living with HIV [25].

According to the Uganda AIDS Commission, approximately 800,000 Ugandans (57.1%) have died from HIV/ AIDS since the epidemic began, and there are currently 1.4 million adults living with the virus [26]. Among these, older adults living with HIV represent nearly 18% of the adult population in Uganda, translating to about 230,000 out of 1.3 million adults [11, 27]. The availability of HIV treatment plays a crucial role in enhancing the survival, health, and well-being of older adults living with HIV in Uganda [27]. Several factors contribute to the survival of older persons living with HIV on antiretroviral therapy (ART), including: the duration of treatment, timing of HIV diagnosis, reduction in opportunistic infections, adherence to antiretroviral medication, and the presence of multi-morbidity among persons living with HIV infection [11]. The "test and treat" policy also plays a vital role in effectively preventing, detecting, and treating opportunistic illnesses, such as tuberculosis and cryptococcal meningitis, thereby helping to avert avoidable fatalities [2]. Given this context, there is an urgent need to assess the predictors of survival among older adults living with HIV who are on antiretroviral therapy (ART) and attending The AIDS Support Organization centers (TASO) of excellence in Uganda. Understanding these predictors can inform interventions that will further enhance the health outcomes and quality of life for this vulnerable population.

Methods

Study design and setting

This study conducted a secondary analysis of retrospective longitudinal data from 30,758 medical records of older adults living with HIV on antiretroviral therapy (ART). The study period was July 2022 to June 2024. Data were extracted from The AIDS Support Organization (TASO) centers of excellence, located in eleven Ugandan districts: Entebbe, Gulu, Jinja, Masaka, Masindi, Mbale, Mbarara, Mulago, Rukungiri, Soroti, and Tororo. Founded in 1987, TASO is a non-governmental organization (NGO) dedicated to addressing the HIV epidemic in Uganda. Evolving from social support to comprehensive care and treatment, TASO centers of excellence are major providers of free ART in these eleven districts. Adults can access services through walk-ins and may receive additional support, such as seedlings, animals, and food rations [28]. This setting offers a unique opportunity to examine the health outcomes and predictors of survival among older adults living with HIV in Uganda, given the comprehensive support and services provided by TASO [28].

Study population

This retrospective study analyzed medical records of older adults living with HIV (\geq 50 years) enrolled in TASO HIV care programs in Uganda (1987–2023). The primary outcome was survival status, defined as the time from enrollment until being lost to follow-up or death. Data were collected from antiretroviral therapy cards and verified using the TASO HIV database.

The analysis considered several individual attributes, including gender (male, female), age categories (50–59 years, 60–69 years, 70–79 years, 80+years), and marital status (never married, currently married/cohabiting, separated/divorced, widowed). Occupational status was classified as peasant, paid employee, or other occupations. Clinical characteristics were examined through the WHO clinical stage (I, II, III, IV), tuberculosis (TB) status (no signs, currently on treatment, defaulted, on prophylaxis, TB diagnosis, suspected TB), and survival status

(alive, deceased, lost to follow-up [LTFU], transferred out).

The study also assessed ART-related factors such as current regimen (first-line, second-line, third-line), adherence status (good, fair, poor), and HIV viral load (<200 copies/ml, >200 copies/ml). The duration on ART was divided into five categories: <5 years, 6–10 years, 11–15 years, 16–20 years, and over 20 years. Lastly, differentiated service delivery models were explored, including community client-led ART distribution, facil-ity-based group care, facility-based individual management, fast-track drug refills, and community drug distribution points.

These variables provided a robust framework for analyzing factors associated with survival among older adults living with HIV on ART, enabling a comprehensive understanding of the influences on health outcomes and longevity.

Data analysis

Data were analyzed using STATA version 15 software. Descriptive statistics were used to summarize participant characteristics. Survival status was categorized as alive, lost to follow-up, transferred out, or dead. Kaplan-Meier analysis estimated survival rates and median time to death. Cox proportional hazards regression assessed the association between explanatory factors and the risk of death, adjusting for confounders. Hazard ratios and 95% confidence intervals were calculated.

Results

Background characteristics of older adults living with HIV

A total of 30,758 medical records were analyzed from 11 TASO centers of excellence, representing older adults living with HIV who initiated antiretroviral therapy (ART). The majority of participants were female (60%), married (72%), and engaged in peasant farming (59%). The most common age group was 50–59 years old, with a gradual decline in older age brackets. These demographic findings underscore the need for tailored interventions and support services to address the specific needs of this population. (Table 1)

Most older adults living with HIV in the study (80%) were at clinical stage II, with fewer at earlier (14%) or later (5%) stages. Nearly 95% had completed tuberculosis prophylaxis. Approximately 73% were actively on anti-retroviral therapy (ART), with 93% receiving first-line regimens. The most common ART regimens included Elvitegravir/Cobicistat/Tenofovir Alafenamide/Emtric-itabine and Elvitegravir/Cobicistat/Tenofovir Disoproxil Fumarate/Emtricitabine. (Table 2)

The study provided valuable insights into the health status of older adults living with HIV, particularly concerning viral load, duration of HIV infection, and weight.

Category	Men		Women		All		
	Number (n)	Percent (%)	Number (n)	Percent (%)	Both (n)	Percent (%)	<i>p</i> -value
Age years (Mean 57.2, SD \pm 7.4 years)							
50–59 Years	6,959	38.15	11,284	61.8	18,243	59.3	< 0.01
60–69 Years	3,709	40.4	5,465	59.6	9,174	29.8	
70–79 Years	1,154	41.4	1,635	58.6	2,789	9.1	
80 + Years	266	48.2	286	51.8	552	1.5	
Marital status							
Never married	1,139	32.4	2,381	67.6	3,520	11.4	< 0.01
Married/Cohabiting	9,971	44.8	12,303	55.2	22,274	72.4	
Separated/divorced	722	16.9	3,550	83.1	692	2.2	
Widow/widower	256	37.0	436	63.0	4,272	13.9	
Occupation							
Peasant farmer	7,140	39.2	11,090	60.8	18,230	59.3	< 0.01
Paid employee	3,074	38.4	4,927	61.6	8,001	26.0	
Others (business, self-employed, etc.)	1,874	41.4	2,653	58.6	4,527	14.7	
Weight (Kgs)							
< 50 kg	1,373	38.8	2,164	61.2	3,537	11.5	0.58
51–70 kg	6,615	39.2	10,259	60.8	16,874	54.9	
71–90 kg	3,645	39.5	5,594	60.5	9,239	30.0	
90 + Kgs	455	41.1	653	58.9	1,108	3.6	
WHO HIV Clinical stage							
Stage I	1,696	40.0	2,547	60.0	9,965	32.4	0.22
Stage II	9,706	39.1	15,136	60.9	20,201	65.7	
Stage III	536	40.4	791	59.6	438	1.4	
Stage IV	150	43.3	196	56.6	346	1.1	
Current TB status (12 months)							
On TB treatment	283	39.9	426	60.1	709	2.3	< 0.01
Defaulted	2	25.0	6	75.0	8	0.0	
Never	308	47.3	343	52.7	651	2.2	
Had side effect	10	30.3	23	69.7	33	0.1	
Completed treatment	11,485	39.1	17,872	60.9	29,357	95.4	
Total	12,088		18,670		30,758		

Key findings include the following: 78% of older adults living with HIV had a viral load of less than 200 copies/ mL, indicating effective management of HIV infection and treatment adherence. A significant portion (35%) of participants had been living with HIV for 11–15 years, reflecting the longevity of treatment and management in this population. More than half (55%) of the participants weighed between 50 and 70 kg, suggesting a relatively stable weight range among older adults living with HIV, which is essential for overall health and treatment efficacy.

The study also highlighted methods of accessing antiretroviral therapy (ART). Nearly 40% of older adults living with HIV obtained ART medication through community drug distribution points, reflecting a significant reliance on community-based services. About 35% of participants used community client-led antiretroviral delivery, indicating an alternative participatory approach to ART access. However, due to incomplete data, important variables such as CD4 count, height, Mid-Upper Arm Circumference (MUAC) scores, and comorbidities were excluded from the analysis. These factors are crucial for understanding the comprehensive health status and treatment efficacy in older adults living with HIV. The findings illustrate the vital role of community-based strategies in improving ART access for older adults living with HIV. Nonetheless, the exclusion of certain clinical parameters due to incomplete data suggests a need for enhanced data collection efforts to provide a more holistic understanding of this population's health status. Addressing these gaps in data collection will be essential for tailoring effective interventions and improving health outcomes among older adults living with HIV.

A significant majority (93%) of older adults living with HIV are on first-line ART regimens, including Dolutegravir/ lamivudine/ tenofovir, abacavir/ dolutegravir/ lamivudine, and lamivudine/ efavirenz. Some older persons living with HIV are on second-line regimens, such as

Category	Men		Women		All		<i>p</i> -value
	Number (<i>n</i>)	Percent (%)	Number (n)	Percent (%)	Both (n)	Percent (%)	
Survival status							
Active on ART	8,185	36.7	14,107	63.3	22,292	72.5	< 0.01
Dead	881	48.8	923	51.1	1,804	5.9	
LTFU	2,264	45.9	2,666	54.1	4,930	16.0	
Transferred out	758	43.7	974	56.2	1,732	5.6	
Current ART regimen							
1st line	11,189	39.2	17,358	60.8	28,547	92.8	0.39
2nd line	897	40.7	1,309	59.3	2,206	7.2	
3rd line	2	40.0	3	60.0	5	0.0	
CD4 count (cells/µL)							
< 500	5,164	39.5	7,902	60.5	13,066	42.5	0.49
> 500	6,924	39.1	10,768	60.9	17,658	57.4	
Adherence							
Good (95%)	210	51.5	198	48.5	30,193	98.2	< 0.01
Fair (85–94%)	69	43.9	88	56.1	157	0.5	
Poor (< 85%)	11,809	39.1	18,384	60.9	408	1.3	
Viral suppression							
< 200 ml	9,304	38.8	14,673	61.2	23,977	78.0	0.01
>200 ml	2,784	41.1	3,997	58.9	6,781	22.0	
Duration with HIV							
< 10 Years	4,118	45.7	4,901	54.3	9,019	29.3	< 0.01
11–15 Years	4,369	40.8	6,346	59.2	10,715	34.8	
16–20 Years	2,950	33.6	5,818	66.4	8,768	28.5	
20+Years	651	28.9	1,605	71.1	2,256	7.3	
DSD model							
Community client led ART delivery	3,894	36.3	6,831	63.7	10,725	34.9	> 0.01
Community drug distribution point	5,034	41.1	7,223	58.9	12,257	39.9	
Facility based groups	263	51.1	252	48.9	515	1.6	
Facility based individual management	47	38.8	74	61.2	121	0.4	
Fast truck drug refill	2,850	39.9	4,290	60.08	7,140	23.2	
Total	12,088		18,670		30,758		

Table 2 Clinical characteristics by gender

TDF + 3TC + LPV/r and AZT + 3TC + LPV/r. The Kaplan-Meier survival analysis indicates that older adults on first and second-line ART regimens have better survival rates compared to those on third-line treatment regimens. (illustrated in Fig. 1)

Figure 1 illustrates the fluctuations in the number of adults enrolled in HIV care at The AIDS Support Organization (TASO) centers of excellence over the years. The following observations can be made: Specific years may have marked a significant increase in enrollment, reflecting heightened awareness, improved access to healthcare services, and effective outreach programs. This increase could also correlate with the introduction of new treatment options or public health campaigns aimed at encouraging adults to seek care. Conversely, periods of decline in enrollment may also be observed, which could be attributed to various factors, such as ongoing stigma surrounding HIV that may deter adults from seeking treatment, geographical barriers, transportation costs, or lack of resources that could prevent potential persons living with HIV from accessing care, and changes in healthcare policies, funding, or resource allocation that could impact the availability and accessibility of services. Analyzing the data over time will allow healthcare providers and policymakers to identify patterns and adapt strategies accordingly. For instance, recognizing years with significant increases or decreases in enrollment can inform future interventions and resource allocation.

Multivariable analysis of predictors of survivorship in older adults living with HIV

Table 3 summarizes the findings from the multivariable analysis utilizing the Cox hazard regression model over a span of 34 years. This analysis aims to identify significant predictors of longevity among older adults living with HIV attending The AIDS Support Organization (TASO) clinics in Uganda. The examination of socio-demographic characteristics of older adults living with HIV



Fig. 1 Illustrates survival of older persons enrolled in HIV care at the The AIDS Support Organization (TASO) 1987–2023

has revealed important predictors of their survivorship. The factors analyzed include gender, age, marital status, and occupation. Below is a detailed overview of the findings related to these characteristics:

The estimated hazard ratio (HR) for females was 1.19 (95% CI: 1.15–1.22), indicating a 19% higher risk of mortality among female older adults living with HIV compared to their male counterparts. The analysis found statistically significant evidence (p < 0.01) of differing effects on survival based on gender. Generally, older age groups tend to have a higher risk of mortality. Older adults living with HIV aged 60–69 years had a 10% lower risk of dying compared to those aged 50–59 years, with a hazard ratio (HR) of 0.90 (95% CI: 0.87–0.92). This suggests that older adults in this age group have a slightly improved survival probability relative to the younger cohort (50–59 years). Survival probability decreases as age increases, with older adults facing more comorbidities and health challenges associated with aging.

The analysis indicates that marital status plays a role in survivorship, although specific hazard ratios were not provided in your summary. Married adults may experience better health outcomes due to emotional and financial support, which could enhance ART adherence and overall health management. The probability of survival was significantly lower among paid-employed older adults living with HIV compared to those engaged in farming, business, casual labor, or as housewives, with a hazard ratio (HR) of 0.55 (95% CI: 0.53–0.57). This suggests that older adults who are paid employees face additional challenges that negatively impact their health outcomes, possibly including work-related stressors. The analysis indicates that both age and occupation are crucial predictors of survivorship among older adults living with HIV. Specifically, older age groups are associated with progressively lower survival probabilities, while the occupation of older adults significantly influences their overall health outcomes. These insights can inform targeted healthcare policies and programs that address the unique needs of older populations, particularly those at higher risk based on age and occupational status.

The analysis of clinical characteristics that influence survival among older adults living with HIV reveals key factors that significantly impact their health outcomes. The clinical characteristics associated with survivorship among older adults living with HIV include WHO HIV clinical stage, duration on ART, adherence to ART medications, viral load, and differentiated service delivery models. Older adults living with HIV classified as WHO HIV clinical stage II had a significantly higher probability of survival (HR 1.67; 95% CI: 1.62–1.73), suggesting that individuals at this stage may have better health status or access to effective treatment compared to those in more advanced stages. Older adults living with HIV at WHO HIV clinical stage III faced a 45.7% increased risk of dying compared to those at stage I (HR 1.45; 95% CI: 1.28–1.65). While specific hazard ratios for the duration on ART were not provided, generally, longer durations on effective ART are associated with improved health outcomes. Adherence to ART over an extended period

Table 3	Predictors of	survival	among	older adu	Its living with HIV

Category	Multivariate analysis				
	Adjusted Hazard ratio (95% CI)	<i>p</i> -value			
Gender					
Men	1				
Women	1.19(1.15–1.22)	< 0.01			
Age years					
50–59 Years	1				
60–69 Years	0.90(0.87-0.92)	< 0.01			
70–79 Years	0.74(0.71–0.78)	< 0.01			
80 + Years	0.60(0.53-0.68)	< 0.01			
Marital status					
Never married	1				
Married/Cohabiting	0.77(0.73–0.80)	< 0.01			
Separated/divorced	0.85(0.80-0.90)	< 0.01			
Widow/widower	1.46(1.33–1.61)	< 0.01			
Occupation					
Peasant	1				
Paid employee	0.55(0.53-0.57)	< 0.01			
Others	0.91(0.87-0.95)	< 0.01			
Weight/kg					
< 50 kg	1				
51–70 kg	1.09(1.04–1.14)	< 0.01			
71–90 kg	1.10(1.05–1.15)	< 0.01			
91 + kg	1.09(1.00-1.18)	0.03			
WHO Clinical stage					
Stage I	1				
Stage II	1.67(1.62–1.73)	< 0.01			
Stage III	1.45(1.28–1.65)	< 0.01			
Stage IV	0.80(0.61-1.05)	0.11			
Adherence					
Good (95%)	1				
Fair (85–94%)	0.94(0.74-1.19)	0.64			
Poor (<85%)	1.51(1.32-1.72)	< 0.01			
Viral suppression					
0-200 Copies/µL	1				
>200 Copies/ µL	1.49(1.44–1.54)	< 0.01			
DSD model					
Facility based individual management		-			
Community client led ART delivery	-	-			
Facility based groups	-	-			
Fast truck drug refill	-	-			
Community drug distribution point	-	-			

can lead to sustained viral suppression and reduced progression of HIV-related complications, thus enhancing survivorship.

Older adults living with HIV who maintained an adherence level of 85–94% to their ART regimen had a 6% probability of survival. This suggests that even moderately high adherence levels significantly contribute to better health outcomes and prolonged survival. In contrast, adults with poor adherence to ART had a 49% increased risk of dying compared to those with higher adherence levels (HR 1.51; 95% CI: 1.32–1.72). This indicates that poor adherence is a significant predictor of mortality among older adults living with HIV, with the hazard ratio signifying that adults with suboptimal adherence are more likely to experience worse health outcomes, including higher mortality rates. The study found no significant difference in survival rates among older adults living with HIV when comparing different Differentiated Service Delivery (DSD) models. However, the probability of survival for older adults living with HIV who had a viral load greater than 200 copies/ml was 49.3% lower than for those with a viral load of less than 200 copies/ ml (HR 1.49; 95% CI: 1.44–1.54). Specifically, older adults with viral loads above this threshold are more likely to experience poorer health outcomes and reduced survival. (Table 3)

Discussion

The primary aim of this study was to identify the predictors of survival among older adults living with HIV in Uganda's AIDS Support Organization centers. Over the past 30 years, the growing number of older adults living with HIV reflects broader changes in HIV treatment paradigms and improved access to care, contributing to increased longevity in this population. The increasing survival of older persons living with HIV (PLHIV), as observed in this study, highlights the positive impact of effective HIV treatment and care strategies. By identifying key predictors of survival, healthcare providers and policymakers can develop targeted approaches to enhance the well-being and longevity of older PLHIV in Uganda and similar contexts [1–3].

According to the findings of this study, 73% of older adults living with HIV were actively receiving antiretroviral therapy (ART). This rate reflects a positive trend in treatment adherence and access to care among this demographic. The study's results are consistent with findings from South Gondar, northwest Ethiopia, where similar rates of ART adherence were reported [19], indicating that comparable health systems and intervention strategies might be effective in promoting ART uptake in different regions. However, the findings from this study were lower than those observed in Southern Ethiopia, where a higher percentage was reported [28]. The reported survival rate is higher than those observed in various studies: 57% at Debre Markos Hospital in Ethiopia, 66% at Zeditue Hospital in Addis Ababa, 47% in Cameroon, and 9% in Nepal. The increase in survival rates is attributed to improved access to medical care, which is linked to better disease management and reduced immunologic deterioration [29].

The predictors of survival included gender (female), age, marital status (being married), weight (over 50 kg), WHO stage II, poor adherence to treatment, and viral load. The age of older adults living with HIV is a significant predictor of survival, with older persons living with HIV having a lower chance of survival compared to younger ones. This finding aligns with previous research in Ethiopia and Japan, where nearly 50% of persons living with HIV aged 50 years and older were diagnosed by 2020, and the age distribution of newly diagnosed adults continues to rise [19, 29]. In Japan, studies have shown that aging with HIV worsens comorbidities and increases the risk of death due to slowed immune recovery associated with age and existing health conditions [19, 30]. The WHO estimates that over 28 million adults living with

HIV are aged 50 and older, highlighting a new challenge regarding longer survival among this demographic in Uganda [31].

The study found a significant gender association with survival among older adults living with HIV, indicating that females outlive their male counterparts. This aligns with previous research that reported higher mortality risks for males living with HIV in Ethiopia [19]. However, a study by Abebe et al. at Debre Markos Referral Hospital found that men had better survival rates than women. Additionally, the findings revealed that older adults who were married or divorced tended to have longer survival times compared to those who were never married or widowed [19, 30, 32–34].

Occupation status was identified as a statistically significant predictor of survival among older persons living with HIV, with paid or salaried employees exhibiting lower survival rates compared to peasant farmers. This finding is consistent with other research. The lower survival rates among salaried employees may be attributed to the lack of access to psychological and mental health care, as well as economic preparedness, particularly among less-educated adults [35].

Other important clinical factors affecting the survival of older adults living with HIV include WHO HIV clinical stage, viral load, duration on antiretroviral therapy (ART), adherence to treatment, and differentiated service delivery care models. The study found that older adults with fair or poor adherence to ART face a higher risk of death compared to those with good adherence. This aligns with previous research by Abebe et al., which indicated that older persons living with HIV with poor adherence were three times more likely to die than those who adhered well to their treatment in Addis Ababa [35].

Limitations and strength of the study

Although the study utilized data from all the eleven TASO centers in major regions of Uganda, to fully understand the survival of older persons living with HIV, data from other health facilities providing care to this population could be included. This would enrich evidence base and inform improved care for older persons living with HIV across Uganda. Additionally, a qualitative study among the caregivers of older persons living with HIV may be necessary to delve deeper into the issue so as to develop evidence-based strategies to increase survival.

Conclusion

The survival of older adults living with HIV at Uganda's AIDS Support Organization centers of excellence is influenced by several factors, including gender, age, WHO clinical stage, viral load, duration on antiretroviral therapy (ART), adherence to treatment, and differentiated service delivery models. To enhance survival rates among

this population, active early case finding and ongoing screening for viral load, CD4 count, WHO clinical stage, and adherence are essential strategies.

Recommendation

To improve the survival of older adults living with HIV at Uganda's AIDS Support Organization centers of excellence, there is ned to increase efforts to identify older adults living with HIV through community outreach programs and health education campaigns. Early diagnosis can lead to timely initiation of treatment.

Abbreviations

ART	Antiretroviral therapy
AIDS	Acquired immune deficiency syndrome
TASO	The AIDS support organization
MoH	Ministry of health
UPHIA	Uganda population based HIV impact assessment
VLS	Viral load suppression
HR	Hazard ratio
UNCST	Uganda national council for science and technology
WHO	World health organization
OPLWHIV	Older adults living with HIV
RRHs	Regional referral hospitals

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Author contributions

Conceptualization: CA, LK, CM, SOW. Data curation: CA, LA. Formal analysis: CA, LA. Methodology: CA, LA, CM Supervision: LA, CM Writing-original draft: CA, LA, CM, SOW. Writing-review and editing: CA, LA, CM, SOW, DA, TO.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

This study was approved by The AIDS Support Organization (TASO) Institutional Review Board on June 27rd, 2022 with Ref. No. TASO REC/ ADMC010/2022-UG-REC-009 and the Uganda National Council for Science and Technology (UNCST) on 30 January, 2023 with Ref. No. SS1396ES. Permission to access the TASO data was approved by TASO.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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