HHS Public Access

Author manuscript

HIV Med. Author manuscript; available in PMC 2025 November 01.

Published in final edited form as:

HIV Med. 2024 November ; 25(11): 1227–1239. doi:10.1111/hiv.13691.

Incidence and predictors of attrition from HIV treatment among adults living with HIV in high caseload facilities following implementation of universal test and treat strategy in Ethiopia: A prospective cohort study

Alemayehu Bekele[1], **Ismael Ahmed**[2], **Fana Tefera**[2], **Jemal Ayalew Yimam**[3], **Fasil Tessema Woldeselassie**[2], **Getinet Abera**[2], **Jelaludin Ahmed**[4], **Alemayehu Mekonnen**[2], **Ashenafi Haile**[2], **Fikerte Yohannes**[2], **Mirtie Getachew**[5], **Saro Abdella**[6], **Minesh Shah**[7]

[1]Centre for Innovative Drug Development and Therapeutic Trials for Africa (CDT Africa), College of Health Sciences, Addis Ababa University, Addis Ababa, Ethiopia

[2]U.S. Centers for Disease Control and Prevention (CDC), Addis Ababa, Ethiopia.

[3]Wollo University, Department of Statistics, College of Natural Science, Dessie, Ethiopia

[4]International Center for AIDS Care and Treatment Programs (ICAP) at Columbia University's Mailman School of Public Health, Addis Ababa, Ethiopia

[5]Ministry of Health of Ethiopia, Addis Ababa, Ethiopia.

[6]Ethiopian Public Health Institute, Addis Ababa, Ethiopia

[7]U.S. Centers for Disease Control and Prevention (CDC), Hanoi, Vietnam

Abstract

Background: The introduction of universal test and treat (UTT) strategy has demonstrated a reduction in attrition in some low resource settings. UTT was introduced in Ethiopia in 2016. However, there is paucity of information in the magnitude and predictors of attrition from HIV treatment in Ethiopia. This study aims to assess the incidence and predictors of attrition from

corresponding author: alemayehubekele2002@gmail.com.

Author contribution statement

As for the contributions of authors, AB wrote the manuscript and analyzed the data; IA reviewed the manuscript; FT reviewed the manuscript; JAY analyzed the data; FTW analyzed the data; GA reviewed the manuscript; JA reviewed the manuscript; AM reviewed the manuscript; AH reviewed the manuscript; FY reviewed the manuscript; MG reviewed the manuscript; SA reviewed the manuscript; MS reviewed the manuscript..

Conflict of interest statement

No conflict of interest declared by all authors.

Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the funding agencies.

Declarations

This study was funded by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) through the United States Centers for Disease Control and Prevention (CDC). None of the authors has competing interest. Ethical clearance was obtained from the Institutional Review Board (IRB) of Ethiopian Public Health Association (EPHA). Consent to collect data and ultimately publish the findings was obtained from the study participants. Data used for analysis are available.

HIV treatment among adults living with HIV (PLHIV) in high caseload facilities following the implementation of universal test and treat strategy in Ethiopia from March 2019 to June 2020.

Methods: A prospective cohort of individuals in HIV care from 39 high case load facilities in Oromia, Amhara, Tigray, Addis Ababa and Dire Dawa regions of Ethiopia was conducted for 12 months. Participants were adults 15 year and older who were first testers recruited for three months from March to June 2019. Subsequent follow up was for 12 months, with data collected on sociodemographic and clinical conditions at baseline, six and 12 months and attrition at six and 12 months. We defined attrition as discontinuation from follow-up care due to lost to follow-up, dropout or death. Data were collected using Open Data Kit at field level and aggregated centrally. Kaplan-Meier survival analysis was employed to assess survival probability to the time of attrition from treatment. The Cox proportional hazard regression model was used to measure association of baseline predictor variables with the proportion of ART patients retained in ART during the follow up period.

Results: The overall incidence rate for attrition from HIV treatment among the study participants during 12 months of follow-up was 5.02 cases per 1000 person-weeks (95% CI, 4.44-5.68 per 1000 person-weeks). Study participants from health facilities in Oromia and Addis Ababa/Dire Dawa had a 68%- and 51%- higher risk of attrition from HIV treatment compared to participants from Amhara region, respectively (adjusted hazard ratio (AHR) 1.68 95% CI (1.22-2.32), and AHR 1.51 95% CI (1.05-2.17), respectively). Participants who did not have a child had a 44% higher risk of attrition compared to those who had a child (AHR 1.44, 95% CI (1.12-1.85)). Individuals who did not own mobile phone had a 37% higher risk of attrition compared to those who owned mobile phone (AHR 1.37, 95% CI (1.02-1.83). Ambulatory/bedridden functional status at the time of diagnosis had a 44% higher risk of attrition compared to participants with a working functional status (AHR 1.44 95% CI (1.08-1.92)) at any time during the follow-up period.

Conclusion: The overall incidence of attrition among people living with HIV enrolled in HIV treatment was not as high as what was reported by other studies. Independent predictors of attrition were administrative regions in Ethiopia where health facilities are located, not having a child, not owning mobile phone and being ambulatory/bedridden functional status at the time of diagnosis. Concerted efforts should be taken to reduce the magnitude of attrition from HIV treatment and address its drivers.

Keywords

Attrition; follow-up; HIV treatment; health facilities; Ethiopia

Introduction

HIV remains a pressing public health concern and has claimed more than 40 million lives to date. By the end of 2022, there were about 39 million people living with HIV (PLHIV) globally(1) , of whom 20.8million from the Eastern and Southern Africa(2).. The number of PLHIV receiving antiretroviral therapy (ART) worldwide was about 29.8 million(1). To help reach the WHO sustainable development goals (SDGs) for health (3), the HIV “universal test and treat (UTT)” strategy was introduced in 2016 to improve HIV treatment outcomes (4). Since introducing UTT, the global proportion of PLHIV linked to HIV

treatment and achieving viral load suppression have remarkably increased (5). Attrition from HIV treatment was reported to be reduced following the introduction UTT as evidenced by studies from South Africa, Uganda and Ethiopia (6-8). In contrast to the report above, there are studies showing a worsened attrition after implementing this strategy (9,10). There is also, some mixed evidence on the effect of UTT on retention in treatment depending on the setting and population studied (11-19).

A systematic review from sub-Saharan African countries found retention rates that ranged between 23% and 88%; retention was higher in women, individuals with >25 years, low CD4 count, high body mass index, tuberculosis co-infected, and in settings with free cotrimoxazole use (20).

In Ethiopia, the total number of PLHIV was estimated at 610,000 by the end of 2022 and the number receiving antiretroviral therapy (ART) was 504 685 (i.e., 83% of those who knew their positive HIV status)(21). ART and chronic care and support services were provided in 1,145 mostly public health facilities. To meet the 95-95-95 targets set in HIV control and prevention, the Ethiopian Ministry of Health introduced UTT in 2016, and ART coverage has steadily increased since then (22). Nonetheless, there has been limited data on retention in ART or attrition from ART in the era of UTT. Therefore, this study aims to assess the incidence and predictors of attrition from HIV treatment among PLHIV in high caseload facilities since UTT introduction in Ethiopia.

Methods and procedures

Study settings and population

This study was conducted in 39 high caseload health facilities (health centers and hospitals) located in 20 U.S. President's Emergency Plan for AIDS Relief (PEPFAR) priority towns targeted for HIV testing and care and treatment services in five administrative regions of Ethiopia. These regions are Addis Ababa, Amhara, Tigray, Dire Dawa, and Oromia and the prevalence of HIV in adults 15 year and above in these administrative regions was 3.47%, 1.09%, 1.24%, 2.9% and 0.64% respectively(23). The health facilities provide comprehensive HIV services including HIV testing, ART, and diagnosis and management of opportunistic infections (OI).

Study period

Recruitment of study participants occurred from March to June 2019; participants were followed for one year, until June 2020.

Study design

A facility-based prospective cohort study design was employed to assess the incidence and predictors of attrition.

Source and study population

All patients age 15 years and above who tested positive for HIV according to the national HIV testing guidelines (12) in the selected public health facilities were considered as the

source population. Those who started ART and provided informed consent and/or assent in the selected facilities were included in the study. Pregnant women were excluded.

Sample size

This study was part of a larger study on ART outcomes including linkage, ART initiation, retention, and viral suppression in the HIV care continuum(24). The sample size was calculated based on the largest sample size required to assess viral suppression at the end of 6-month following ART initiation using the following formula.

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} P(1-P)}{d^2} \times DEFF$$

Where P is the proportion of virally suppressed patients within six months of ART initiation, α is level of significance set at 5% with Z the standard normal value equal to 1.96, d is margin of error which was assumed to be 0.05, and DEFF is design effect assumed to be 1.5.

Accordingly, the minimum sample size required was 1,070. Considering a 20% non-response rate associated with unavailability of viral load testing kits, refusal to participate and loss of patient records, the final minimum sample size required for the prospective study was 1,284.

Probability sampling method was employed and sample size was proportionally allocated to each administrative region and health facility based on patient load they were reporting in the fiscal year preceding the study period. Enrollment continued at all sites until the required final sample size was reached. When fewer participants were enrolled in some health facilities, the sample size for each region was compensated by enrolling more study participants from other high caseload facilities within the region.

Ethical considerations

Ethical clearance was obtained from the Institutional Review Boards of Ethiopian Public Health Association (EPHA). This project was reviewed in accordance with Centers for Disease Control and Prevention (CDC) human research protection procedures and was determined to be research, but CDC investigators did not interact with human subjects or have access to identifiable data or specimens for research purposes. Consent and assent were secured from each study participant before the interview process.

Data collection method

The data collection methods include document review and face-to-face interview using Amharic, Oromigna and Tigrigna languages. Verbal and written consent/assent, was obtained from the study participants. For illiterate study participants a fingerprint was used in lieu of a signature, with witness attestation. Parental/guardian consent and minor's assent was sought and secured for study participants aged 15-17 year before the interview. The first or baseline interview on sociodemographic, behavioral, and clinical characteristics, and linkage to HIV treatment was conducted in the first arrival of study participants to

the health facility who fulfilled the eligibility criteria. Study participants linked to HIV treatment and enrolled for the study were interviewed and necessary documents reviewed at 6- and 12-month routine clinical appointments. Data were collected using open data kit (ODK) (25) and completed forms were sent to the server located at the Ethiopian Public Health Association (EPHA) office in Addis Ababa. The data collected from each study participant on sociodemographic, behavioral, clinical characteristics, and attrition from HIV treatment at the field level were transferred to the central ODK aggregate database server for management and analysis. A data collection field manual or standard operating procedure was developed before the commencement of data collection to guide and standardize the data collection process at facility level.

Data collection instruments and variables

The data collection instrument was a questionnaire comprised of sociodemographic, behavioral, and clinical characteristics.

Attrition from HIV treatment and time to death or lost to follow-up (LTFU) from HIV treatment were the dependent variables. Independent variables included were as follows:

- Sociodemographic characteristics (age, sex, marital status, educational status, income, residence, occupation, distance from the health facility, mobile ownership, presence of child in the family),
- Health facility access (distance to HF, travel time to HF, means of transportation to HF),
- Behavioral characteristics (tobacco use, alcohol consumption, khat consumption, sexual behavior (number of sexual partners, condom use), disclosure status and others, and
- Clinical characteristics (WHO staging, opportunistic diseases including tuberculosis (TB), functional status, isoniazid prophylaxis, ART regimens, adherence levels and comorbidities)

Operational definitions

LTFU: It is defined as clients who were on ART and did not return for subsequent treatment for a period of one month or more since their most recent documented appointment date.

Attrition from HIV care and treatment: Persons who started on HIV treatment but discontinued their treatment due to LTFU, or death.

High caseload health facilities: These are health facilities with the high number of HIV testing and PLHIV enrolled to HIV treatment within a region.

Functional status of PLHIV: This was graded into three categories by the WHO (25) and the classification was as follows.

- Working: Able to perform usual work inside or outside home.
- Ambulatory: Able to perform activity of daily living, not able to work.

- Bedridden: Not able to perform activity of daily living.

Transferred out: are HIV positive persons transferred out to other health facilities after ART initiation

Quality control measures

Pretest study—Before conducting the actual study, the study instrument was pretested in six public health facilities in Adama town (one hospital and five health centers) to familiarize data collectors with the study instruments and procedures.

There was close supervision during the data collection period in the field by central team and CDC-Ethiopia staff to ensure data quality The data manager was routinely checking completeness and correct missing information in consultation with data collectors before the end of the data collection period.

Data safety and confidentiality—Personally identifiable information (PII) from facility logbooks were kept in the facility until results were reported and then destroyed. A unique study identification number was used for data collection. Paper-based data at study sites were kept in a locked file-cabinet until they were collected and entered to ODK. De-identified data were transferred from data collection tablets every three months and back up was done. Data were analyzed in aggregate and PII i were not used in any study reports.

Data management and analysis—All analyses were completed using Stata version 16 (Stata Corp. LP, College Station, TX, United States of America) and SPSS version 24. Descriptive analysis was used to produce tables and figures,. Incidence rate for attrition from HIV treatment was computed using person-week observation. Kaplan-Meier survival analysis was employed to assess survival probability to time to attrition from care. Cox proportional hazard regression model was used to measure association of baseline variables with the proportion of ART patients not retained in ART. Variables such as CD4 cell count, HIV status disclosure, and monthly income had missing values >5% and hence excluded from the bivariable and multivariable analyses. Variables with p-value <0.2 on bivariable analysis were included in the multivariable Cox regression model and variables with p-value <0.05 were declared to be significantly and independently associated with the hazard of time to attrition. Results were reported using hazard ratios with their 95% confidence intervals and p-values. The model goodness-of-fit test of the null proportional hazards assumption was considered based on a semi-parametric generalization of the Cox model, whereby the hazard functions can cross for different values of the covariates, using KullbackLeibler distance (26). Proportionality of hazard functions over time was also checked for the values or strata in the survival curve.

Results

Sociodemographic characteristics

Between March 2019 and June 2019, 1,487 participants were reached by the larger outcome study. Of these, 1,229 participants who started ART were enrolled in this study. 430 (35%) were from Oromia and 378 (30.7%) from Amhara regions. Of these, 958 (77.9%) were

urban residents and 674 (54.8%) were females. Other sociodemographic characteristics are displayed in Table 1.

Access to HIV service-related factors

803 (65.3%) participants were identified in hospitals, and the most common HIV testing service delivery points were outpatient department (OPD) and voluntary counselling and testing (VCT) and (OPD), 473 (38.5%) combined. 460 (37.4%) received HIV testing service from health facilities located in the same city where they live, with 766 (51.6%) reporting 7 km or less distance to travel from their home to health facilities and 674 (54.8%) reporting an estimated time of 30 to 60 minutes to travel from their home to the health facility (Table 2).

Clinical characteristics at baseline and 6th and 12th months follow up

Of the 1229 participants at baseline, 587 (47.8%), 232 (18.9%), 317 (25.8%), and 93 (7.6%) had WHO clinical stage I, II, III and IV, respectively. Participants classified as treatment (T) stage I were 744 of 881 (84.4%) at 6 months, and 796 of 822 (96.8%) at 12 months. 994 of the 1229 (80.9%) had working functional status at baseline, increased to 852 of the 881 (96.7%) at 6 months, and to 809 of 822 (98.4%) at 12 months. Among those with documented CD4 count result, 27.8% (87/313), 7.4% (21/282), and 2.5% (6/237) participants had a CD4 <100 at baseline, 6, and 12 months, respectively. The median (IQR) CD4 count at baseline, 6, and 12 months was 188 (89-347, 338.5 (204-480) and 367 (235-516) respectively. 1,134 (92.3%), 858 (97.4%) and 799 (97.2%) were screened for TB, and 125 (11.0%), 85 (9.9%) and 59 (7.4%) were diagnosed with TB at baseline, 6 and 12 months, respectively. 90.4% (113/125) participants diagnosed with TB started on anti-TB medications at baseline. More than 95% of PLHIV without TB received isoniazid prophylactic therapy (IPT). OIs other than TB were identified in 327 (26.6%), 43 (4.9%), and 23 (2.8%) study participants at baseline, 6, and 12 months, respectively. For ART regimen, TDF/3TC/EFV (FDC) was prescribed for 749 (60.9%) at baseline, decreased to 412 (46.8%) and 200 (24.3%) at 6 and 12 months, respectively. In contrast, TDF/3TC/DTG was prescribed to 455 (37.0%) at baseline, increased to 459 (52.1%) and 608 (74.0%) at 6 and 12 months, respectively. ART regimen shift or switch occurred in 124 (14.1%) and 245 (29.8%) participants at 6 and 12 months, respectively. Health care providers assessed 57 (6.7%) and 55 (7.2%) participants to have fair or poor adherence to treatment at 6 and 12-months follow-up, respectively (Table 3).

Outcome of participants follow-up at 6 and 12 months

At 6 months follow-up of the 1,229 participants, 934 (76%) were active and on ART (including the 53 who missed the interview), 178 (14.5%) were LTFU, 66 (5.4%) were transferred out to other health facilities, and 51 (4.1%) had died. At the end of 12 months follow-up, 882 (71.8%) were active and on ART, 93 (7.6%) were transferred-out to other heath facilities, 195 (15.9%) were LTFU, and 59 (4.8%) had died (Table 4).

Reasons for LTFU

A total of 195 persons were lost from HIV care during the follow-up period. The three most common reasons reported for LTFU were feelings of hopelessness (31, 15.9%), denial of positive HIV diagnosis (31, 15.9%), and being addicted with substances like Khat (23, 11.8%) (Figure 1).

Magnitude and predictors of attrition from HIV treatment services

The overall incidence rate of attrition from HIV care and treatment during the one-year follow-up period was 5.02 cases per 1000-person week (95% CI, 4.44-5.68 per 1000-person week). The highest incidence rate of attrition occurred in the first 24 weeks of follow-up period (Table 5).

Association of socio-demographic, behavioral and clinical variables were tested using Kaplan Meier's method to outline candidate variables for the final model. However, only administrative region, mobile ownership, having a child and baseline functional status were found to show a statistically significant association with attrition from HIV treatment. Overall attrition was found to be higher in the first 24 weeks of follow-up and observed to stabilize afterwards (Figure 2).

After excluding variables using Kaplan Meier's method , the following findings were reported through the cox-regression model. PLHIV from health facilities in Oromia, AHR=1.68 (95% CI: 1.22-2.32), and Addis Ababa/Dire Dawa, AHR=1.51 (95% CI: 1.05-2.17), had increased risk of attrition from HIV care and treatment compared to participants from health facilities in Amhara. Study participants who did not have a child had higher risk i.e., 1.44, (95% CI: 1.12-1.85) times risk of attrition compared to participants who had a child. Participants who did not own mobile phone had 1.37 (95% CI: 1.02-1.83) times risk of attrition compared to participants who owned mobile phone. Patients with ambulatory/bedridden functional status at the time of diagnosis had 1.44 (95% CI: 1.08-1.92) times risk of attrition from HIV care and treatment as compared to participants with working functional status (Table 6).

Discussion

In this analysis of attrition among PLHIV enrolled in HIV care and treatment in 39 high caseload public health facilities in five administrative regions of Ethiopia, the overall incidence rate of attrition was 5.02 cases per 1000-person week (i.e., for every 1000 PLHIV enrolled to ART and under follow up, there were about 5 PLHIV leaving the ART services each week). his figure is by far lower than the magnitude of attrition reported by other studies from health facilities in Northern (13) and Southern Ethiopia (27), Zimbabwe (28), and Kenya (14). This disparity could be explained by the larger scope or coverage of our study, which included many health facilities in different regions of Ethiopia. Other explanations could be differences in service quality, provider skills and training, better treatment options in this study.

The most common documented reasons for LTFU were feeling of hopelessness, denial of the diagnosis, and addiction to substances. Mostly similar reasons were reported in a

study from Zambia (15).The variety of these reasons for leaving HIV care and treatment suggest multifaceted interventions (including exploring predisposing factors for LTFU, strengthening mental health services and other relevant measures) are warranted to enhance retention of PLHIV to ensure better outcomes.

Overall attrition was found to be higher in the first 24 weeks of follow-up and observed to stabilize afterwards. In contrast to this, attrition from HIV care and treatment was found to be low in the first six-months of follow up in a study finding from Zimbabwe(29). The variation in the level of attrition between the two studies could be explained by better experience in engaging the PLHIV during the early phase of ART initiation in Zimbabwe This heralds that further efforts need to be in place during the enrolment phase to ensure better retention including during ART initiation and the early phases of treatment in Ethiopian context.

Participants from health facilities in Oromia and Addis Ababa/Dire Dawa regions had increased risk of attrition from HIV care and treatment compared to participants from Amhara. This may indicate regional disparities in terms of providing HIV care and treatment services, i.e., health facilities from Amhara region and included in this study may have had better experience in ensuring retention in HIV care once PLHIV are enrolled to treatment than health facilities in other regions. Further investigations are required to examine and explore the experiences in strengthening retention in HIV treatment in Amhara and Tigray administrative regions so that better experiences could subsequently be adopted by other regions. Persons enrolled in HIV care and who did not have a child had increased risk of attrition from HIV care and treatment compared to participants who had a child, which may suggest that PLHIV with family members might be more stable to continue receiving treatment than persons who do not have children. Persons who were enrolled in HIV care and treatment who did not own mobile phone had increased risk of attrition from HIV care and treatment compared to participants who owned mobile phone, consistent with the interventional studies of mobile health services in the United States of America and South Africa (17,18). Communication through mobile phones with persons enrolled to HIV treatment might have improved retention of PLHIV in HIV treatment.

Persons with ambulatory/bedridden functional status at the time of diagnosis had increased risk of attrition from HIV care and treatment as compared to participants with working functional status, consistent with other studies conducted in Zimbabwe and different parts of Ethiopia(13,19,29).

These results provide insights into strategies and interventions to reduce attrition from HIV treatment, a shared responsibility for health system leadership, healthcare workers, family members of PLHIV, the community and health partners.

Strengths of this analysis include the prospective cohort study design, the scope of the study including a large number of high case-load facilities in multiple regions, and the rigorous data analysis. However, there are some limitations to this analysis, including limited data completeness on some variables and social desirability bias for some responses.

Conclusion

While the low attrition rate from HIV treatment in Ethiopia compared to other regional countries is encouraging the first six months following the initiation of ART warrants close follow up as considerable proportion of attrition was reported during this critical period. Administrative regions with increased risk of attrition have to adopt best experiences from others with better performance. Comprehensive mental health services and psychosocial support addressing PLHIV have to be strengthened. Real-time communication with PLHIV and their family members needs to be enhanced including through telephone calls. Fostering family and social support to PLHIV is another key intervention to be promptly instituted. Generation of timely evidence required to inform policy makers and programmers as to what interventions are required to improve retention in lHIV treatment. The result of this assessment can inform all concerned parties to design strategies and programs to improve treatment continuity, improve health outcomes for PLHIV, and improve the HIV epidemic control treatment cascade.

Acknowledgement

This study was funded by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) through the United States Centers for Disease Control and Prevention (CDC) under the terms of Cooperative Agreement with Ethiopian Public Health Association number 1U2GGH001039. The authors are grateful to Ministry of Health, Ethiopian Public Health Institute, Regional Health Bureaus, health facilities for their support during the conduct of the study.

References

1. Global U, Update A. THE PATH THAT ENDS. 2023;
2. UNAIDS. Global- Hiv/Aids Statistics. Vol. 3, Factsheet on HIV Epidemiological Estimate. 2023.
3. Global WHO, Programme HI V. WHO GLOBAL HIV PROGRAMME WHO HIV POLICY ADOPTION AND IMPLEMENTATION STATUS IN COUNTRIES. 2022;2021(JULY).
4. World Health Organization. Guideline on When To Start Antiretroviral Therapy and on Pre-Exposure Prophylaxis for HIV. 2015;(September):1–76.
5. UNAIDS. Global HIV Statistics. Fact Sheet 2021. 2021;(June):1–3.
6. Onoya D, Hendrickson C, Sineke T, Maskew M, Long L, Bor J, et al. Attrition in HIV care following HIV diagnosis: a comparison of the pre-UTT and UTT eras in South Africa. J Int AIDS Soc. 2021;24(2).
7. Mugenyi L, Nanfuka M, Byawaka J, Agaba C, Mijumbi A, Kagimu D, et al. Effect of universal test and treat on retention and mortality among people living with HIV-infection in Uganda: An interrupted time series analysis. PLoS One [Internet]. 2022;17(5 May):1–13. Available from: 10.1371/journal.pone.0268226
8. Girum T, Yasin F, Wasie A, Shumbej T, Bekele F, Zeleke B. The effect of "universal test and treat" program on HIV treatment outcomes and patient survival among a cohort of adults taking antiretroviral treatment (ART) in low income settings of Gurage zone, South Ethiopia. AIDS Res Ther [Internet]. 2020;17(1):1–9. Available from: 10.1186/s12981-020-00274-3 [PubMed: 31907064]
9. Mayasi N, Situakibanza H, Mbula M, Longokolo M, Maes N, Bepouka B, et al. Retention in care and predictors of attrition among HIV-infected patients who started antiretroviral therapy in Kinshasa, DRC, before and after the implementation of the 'treat-all' strategy. PLOS Glob Public Heal. 2022;2(3):e0000259.
10. Bantie B, Abate MW, Nigat AB, Birlie TA, Dires T, Minuye T, et al. Attrition rate and its predictors among adults receiving anti-retroviral therapy following the implementation of the "Universal Test and Treat strategy" at public health institutions in Northern Ethiopia. A

retrospective follow-up study. Heliyon [Internet]. 2022;8(11):e11527. Available from: 10.1016/j.heliyon.2022.e11527 [PubMed: 36411907]

11. Muhula S, Gachohi J, Kombe Y, Karanja S. Interventions to improve early retention of patients in antiretroviral therapy programmes in sub-Saharan Africa: A systematic review. PLoS One [Internet]. 2022;17(2 February):1–26. Available from: 10.1371/journal.pone.0263663
12. Federal Ministry of Health Ethiopia. National Consolidated Guidelines for Comprehensive Hiv Prevention , Care and. Fmoh [Internet]. 2018;1–238. Available from: file:///C:/Users/Tere/Desktop/University of South Africa (17–2017)/Documents on Cervical Cancer/July 22,2017/All Litratures/National Comprehensive HIV Care Guideline 2018.pdf
13. Dejen D, Jara D, Yeshanew F, Fentaw Z, Feleke TM, Girmaw F, et al. Attrition and its predictors among adults receiving first-line antiretroviral therapy in woldia town public health facilities, northeast Ethiopia: A retrospective cohort study. HIV/AIDS - Res Palliat Care. 2021;13:445–54.
14. Hassan AS, Mwaringa SM, Ndirangu KK, Sanders EJ, De Wit TFR, Berkley JA. Incidence and predictors of attrition from antiretroviral care among adults in a rural HIV clinic in Coastal Kenya: A retrospective cohort study. BMC Public Health. 2015;15(1):1–9. [PubMed: 25563658]
15. Mody A, Sikombe K, Beres LK, Simbeza S, Mukamba N, Eshun-Wilson I, et al. Profiles of HIV Care Disruptions Among Adult Patients Lost to Follow-up in Zambia: A Latent Class Analysis. J Acquir Immune Defic Syndr. 2021;86(1):62–72. [PubMed: 33105396]
16. Beard JH, Ohene-Yeboah M, deVries CR, Schecter WP. Hernia and Hydrocele. Dis Control Priorities, Third Ed (Volume 1) Essent Surg. 2015;151–71.
17. Belzer ME, Naar-King S, Olson J, Sarr M, Thornton S, Kahana SY, et al. The use of cell phone support for non-adherent HIV-infected youth and young adults: An initial randomized and controlled intervention trial. AIDS Behav. 2014;18(4):686–96. [PubMed: 24271347]
18. Venter WDF, Fischer A, Lalla-Edward ST, Coleman J, Chan VL, Shubber Z, et al. Improving linkage to and retention in care in newly diagnosed hiv-positive patients using smartphones in South Africa: Randomized controlled trial. JMIR mHealth uHealth. 2019;7(4):1–10.
19. Abebe Moges N, Olubukola A, Micheal O, Berhane Y. HIV patients retention and attrition in care and their determinants in Ethiopia: A systematic review and meta-analysis. BMC Infect Dis. 2020;20(1):1–24.
20. Plazy M, Orne-gliemann J, Dabis F. Retention in care prior to antiretroviral treatment eligibility in sub-Saharan Africa : a systematic review of the literature. 2015;
21. The Joint United Nations Programme on HIV/ AIDS. UNAIDS data 2023. UNAIDS Jaint United Nationns Program HIV/AIDS [Internet]. 2023;1–38. Available from: unaids.org
22. PEPFAR. Ethiopia Country Operational Plan Strategic Direction Summary. 2022;
23. Ministry of Health E. HIV NATIONAL. 2023;
24. Al. AB et. Assessment of patients' outcomes along the HIV continuum study_full report_March 16_2023. 2023.
25. Thejus T, Jeeja M, Jayakrishnan T. The functional status of patients with AIDS attending antiretroviral treatment center. Indian J Palliat Care. 2009;15(1):57–60. [PubMed: 20606857]
26. Ebrahimi KD and N. Goodness-of-Fit Testing for the Cox Proportional Hazards Model. :237–54.
27. Bimer KB, Sebsibe GT, Desta KW, Zewde A, Sibhat MM. Incidence and predictors of attrition among children attending antiretroviral follow-up in public hospitals, Southern Ethiopia, 2020: A retrospective study. BMJ Paediatr Open. 2021;5(1).
28. Tlhajoane M, Dzamatira F, Kadzura N, Nyamukapa C, Eaton JW, Gregson S. Incidence and predictors of attrition among patients receiving ART in eastern Zimbabwe before, and after the introduction of universal 'treat-all' policies: A competing risk analysis. PLOS Glob Public Heal [Internet]. 2021;1(10):e0000006. Available from: 10.1371/journal.pgph.0000006
29. Makurumidze R, Mutasa-Apollo T, Decroo T, Choto RC, Takarinda KC, Dzangare J, et al. Retention and predictors of attrition among patients who started antiretroviral therapy in Zimbabwe's national antiretroviral therapy programme between 2012 and 2015. PLoS One. 2020;15(1).

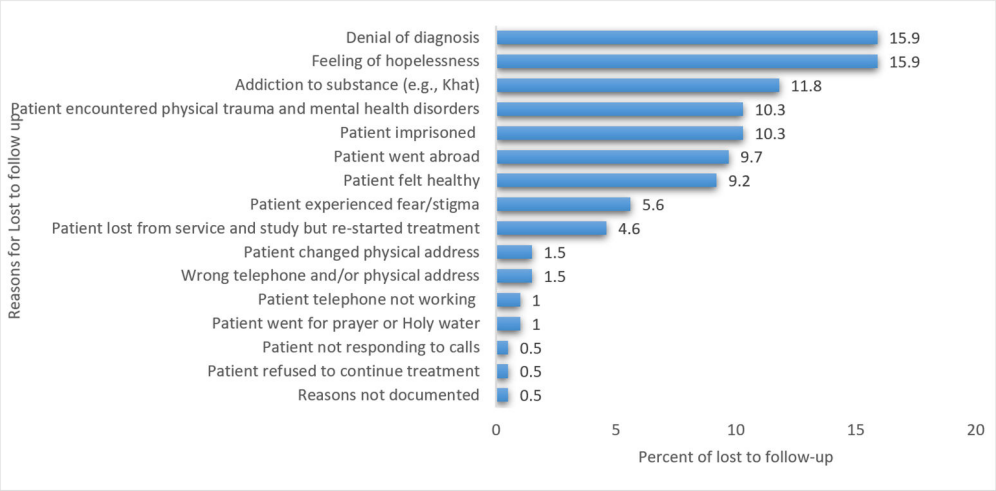

Figure 1:

Reasons for LTFU among PLHIV enrolled in ART in 39 health facilities in Ethiopia at 12 months, March 2019 to July 2020 (n=195)

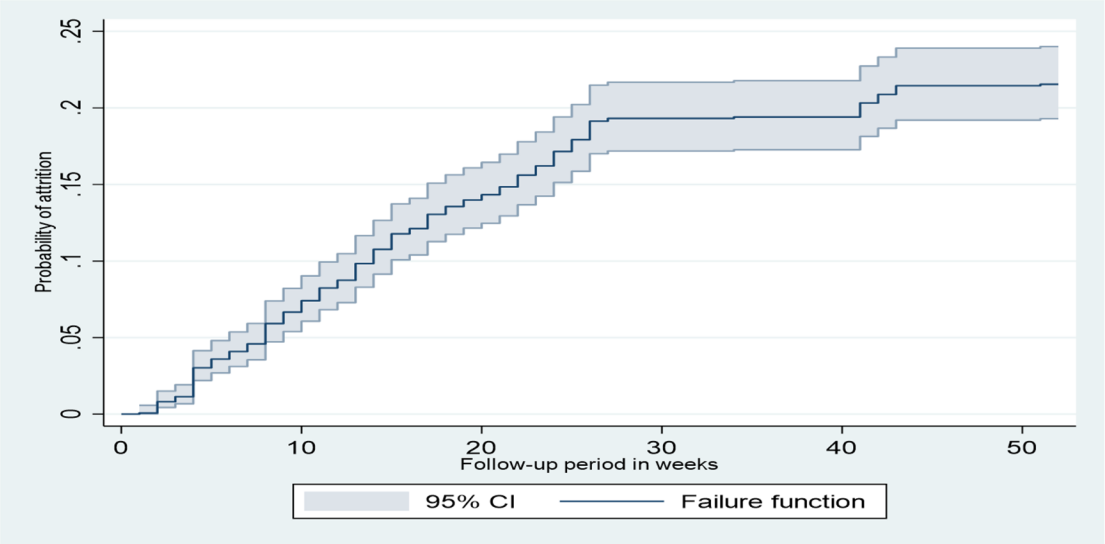

Figure 2:
Estimated overall attrition probability plot from HIV care and treatment among PLHIV in the study health facilities in Ethiopia, March 2019 to July 2020 (n=1,229)

Table 1:

Sociodemographic characteristics of PLHIV enrolled in treatment in 39 health facilities in Ethiopia, March to June 2019 (n=1,229)

Characteristics	Number	Percent
Region		
Oromia	430	35.0
Amhara	378	30.7
Addis Ababa	228	18.6
Tigray	155	12.6
Diredawa	38	3.1
Residence		
Urban	958	77.9
Rural	271	22.1
Sex		
Female	674	54.8
Male	555	45.2
Age group		
15 – 24	145	11.8
25 – 34	435	35.4
35 – 44	403	32.8
45+	246	20.0
Religion		
Orthodox	931	76.1
Muslim	200	16.4
Protestant	92	7.5
Education		
No formal school	368	29.9
Primary	424	34.5
Secondary	294	23.9
Higher	143	11.6
Marital status		
Married/cohabiting	512	41.7
Single	237	19.3
Divorced/Separated	342	27.8
Widow	138	11.2
Employment status		
Employed	552	44.9
Unemployed	318	25.9
Farmer	143	11.6
Others*	216	17.6
Average monthly household income in ETB		
< 1800	483	48.2

Characteristics	Number	Percent
≥1800	519	51.8
Own mobile phone		
Yes	986	80.3
No	242	19.7

ETB: Ethiopian Birr

Others: Refers to students, daily laborers, housewives and commercial sex workers

Table 2:

Access to HIV services among PLHIV enrolled in treatment in 39 health facilities in Ethiopia, March to June 2019 (n=1,487)

Variables	Number	Percent
Health facility type		
Hospital	803	65.3
Health center	426	34.7
Service delivery point HIV testing outlet at the facility		
Outpatient department	473	38.5
Voluntary counseling and testing	460	37.4
Inpatient department	74	6.0
Index case testing	73	5.9
Others *	149	12.1
HIV testing and counselling service providers at the time of diagnosis		
Nurses	1,006	81.9
Other health workers	223	18.1
Patient lives in the same city as the HF		
Yes	850	69.2
No	379	30.8
Estimated travel time from home to the facility		
< 30 minutes	128	10.4
30 – 59 minutes	569	46.3
1-2 hours	245	19.9
2.0-4.99 hours	72	5.9
5+ hours	215	17.5
Estimated distance from home to the health facility in Kilometers		
Less than 2	327	26.6
2 - 7	347	28.2
8 - 30	323	26.3
31+	232	18.9
Usual means of transportation to the facility		
On Foot	239	19.5
Public Transportation (Taxi, bus, train)	975	79.3
Others **	15	1.2

HF: Health Facility

Others*: Refers to persons tested in other health facilities (including private clinics) and arrived through referral and outreach services at community level

Others**: Refers to horseback, cart, Pedal bicycle and motor bicycle

Table 3:

Clinical characteristics of PLHIV newly enrolled in ART in 39 health facilities in Ethiopia, March to July 2020

Variables	Baseline		6th -month		12th -month	
	Number	Percent	Number	Percent	Number	Percent
BMI classification	*(n=1,200)*		*(n=881)*		*(n=822)*	
Underweight	470	39.2	167	19.0	117	14.2
Normal weight	629	52.4	594	67.4	557	67.8
Overweight/Obese	101	8.4	120	13.6	148	18.0
WHO clinical stage	*(n=1,229)*		*(n=881)*		*(n=822)*	
WHO/T stage I	587	47.8	744	84.4	796	96.8
WHO/T stage II	232	18.9	53	6.0	7	0.9
WHO/T stage III	317	25.8	66	7.5	14	1.7
WHO/T stage IV	93	7.6	18	2.0	5	0.6
Functional status	*(n=1,229)*		*(n=881)*		*(n=822)*	
Working	994	80.9	852	96.7	809	98.4
Ambulatory	203	16.5	28	3.2	13	1.6
Bed ridden	32	2.6	1	0.1	0	0.0
Had CD4 count measured	*(n=1,229)*		*(n=881)*		*(n=822)*	
Yes	366	29.8	307	35.2	286	35.4
No	863	70.2	566	64.8	522	64.6
CD4 result (cells/mm^3)	*(n=313)*		*(n=282)*		*(n=237)*	
<100	87	27.8	21	7.4	6	2.5
100 - 199	79	25.2	42	14.9	36	15.2
200-349	69	22.0	87	30.9	65	27.4
350-499	32	10.2	67	23.8	63	26.6
>=500	46	14.7	65	23.0	67	28.3
Median (IQR: Q1-Q3)	188(89-347)		339 (204-480)		367 (235-516)	Median (IQR: Q1-Q3)
Screened for TB	(n=1,229)		(n=881)		(n=822)	
Yes	1,134	92.3	858	97.4	799	97.2
No	95	7.7	23	2.6	23	2.8
Among the screened, had TB	*(n=1,134)*		*(n=858)*		*(n=799)*	
Yes	125	11.0	85	9.9	59	7.4
No	1009	89.0	773	90.1	740	92.6
Type of TB diagnosed	*(n=125)*		*(n=85)*		*(n=59)*	
Pulmonary TB	69	55.2	45	52.9	36	61.0
Extra pulmonary TB	38	30.4	31	36.5	17	28.8
Others	18	14.4	9	10.6	6	10.2
Anti-TB medication started	*(n=125)*		*(n=85)*		*(n=59)*	
Yes	113	90.4	85	100	58	98.3
No	12	9.6	0	0	1	1.7

Variables	Baseline		6th -month		12th -month	
	Number	Percent	Number	Percent	Number	Percent
Received prophylactic medications (IPT or CPT)	*(n=1,009)*		*(n=773)*		*(n=740)*	
Yes	602	59.7	592	76.6	324	43.8
No	407	40.3	87	11.3	65	8.8
Completed	NA		94	12.2	351	47.4
Had any opportunistic diseases other than TB	*(n=1,229)*		*(n=881)*		*(n=822)*	
Yes	327	26.6	43	4.9	23	2.8
No	902	73.4	838	95.1	799	97.2
Had any co-morbidities or medical problems other than OIs						
	(n=1,096)		*(n=881)*		*(n=822)*	
Yes	75	6.8	35	4.0	22	2.7
No	1021	93.2	846	96.0	800	97.3
ART regimen	*(n=1,229)*		*(n=881)*		*(n=822)*	
TDF + 3TC + EFV(FDC)	749	60.9	397	45.1	193	23.5
TDF+3TC+DTG	455	37.0	459	52.1	608	74.0
Others *	25	2.1	25	2.8	21	2.6
ARV treatment regimen switch/shift			*(n=881)*		*(n=822)*	
Yes			124	14.1	245	29.8
No			757	85.9	577	70.2
Adherence level			*(n=856)*		*(n=762)*	
Poor			22	2.7	17	2.2
Fair			34	4.0	38	5.0
Good			800	93.3	707	92.8

IPT- Isoniazid Preventive Therapy, CPT- Cotrimoxazole Preventive Therapy, TB-Tuberculosis, ARV-Antiretroviral drugs, ART-Antiretroviral treatment, OIs-Opportunistic infections, IQR: Interquartile range

Others*: AZT + 3TC + EFV, AZT + 3TC + NVP and TDF + 3TC + NVP

Table 4:

Outcome of study participants who were initiated on ART in the study health facilities in Ethiopia at the 6th and 12th month of follow-up, March 2019 to July 2020

Status	6th month		12th month	
	Number	Percent	Number	Percent
Active/retained	881	71.7	822 *	66.9
LTFU	178	14.5	195	15.9
Transferred Out	66	5.4	93	7.6
Dead	51	4.1	59	4.8
Missed Interview but still receiving treatment **	53	4.3	60	4.9
Total	1,229	100	1,229	100

LTFU, lost to follow-up.

* 24 cases were interviewed through telephone call as the study participants could not come to the health facility due to COVID-19 pandemic travel restriction.

** Study participants who missed their in-person study interview at 6 and 12-months but their medical record showed a visit.

Table 5:

Incidence rate of attrition within 12 months after ART initiation among PLHIV enrolled in ART in 39 health facilities of Ethiopia, March 2019 to July 2020 (n=1229)

Cohort time in Weeks	Person-time	LTFU /Dead	Rate	95% CI	
0 – 12	14,000	106	7.57	6.26	9.16
12 – 24	12,296	99	8.05	6.61	9.80
25 – 36	10,716	26	2.43	1.65	3.56
> 36	13,564	23	1.70	1.13	2.55
Total	50,576	254	5.02	4.44	5.68

LTFU: lost to follow-up.

Table 6:

Predictors of attrition from HIV care using cox regression model for PLHIV who visited selected health facilities in Ethiopia, March 2019 to July 2020 (n=1229)

Attrition to HIV care and treatment	CHR	95% CI for CHR		AHR	p-value	95% CI for AHR	
Region							
Amhara	1.00			1.00			
Oromia	1.72	1.25	2.35	1.68	0.0014	1.22	2.32
Tigray	1.22	0.79	1.91	1.23	0.3601	0.79	1.92
Addis Ababa /Dire Dawa	1.48	1.04	2.12	1.51	0.0251	1.05	2.17
Had children							
Yes	1.00			1.00			
No	1.37	1.07	1.76	1.44	0.0042	1.12	1.85
Owned mobile phone							
Yes	1.00			1.00			
No	1.48	1.11	1.96	1.37	0.0340	1.02	1.83
Functional status at baseline							
Working	1.00			1.00			
Ambulatory/Bed ridden	1.55	1.16	2.05	1.44	0.0125	1.08	1.92

CHR: Crude Hazard Ratio, AHR: Adjusted Hazard Ratio, CI: Confidence Interval