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Time to Loss to Follow-Up and Its Predictors among Adult Patients Receiving Antiretroviral Therapy at Aira General Hospital, Western Ethiopia

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Abstract

The study aimed to assess the time to loss to follow-up and its predictors among HIV patients on ART at Aira General Hospital, Western Ethiopia. 2025. A retrospective cohort study was conducted on patients enrolled from January 2020 to December 2024 at Aira General Hospital. Data were analysed using Kaplan–Meier survival curves and Cox proportional hazard models. Variables with a p-value less than 0.05 in multivariate analysis were considered statistically significant. The incidence density rate of loss to follow-up (LTFU) from ART services among patients was 11.03 per 1,000 person-months (95% CI: 8.71, 13.96). Notably, 47 (67.14%) of the LTFU cases occurred within the first 12 months of treatment initiation. Several factors were significantly associated with LTFU in the multivariable analysis. Patients without a registered phone number (AHR = 4.16; 95% CI: 1.80–11.12), advanced WHO clinical stages (III and IV) (AHR = 2.78; 95% CI: 1.35–10.31), unknown viral load status (AHR = 3.81; 95% CI: 2.52–6.36), Non-disclosure of HIV status (AHR = 3.67; 95% CI: 1.56–7.21), lack of Cotrimoxazole preventive therapy (CPT) initiation (AHR = 3.22; 95% CI: 1.15–8.25), and poor or fair adherence to ART (AHR = 4.44; 95% CI: 1.73–10.12) were independent predictors of Loss To follow up. Loss to follow-up was highest within the first 12 months. Key predictors included lack of phone registration, advanced disease stages, non-disclosure, and poor adherence. Health providers should prioritize updating contact details, monitoring new patients, and assessing virological status regularly.

Keywords: *ART, Ethiopia, Follow-up, Predictor.*

Introduction

HIV/AIDS remains one of the world's most significant public health challenges, particularly in low- and middle-income countries. Globally, 38.4 million people live with HIV, and out of them, 75% received ART in 2021 (WHO). 1.5 million People became newly infected with HIV in 2021, and on average, 650,000 people died from AIDS-related illnesses in the same year (6). Two-thirds of whom (25.6 million) are African. According to the World Population Review, adult HIV prevalence in Ethiopia is 0.9%, with 13,000 deaths in 2020 [1].

Even though many programs and interventions have been implemented in the HIV/AIDS program globally, there is a big challenge of loss to follow-up from treatment. Systematic and meta-analysis research, which was done in LMIC, LTFU in Sub-Saharan African countries, varies between 2.8% and

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65.6% [2]. Another study conducted in sub-Saharan Africa indicates that, Predictors of loss from care among HIV infected patients receiving ART at a public sector HIV treatment clinic revealed that 24.6 % were lost to follow-up [3]. According to studies conducted in African countries, the incidence of lost to follow-up was 25.35% in South Africa [1], 26% in Malawi [4], 15.5% in Uganda [5], and 30.6% in Nigeria [6]. According to a retrospective follow-up study conducted in Ethiopia, the incidence of LTFU ranges from 8.95% to 13.99% in different regions [7]. The incidences were 21.3%, 13.45 %, 14.8% and 9.1% in Oromia Region, Northwest Amhara, Jigjiga Karamara General Hospital, and Arab Minch General Hospital, respectively [8–11].

LTFU remains a critical barrier to ART program success, particularly in low-resource settings like Ethiopia [9, 12]. It significantly contributes to increased morbidity and mortality, treatment failure (both virological and immunological), drug resistance, hospitalization, and transmission of resistant strains. Retention in care is a key indicator of ART program effectiveness [13, 14]. LTFU hinders the attainment of the second and third “95” targets of the UNAIDS 95–95–95 framework by disrupting consistent ART use and viral load suppression, ultimately reducing CD4 counts and increasing viral replication [15].

Several studies have identified contributing factors to LTFU. These include low haemoglobin levels, nutritional deficiencies, opportunistic infections, cancers, illiteracy, being unmarried, rural residency, alcohol consumption, tobacco use, low CD4 count, advanced WHO clinical stages, brief HIV history, drug side effects, high viral load, unemployment, regimen changes, tuberculosis co-infection, male gender, low weight, mental illness, INH therapy, impaired functional status, and advanced HIV disease affecting haematopoiesis [1, 3, 13, 15, 16].

To address LTFU, several interventions and tracing methods have been implemented. A systematic review in LMICs highlighted four effective strategies in Sub-Saharan Africa: directly observed therapy with added support, community-based adherence programs, adherence clubs, and specialized care for patients with low CD4 counts [17]. A study from southern South Africa reported that LTFU patients were traced by phone calls (33%), home visits (48%), or both methods combined (19% [1]. In Ethiopia, findings from Paw General Hospital showed that 77.1% of traced LTFU patients were alive, while 22.9% had died. Among the living, 41.2% had resumed ART at the same hospital, 20.8% were on treatment at other facilities, and 38% had discontinued therapy [16].

Currently, the Ethiopian government is targeting the third "95", achieving viral load suppression among those on ART by 2030. To achieve this, comprehensive data on the timing and predictors of LTFU is essential. While numerous factors have been identified, detailed, localized data on when patients disengage from treatment remains scarce. This study aims to estimate the time to LTFU and identify its predictors, including behavioral and clinical factors, among adults receiving ART at Aira General Hospital in western Ethiopia. The findings are expected to provide evidence for designing targeted interventions, enhancing patient retention, and supporting national and global efforts to meet the UNAIDS 95 95–95 targets.

Materials and Methods

Description of the Site

This study was a facility-based retrospective cohort study conducted at Aira General Hospital. The source population comprised all adult patients who were enrolled on antiretroviral therapy (ART) at Aira General Hospital between January 1, 2020, and December 31, 2024. From this source population, a subset of records was selected

based on defined eligibility criteria to form the study population. The study was conducted using an open cohort design, allowing participants to enter and exit the cohort at any point within the study period.

The inclusion criteria involved all records of adults enrolled on ART during the specified timeframe. Exclusion criteria included records that did not specify the ART initiation date or were recorded as transfer out or death. Ethical clearance was obtained from the relevant university institute, and no personal identifiers were used in the data collection process. The principal investigator ensured confidentiality by securely storing the data. Results of this study are intended to be disseminated through academic channels, including submission to the affiliated university, presentations at seminars, and publication in peer-reviewed journals.

Description of the Experiments Done

Sample size determination was performed for time-to-event data using survival analysis techniques. Specifically, the log-rank method was used under the assumptions of proportional hazards and equal allocation between two comparison groups ($\pi1=\pi2=0.5\pi\_1 = \pi\_2 = 0.5\pi1 = \pi2 = 0.5$). The required number of events (EEE) was calculated using the formula:

$$\mathbf{E = (Z\alpha/2 + Z\beta)^2 / [\pi_1\pi_2 (\log HR)^2]}$$

The probability of the event was:

$$\mathbf{PE = 1 - (\pi_1 S_1(t) + \pi_2 S_2(t))}$$

Calculations were based on a 5% significance level ($Z\alpha/2 = 1.96$), 80% power ($Z\beta$), a hazard ratio (HR) from prior studies, and a 10% withdrawal rate. The Freedman method was applied using STATA version 14 with the command stopper log rank, and HR estimates were drawn from studies in North Showa Zone public hospitals [18]. The estimated probability of events was derived from the sample size and number of events.

The Freedman method was implemented using STATA version 14, using prior hazard ratios from studies conducted in the North Showa Zone public hospitals. Based on estimated hazard ratios and probabilities of event occurrence, sample size calculations were made for several variables. For WHO stage IV (HR = 1.50), 198 events were expected, leading to a sample size of 382. Similarly, for BMI < 18.5 kg/m² (HR = 1.60), 148 events were projected with a sample size of 280. For baseline CD4 count < 200 (HR = 1.66), 128 events were expected from a sample of 240. Considering the largest required sample size, 382 was selected as the final sample size.

The study investigated a range of variables. The dependent variable was the time to loss to follow-up (LTFU) from ART services. Independent variables included socio-demographic factors (age, sex, marital status, education, religion, residence, occupation, distance to facility, ethnicity, and registered phone number), clinical and laboratory characteristics (functional status, WHO stage, viral load, BMI, ART initiation time, regimen and changes), behavioral factors (ART adherence and disclosure status), and past medical history (opportunistic infections, TB, CPT, and TPT).

Operational definitions were established to ensure consistent interpretation. For example, "lost to follow-up" (LTFU) referred to patients not seen for at least 30 days after the last missed appointment, excluding those transferred out or recorded as dead. Time to LTFU was the interval from ART initiation to the last missed appointment. "Events" were defined as patients who were LTFU, while "censored" referred to those who died, transferred out, or remained in treatment by the study's end. ART adherence was classified as good, fair, or poor based on missed doses.

Description of the Laboratory Methods

Data collection was performed using a structured data extraction checklist derived from ART intake and follow-up forms. The intake form was divided into two parts. Intake Form A captured socio-demographic characteristics, disclosure status, and caregiver availability. Intake Form B documented past medical history, including history of opportunistic infections and TB. The follow-up form recorded clinical data such as weight, height, WHO stage, functional status, ART initiation date, adherence, and viral load.

Before data collection, a one-day orientation was provided to both data collectors and supervisors, focusing on how to fill in the questionnaire and maintain data confidentiality. Data collectors were trained BSc nurses from the ART clinic. Supervisors monitored the collection process daily to ensure data quality. To further enhance data reliability, a pre-test was conducted on 5% of the sample size at Gumbi Adventist Hospital. Based on pre-test feedback, the data collection tool was refined.

Description of Statistical Methods Used

Following data collection, the data were entered into EPI Info version 4.6 and exported to STATA version 17 for cleaning, coding, and analysis. Descriptive statistics were used to summarize the data, and results were presented in tables and graphs. Continuous variables were categorized, and categorical variables were recategorized for suitability in analysis. Each participant's outcome was dichotomized into either LTFU or censored.

The incidence density rate was calculated using person-time of follow-up for the entire cohort and various subgroups. Time was measured in months to calculate median survival time. Kaplan–Meier survival curves were used to estimate the probability of LTFU over time. The log-rank test was applied to compare survival curves across different categories of independent variables.

The Cox proportional hazards model was used to identify predictors of LTFU. The model's assumptions were evaluated using Schoenfeld residuals, log-log plots, and global tests. The overall fit of the model was assessed using a Cox-Snell residual plot. Model selection was guided by the log-likelihood (LL) value. Variables with a p-value less than 0.25 in bivariate analysis were included in the multivariable model. Final results were reported using crude and adjusted hazard ratios (CHR and AHR) with 95% confidence intervals. Statistical significance was set at $p < 0.05$.

Results

Socio-Demographic Characteristics

In this study, 380 patient records were reviewed, yielding a response rate of 99.5%. The age of participants ranged from 15 to 75 years, with a mean age of 31.64 years (±10.5 SD). The 15–24 age group constituted the largest proportion of the cohort (47.2%) and also represented the highest number of patients lost to ART follow-up (LTFU), accounting for 47.2% of all events. This was followed by the 25–34 age group, contributing 20.8% of LTFU cases, indicating that younger individuals are at increased risk of treatment discontinuation. Females made up the majority of the total cohort (69.2%) and accounted for 62.5% of LTFU events, while males represented 30.8% of censored cases and 37.5% of those lost to follow-up. Although females were more likely to be retained in care, their high absolute number among LTFU cases reflects their greater representation overall.

Marital status showed that married individuals made up the largest proportion of both the total sample (51.4%) and those lost to follow-up (37.5%). Single (23.6%), divorced (18.1%), and widowed (6.9%) individuals also contributed notably to LTFU. The vast majority of participants lived in urban areas

(82.5%), and this group also accounted for 84.7% of LTFU cases. In terms of educational status, patients with primary-level education represented 62.5% of LTFU cases and 49.0% of censored individuals. Those with no formal education made up 8.3% of LTFU, while patients with secondary education and above accounted for only 29.2% of LTFU events. Occupational status showed significant variation. Employed individuals (government or private) accounted for 42.5% of censored cases and 31.9% of LTFU, while housewives represented 27.9% of those censored but only 18.1% of LTFU. Notably, female sex workers (FSWs) were disproportionately represented among those lost to follow-up, accounting for 38.9% of events despite comprising only 16.2% of the censored population.

Religious affiliation showed Orthodox Christians comprised the largest share of both censored (50.3%) and LTFU (54.2%) cases, followed by Protestants and Muslims. However, no strong association between religion and LTFU was observed. Unexpectedly, most LTFU cases (69.4%) came from patients who lived more than 5 km away from the health facility, despite this group representing only 61.0% of those retained. This suggests that physical distance may still play a role in follow-up challenges. Finally, mobile phone ownership showed a clear association with retention. Among patients who had a registered cell phone number, only 31.9% were lost to follow-up. In contrast, 68.1% of LTFU cases came from those without a registered phone.

Table 1. Sociodemographic characteristics of adult patients receiving ART drugs at Aira General Hospital, Western Ethiopia, 2025

Variable	Category	Events	Censored
Sex	Female	45 (62.5)	213 (69.2)
	Male	27 (37.5)	95 (30.8)
Age	15–24	34 (47.2)	68 (22.1)
	25–34	15 (20.8)	126 (40.9)
	35–44	9 (12.5)	75 (24.4)
	45–54	12 (16.7)	28 (9.1)
	>55	2 (2.8)	11 (3.6)
Marital Status	Single	17 (23.6)	60 (19.5)
	Married	37 (51.4)	159 (51.6)
	Divorced	13 (18.1)	59 (19.2)
	Widowed	5 (6.9)	30 (9.7)
Residence	Urban	61 (84.7)	254 (82.5)
	Rural	11 (15.3)	54 (17.5)
Educational Status	No formal education	6 (8.3%)	42 (13.6%)
	Primary	45 (62.5%)	151 (49.0%)
	Secondary and above	21 (29.2%)	115 (37.3%)
Occupational Status	Housewife	13 (18.1%)	86 (27.9%)
	Employed (Gov't/Private)	23 (31.9%)	131 (42.5%)
	Daily laborer	6 (8.3%)	36 (11.7%)
	FSW	28 (38.9%)	50 (16.2%)
	Others*	2 (2.8%)	5 (1.6%)

Religion	Protestant	19 (26.4%)	88 (28.6%)
	Orthodox	39 (54.17%)	155 (50.32%)
	Adventist	1 (1.4%)	2 (0.6%)
	Muslim	13 (18.1%)	59 (19.2%)
	Others**	0 (0.0%)	4 (1.3%)
	Protestant	19 (26.4%)	88 (28.6%)
Distance from HF	< 5 km	22 (30.6)	120 (39.0)
	> 5 km	50 (69.4)	188 (61.0)
Having a cell Phone	Yes	23 (31.9)	243 (78.9)
	No	49 (68.1)	65 (21.1)

Others - students, farmers, merchants,* *Others** - Wakefata, Jehovah's Witness*

Clinical and Past Medical Characteristics

Although the majority of respondents were in WHO clinical stage I (65.0%), a higher proportion of events occurred among those in advanced stages, particularly stage IV. Most patients (82.9%) were on regimen 1j (TDF+3TC+DTG), and no substantial difference was observed in event distribution across ART regimens. Functional status was also a key indicator: while 86.1% of patients were working, events were more common among those who were ambulatory or bedridden, pointing to the predictive value of reduced functional capacity. Notably, viral load monitoring emerged as a critical gap; 34.5% of patients had no recorded viral load result, and 83.3% of those lost to follow-up lacked viral load documentation at their last visit (Table 2).

Nearly three-fourths of the patients [278 (73.16%)] had no history of opportunistic infection, while 102 (26.84%) had a documented history of such infections. Among the reviewed charts, 306 (80.5%) of the respondents had initiated tuberculosis preventive therapy (TPT), whereas 74 (19.5%) had not.

Regarding Cotrimoxazole Preventive Therapy (CPT), 151 (39.7%) of patients had received CPT as prophylaxis, while 216 (56.8%) had not received it, and CPT status was missed in 13 (3.4%) cases. Among those who did not initiate CPT, 58 (80.56%) were lost to care and treatment, highlighting a possible link between lack of CPT and treatment interruption. (Table 2).

Table 2. Clinical and Past Medical Characteristics of Adult Patients Receiving ART Drugs at Aira General Hospital, Western Ethiopia, 2025

Variable	**Category**	**Events (n = 72)**	**Censored (n = 308)**
Baseline WHO staging	Stage I	43 (59.7%)	204 (66.2%)
	Stage II	4 (5.6%)	47 (15.3%)
	Stage III	13 (18.1%)	31 (10.1%)
	Stage IV	12 (16.7%)	26 (8.4%)
Baseline ART regimen	1j (TDF+3TC+DTG)	58 (80.6%)	257 (83.4%)
	1e (TDF+TC+EVF)	11 (15.3%)	43 (14.0%)
	1k (AZT+3TC+DTG)	2 (2.8%)	7 (2.3%)
	Other***	1 (1.4%)	1 (0.3%)
Nutritional status	Underweight	61 (84.7%)	234 (76.0%)

	Normal	7 (9.7%)	58 (18.8%)
	Overweight	4 (5.6%)	16 (5.2%)
Viral load status	Suppressed	8 (11.1%)	225 (73.1%)
	Moderate	2 (2.8%)	7 (2.3%)
	High	2 (2.8%)	5 (1.6%)
	Not done	60 (83.3%)	71 (23.1%)
Functional status	Working	52 (72.2%)	275 (89.3%)
	Ambulatory	13 (18.1%)	25 (8.1%)
	Bedridden	7 (9.7%)	8 (2.6%)
History of opportunistic infection	Yes	20 (27.78%)	82 (26.62%)
	No	52 (72.22%)	226 (73.38%)
History of Active TB	Yes	5 (6.94%)	28 (9.09%)
	No	67 (93.06%)	280 (90.91%)
CPT initiation	Yes	14 (19.44%)	137 (44.48%)
	No/Missed	58 (80.56%)	171 (55.52%)

*Others***- 1h (ABC + 3TC + EFV)*

Behavioural Factors

About disclosure status, 133 (35.0%) patients had not disclosed their HIV status to their relatives, while 231 (60.8%) had disclosed, and the status was undocumented in 16 (4.2%) cases. Among those lost to follow-up, 50 (69.44%) were from the group that had not disclosed their status, suggesting a potential association between non-disclosure and treatment interruption. In terms of adherence, 235 (61.8%) patients had a history of good adherence, while 53 (13.9%) and 66 (17.4%) showed poor and fair adherence, respectively. Adherence status was missing for 26 (6.8%) patients. Among those who were lost to follow-up, the majority, 45 (62.50%), had fair adherence, followed by 16 (22.22%) with poor adherence and only 3 (4.17%) with good adherence. Regarding caregiver availability, 247 (65.0%) patients had an identified caregiver, 126 (33.2%) did not, and data were missing for 7 (1.8%). Loss to follow-up was slightly higher among those without a caregiver (35 out of 72 events, or 48.61%), compared to those with caregiver support (37 out of 72 events, or 51.39%) (Table 3).

Table 3. Behavior of patients on ART at Aira General Hospital, Western Ethiopia, 2025

Variables	**Categories**	**Events**	**Censored**
Disclosure status	Disclosed	21 (29.17)	210 (68.18)
	Not disclosed	50 (69.44)	83 (26.95)
	Missed	1 (1.39)	15 (4.87)
Availability of a caregiver	Yes	37 (51.39%)	210 (68.18%)
	No	35 (48.61%)	98 (31.82%)
Adherence	Good	3 (4.17%)	232 (75.32%)
	Poor	16 (22.22%)	37 (12.01%)
	Fair	53 (73.61%)	39 (12.66%)

Incidence of Loss to Follow-Up

The study participants were followed for a total of 6,993 months with a median of 19 months. Among the respondents, a total of 70 HIV infected patients were lost to follow-up from ART services. One third of the losses to follow up, 24 (34.28%), were within the first 6 months of ART initiation, and twenty-three (32.86%) of the losses to follow up were within the second six months of ART initiation. Therefore, the incidence density rate of loss to follow-up from ART services among ART attending patients was 11.03 (95% CI: 8.71, 13.96) per 1000 person months (Figure 1).

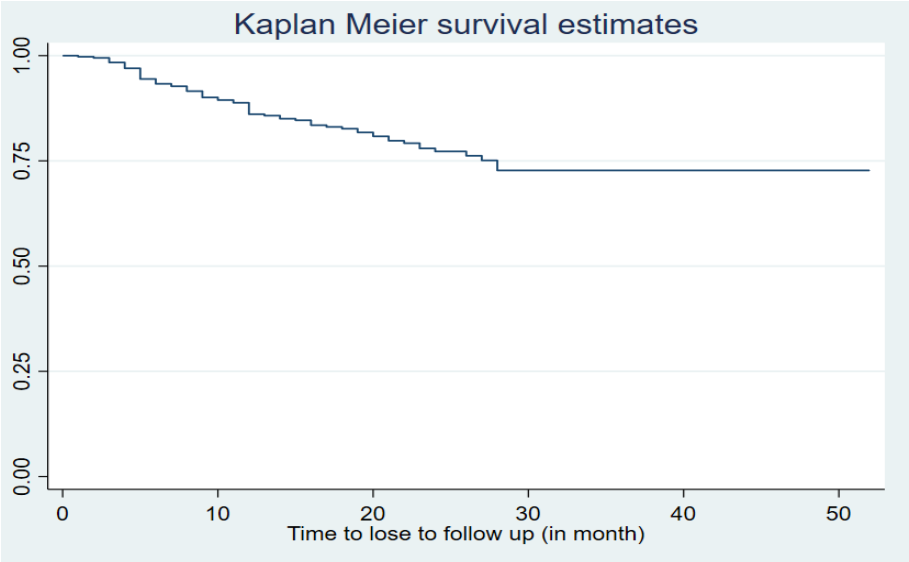

Figure 1. Kaplan–Meier estimate of loss to follow-up among patients attending ART at Aira General Hospital, Western Ethiopia, 2025

Survival Status of the Patients

Two-thirds (66.1%) of the study participants were actively engaged in Antiretroviral Therapy (ART) at the end of the study. In contrast, 68 patients (17.9%) were lost to follow-up, 42 participants (11.1%) had been transferred to other treatment facilities, and 19 patients (5%) had died during the study. These findings highlight the need for strategies to improve patient retention, reduce loss to follow-up, and address the underlying factors contributing to mortality in this cohort (Figure 2).

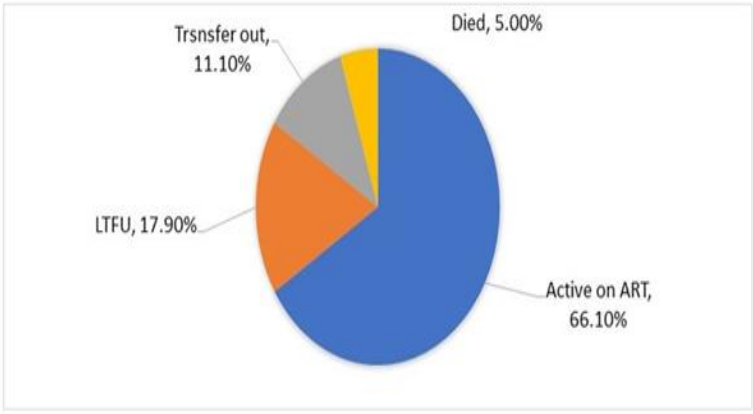

Figure 2. Outcome status of patients on ART at Aira General Hospital, Western Ethiopia, 2025.

Log Rank Estimate of the Variables

The analysis reveals that several variables have a statistically significant association with survival outcomes. Most notably, age, adherence, recent viral load, and last functional status showed the strongest associations ($p < 0.001$), indicating they are critical predictors of patient outcomes. Other significant factors include educational status, occupation, registered phone number, WHO clinical staging, initiation of TPT and CPT, disclosure status, and availability of a caregiver—all of which likely influence adherence, access to care, and overall treatment success. In contrast, variables such as sex, marital status, residence, region, baseline regimen, BMI, regimen change, and active TB did not demonstrate significant effects, suggesting they may have less impact on survival in this context or their influence could be mediated through other factors (Table 4).

Table 4. The Log Rank Estimate of Variables among ART at Aira General Hospital, Western Ethiopia, 2025

Variables	**Log Rank Estimate (X^2)**	**P-value**
Age	401.7	0.000
Sex	0.12	0.9123
Marital status	3.21	0.3604
Residence	0.45	0.5021
Educational status	8.75	0.0311
Occupation	14.82	0.0071
Region	0.94	0.8102
Distance from the health facility	2.49	0.1153
Registered phone number	19.87	0.0000
WHO clinical staging	17.92	0.0006
Baseline regimen	1.65	0.6820
BMI	3.89	0.1425
Regimen change	1.35	0.2441
Recent viral load	147.52	0.0000
Last functional status	31.88	0.0000
History of opportunistic infection	2.42	0.1197
Active TB	0.49	0.4832
Initiation of TPT	12.63	0.0003
Initiation of CPT	7.48	0.0062
Disclosure status	30.97	0.0000
Presence of a caregiver	25.33	0.0000
Adherence	145.61	0.0000

TB – Tuberculosis, CPT - Cotrimoxazole prophylactic therapy

TPT - Tuberculosis Preventive Therapy, BMI – Body Mass Index

Survival Probability

A Kaplan–Meier hazard estimate revealed that patients who were not started on cotrimoxazole preventive therapy had an increased risk of loss to follow-up compared to their counterparts (Figure 3).

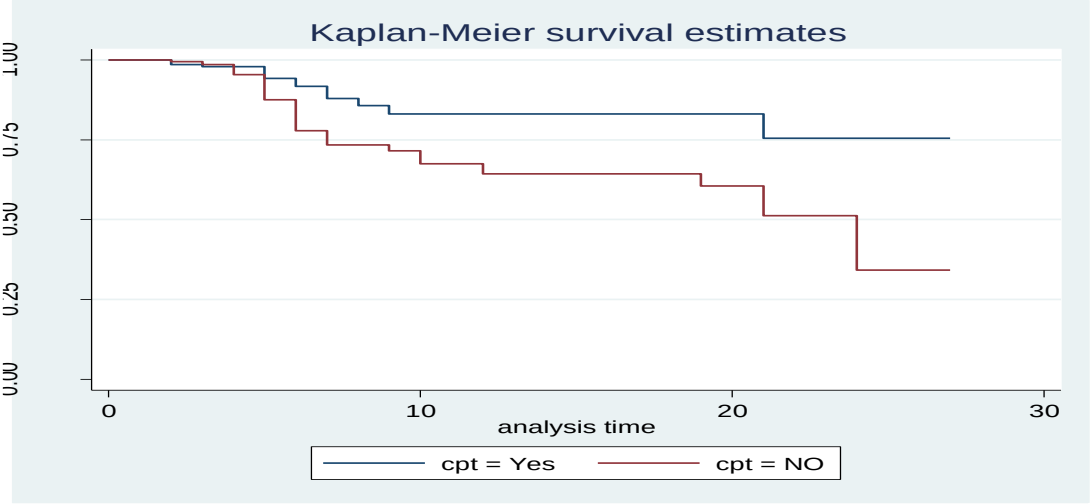

Figure 3. Kaplan–Meier survival estimate of CPT initiation among patients attending ART at Aira General Hospital, Western Ethiopia, 2025. Testing the overall model fit

Assessment of Adequacy of the Cox-Regression Model

The proportional hazard assumption was satisfied based on the global test (value = 0.562). The adequacy of a final fitted model was assessed with the Snell residual. The plot of the cumulative hazard function of the Cox-Snell residuals against maximum likelihood estimation with cumulative hazard functions is presented in Figure 4. The plot shows that the cumulative hazard function of residuals against ox-Snell residuals was approximately a straight line; hence, the model fits the data (Figure 4).

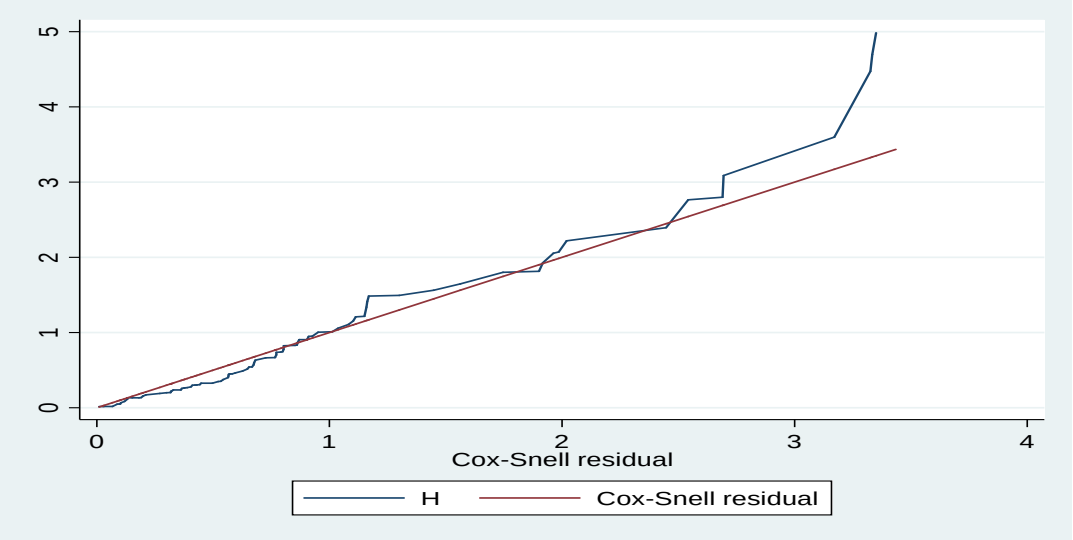

Figure 4. Cox-Snell residual graph on lost to follow up among clients attending ART at Aira General Hospital, Western Ethiopia, 2025.

Predictors of Lost to Follow-up

In this study having registered phone numbers, distance from health facility, WHO clinical staging, last viral load status, last functional status, initiation of TPT and CPT as a prophylaxis, history of opportunistic

infection, disclosure status, availability of caregiver and adherence status were candidate for multivariable cox proportional hazard model because their p- value by bivariate analysis were less than 0.25.

In the multivariable Cox proportional hazards model, several factors were independently associated with an increased risk of loss to follow-up among ART patients at Aira General Hospital. Not having a registered phone number significantly elevated the risk of loss to follow-up (AHR = 4.16, 95% CI: 1.80–11.12), suggesting a lack of reliable contact may hinder retention in care. Patients in WHO clinical stages III and IV also faced a substantially higher risk compared to those in stage I (AHR = 2.78, 95% CI: 1.35–10.31), reflecting the vulnerability of more clinically advanced individuals.

Those with moderate or high viral loads were more likely to be lost to follow-up than those with suppressed viral load levels (AHR = 3.81, 95% CI: 2.52–6.36), indicating that viral suppression is a critical factor in patient retention. Moreover, individuals who did not receive Co-trimoxazole Preventive Therapy (CPT) had a higher likelihood of loss to follow-up (AHR = 3.22, 95% CI: 1.15–8.25), underscoring the importance of supportive therapies in HIV care.

Failure to disclose HIV status was also significantly associated with an increased risk (AHR = 3.67, 95% CI: 1.56–7.21), which may reflect the role of social support in treatment adherence and engagement. Lastly, poor or fair adherence to ART dramatically increased the risk of loss to follow-up compared to those with good adherence (AHR = 4.44, 95% CI: 1.73–10.12), highlighting adherence as a key determinant of continued care (Table 5).

Table 5. Bivariate and multivariate analysis of predictors of Loss to Follow-Up among Patients Attending ART at Aira General Hospital, Western Ethiopia, 2025

Variable	Category	CHR with 95%CI	AHR with 95%CI
WHO stage	I	1	1
	II	0.32(0.10, 1.04)	0.39(0.10, 1.57)
	III & IV	2.33(1.47, 4.16)	2.78(1.35, 10.31)
Distance from HF	< five km	1	1
	> five km	0.65(0.40, 1.15)	1.54(0.62, 3.83)
Having a cell phone	Yes	1	1
	No	4. 25(3.23, 7.15)	4.16(1.80,11.12)
Viral load status	Suppressed	1	1
	Mod. & High	3.35(0.87, 9.65)	2.42(0.38, 12.35)
	Not done	4.14(2.44, 7.65)	3.81(2.52, 6.36)
Factional status	Working	1	1
	Amb & B/ridden	3.62(2.18, 6.34)	0.5(0.19, 1.31)
OI	Yes	1	1
	No	0.66(0.40, 1.15)	0.82(0.27, 2.52)
TPT	Yes	1	1
	No	2.86(1.61, 5.22)	0.88(0.42, 2.32)
CPT	Yes	1	1
	No	2.32(1.37, 4.35)	3.22(1.15, 8.25)

Disclosure status	Yes	1	1
	No	4.67(2.85, 7.85)	3.67(1.56, 7.21)
Care giver	Yes	1	1
	No	3.38(2.15, 5.36)	0.52(0.24, 1.15)
Adherence to ART	Good	1	1
	Poor and Fair	5.21(4.71, 8.35)	4.44(1.73, 10.12)

HF – Health Facility, OI – Opportunistic Infection, CPT – Cotrimoxazole prophylactic therapy TPT - Tuberculosis Preventive Therapy.

Discussion

This study assesses the incidence, survival time and predictors of loss to follow-up from ART services at Aira General Hospital and finally no registered phone number, no CPT initiation, WHO stage III and IV, unknown viral load status, poor and fair history of drug adherence and disclosure status were statistically significant predictors of loss to follow-up.

The incidence density rate of loss to follow up from ART services among ART attending patients was 11.03 (95% CI: 8.71, 13.96) per 1000 person months. This study finding was greater than the finding of the study conducted at public hospitals in southern Ethiopia, North Shoa Zone public Hospitals and district of Kigali city, Rwanda, which were 6.48, 8.9, and 9.4 per 1000 person months, respectively [18–20]. On the other hand, this incidence rate is less than the study conducted at Gondar Comprehensive Specialized Hospital and Karamara General Hospital in Jigjiga town, which was 12.26 and 26.60 per 1000 person months, respectively [10, 15]. The observed difference between the studies might be due to the time variation between the studies. Recent studies reflect the implementation of different stakeholders' strategies. In addition, it might be due to the difference in the socio-demographic characteristics of the study participants.

Having a registered cell phone was associated with a loss to follow up from ART services. ART-attending patients who had no phone number had a five times higher risk of loss to follow-up as compared with their counterparts who had a phone number. This study finding was similar to studies conducted Pawi Hospital, North West Ethiopia, and North Shoa Zone public Hospitals [16, 18]. This might be due to the successful tracing of patients using their cell phones. Therefore, access to telephone contact became an effective tracing and follow-up strategy to prolong patients ' care and treatment.

According to this study, the risk of loss to follow-up from treatment among ART patients diagnosed with stage III and IV was three times higher than in other stages. This finding is similar to studies conducted at health facilities in Malawi, Tanzania, and Debra Markos Hospital [4, 21, 22]. This is because most of the LTFU could be due to death. And also, it could be explained by the fact that those with WHO clinical stage III and IV were highly experienced with immunological deterioration, because of this, they couldn't come to the health facility. Due to this, they could not overcome the challenge they faced in care and treatment and had discontinued.

In this study, patients who were not taking CPT were three times at risk of LTFU from ART, and this is in line with a study done in Gondar Specialized Hospital [15]. This might be since CPT, given for the prevention of many opportunistic infections such as pneumocystis pneumonia, toxoplasmosis, bacterial infections & diarrheal diseases, might have a direct or indirect effect on retention of patients on HIV care and treatment. In contrast, a study done at North Shoa zone public Hospitals, North East Ethiopia, found that the risk of follow-up among clients who

did not start CPT was decreased [18]. The observed difference in these studies may be due to the variation in confounding variables that were not controlled by the respective studies, as it could affect the true effect of Cotrimoxazole therapy on LTFU.

Regarding viral load status, this study observed that the risk of loss from care and treatment was greater than eleven times among patients with unknown (not done at all) viral load status. This could be due to most of the LTFU occurring before six months, and also it may indicate that the viral load of patients is not being done according to guidelines/standards.

This study shows that clients who did not disclose their HIV/AIDS status were 3.5 times more likely to withdraw from the treatment program as compared to their counterparts. This finding is consistent with studies conducted in Jigjiga town, Karamara General Hospital [10]. This might be attributed to the fact that client will adhere much more if they disclose their HIV status to their relatives, since ART drug adherence needs comprehensive support and care from different parts of the community as well.

ART drug adherence was a statistically significant predictor of lost to follow-up; patients who had a history of poor or fair ART drug adherence were more at risk of lost to follow-up compared to good ART drug adherence. This is consistent with the findings of the studies conducted in the Amhara region, Gondar Comprehensive Specialized Hospital, Oromia region, Sub-Saharan African, low and middle-income countries meta and systematic analysis, and Nigeria [6, 9, 11, 15, 23]. The possible reasons may be due to HIV patients' hopelessness about treatment, conflicts with religious concerns, demanding traditional healers, lack of social support, fear of stigma and discrimination, drug side effects, and other socio-economic reasons that cause them to miss their medication. This finding has several strengths; it represents all clients at Aira General Hospital because the data were taken from randomly selected health facilities and patient charts with an adequate sample size. Almost all of these study findings can be applied with existing human power and resources. As a limitation, this study did not consider some essential variables like economic status, since it was conducted using secondary data that lacks accuracy and completeness. In addition to the above, it might lead to underestimating.

Conclusion

The time until loss to follow up from treatment was high in the first 6 months of the initiation of the ART follow up and it declines after 18 months; have no registered phone number, WHO stage III and IV, not disclosure status, poor and fair drug adherence and not taking CPT as prophylaxis were the independent predictors of loss to follow-up from ART services. Furthermore, updating phone numbers on each visit and initiating INH should be encouraged for health facilities.

Based on the study findings, the following recommendations were drawn to reduce the prevalence of lost to follow-up. Special attention should be given by health care providers to clients newly initiated on ART or those on ART for less than one year. Health care providers, case managers, and adherence supporters working in the Hospital should give greater attention for updating clients' addresses (e.g, phone) since address data is crucial in inpatient monitoring and tracing loss to follow up. Health care providers working at selected health facilities should emphasize the monitoring of immunological and virological status of the patient, since viral load status is the major predictor of lost to follow up.

Conflict of Interest

The authors have declared that they have no competing interests.

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