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Retention in HIV Care among Patients Testing Positive for HIV and Ineligible to Start Antiretroviral Therapy

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ABSTRACT

Background: The failure to monitor and link patients from HIV testing to HIV care and retain them in care until they are eligible for ART is a major barrier to early ART initiation. This study evaluated the retention in pre-ART care of HIV-positive patients who are ineligible to start ART in Nigeria. **Methods:** Out of 1766 ART-ineligible HIV-positive patients enrolled into pre-ART care (during 1st March to 31st December 2007), 1098 patients were randomly selected for a five-year (ending 30th April 2012) retrospective cohort assessment using routine data in two health facilities. Retention was defined as remaining connected to pre-ART care once entered until ART initiation or transfer-out to continue care elsewhere. Probability of retention was estimated using Kaplan-Meier survival method and log-rank test. Cox proportional hazards model was used for attrition and $P < 0.05$ used to determine statistical significance. **Results:** The mean age of participants was 33.1 (95% CI, 32.6 - 33.6) years old; and 65.1% were female. Patients were followed up for 512.6 person-years. Of the 59.0% patients retained, 93.8% started ART, 4.6% were transferred out to continue care elsewhere and 1.6% were active in care at the end of observation period. The retention rates at 1, 2, 3, 4 and 5 years observation period were 36.1 cases per 100 person-years, 17.4 cases per 100 person-years, 9.6 cases per 100 person-years, 3.7 cases per 100 person-years and 0.6 cases per 100 person-years respectively; the differences were statistically significant ($P < 0.05$). The mean estimate of patients' attrition time was 1.9 (95% CI, 1.7 - 2.1) years. Patients who started cotrimoxazole prophylaxis (CPT) at enrolment had significantly higher attrition time of 2.4 (95% CI, 2.1 - 2.7) years, compared to 0.9 (95% CI, 0.7 - 1.1) years for those not on CPT ($P < 0.05$). There was 54.0% reduction in risk of attrition among those who started CPT compared to those who did not [HR = 0.460, 95% CI: 0.321 - 0.660; $P = 0.000$]. Socio-demographic characteristics, CD4 cells count and WHO clinical stage at pre-ART enrolment were not associated with attrition ($P > 0.05$). **Conclusion:** Retention in pre-ART care was somewhat poor. Uptake of CPT significantly improved retention. Majority of attrition occurred in first year of pre-ART care. Close monitoring and tracking of patients during this period is recommended.

Keywords: Retention; Attrition; HIV Care; Patients; Nigeria

1. Introduction

Pre-antiretroviral therapy (pre-ART) care starts with patients testing positive for HIV and continuing until the first antiretroviral drugs are dispensed [1]. It requires long periods of follow-up and reliable information systems that allow tracking of defaulting patients. Pre-ART care in Nigeria included periodic ongoing counselling, health education and periodic CD4+ estimation [2]. Earlier initiation of ART requires earlier diagnosis, regular monitoring and retention in pre-ART care until treatment eligibility. With poor retention in pre-ART care, patients testing positive for HIV including those who have long been aware of their HIV status will access care only when seriously ill, which is often well after ART eligibility [1]. This is not desirable as the odds of ART success are lower in patients initiating ART late, with very low CD4 counts. Patients starting ART with CD4 counts below 25 cells/mm^3 faced a more than 3-fold increased risk of death compared to those with baseline CD4 counts above 50 cells/mm^3 [1,3]. Those who survive suffer more morbidity and utilize more medical care resources than would otherwise have been necessary [1,4]. Retention in pre-ART care is an important pre-requisite for earlier initiation of ART, and is required for optimal clinical outcomes.

In a systematic review, it was suggested that less than one-third of patients testing positive for HIV and not yet eligible for ART when diagnosed are retained continu-

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ously in care [1]. The substantial pre-ART loss to care (attrition) ranged from patients who did not return for their initial CD4 count results and ending with those who did not initiate ART despite eligibility [1]. Studies have reported unacceptably high levels of pre-ART attrition in HIV-positive patients that are ineligible to commence ART, as high as 76% in Malawi [5], 49% in Cambodia [6] and 18% in Kenya [7]. There are no studies documenting the attrition rates of pre-ART patients in Nigeria to our knowledge.

There may be several factors related to pre-ART attrition such as inadequate post-HIV test counselling, poor attitudes of both health workers and patients, cost-of-transport to clinic for continuity of care, relatively long waiting times at the clinic, and unknown cases of death due to undiagnosed severe diseases such as tuberculosis [8].

Some demographic characteristics and opportunistic diseases were found to be significantly associated with pre-ART attrition. These included age < 35 years, severe malnutrition, active pulmonary tuberculosis, severe bacterial infections such as severe bacterial pneumonia and prolonged unexplained fever [7]. Pre-ART attrition represents a missed opportunity to enhance the uptake of preventive interventions such as cotrimoxazole prophylaxis (CPT) and isoniazid preventive therapy (IPT), periodic ongoing counselling, health education, social support, and ongoing clinical and immunologic evaluation amongst others. High pre-ART attrition in HIV/AIDS programs is signal of poor uptake of these interventions. This study evaluated the retention in pre-ART care of HIV-positive patients who are ineligible to start ART in Nigeria.

2. Methods

2.1. Study Design

The study was a retrospective cohort assessment of HIV positive and ART-ineligible patients using routinely collected data from the patients' hospital records. The patients were enrolled into HIV care based on the Nigerian national HIV care and treatment guideline [2].

2.2. Setting

This study was carried out in General Hospital Minna, Niger State and Maitama District Hospital, Abuja FCT. The hospitals are both secondary public health care facility in North-central Nigeria; and they offer comprehensive HIV care services including antiretroviral therapy with funding support from President's Emergency Plan for AIDS Relief (PEPFAR) through United States Agency for International Development (USAID) and implemented by Global HIV/AIDS Initiative Nigeria (GHAIN) project. In General Hospital Minna, there were 5627 clients enrolled into HIV care from May 1, 2007 to December 31, 2011; while Maitama District Hospital had 4776 clients enrolled into HIV care from March 1, 2007 to December 31, 2011. In both hospitals, HIV positive clients identified at the HIV counselling and testing service points and not eligible to commence ART are enrolled into a pre-ART register for follow-up. Only those who meet the eligibility criteria for starting antiretroviral therapy based on the Nigeria national HIV care and treatment guideline are commenced on treatment [2]. The services are provided at no cost to the clients.

2.3. Study Population and Sample

The study sites were selected using purposive sampling technique. The study population for General Hospital Minna included 856 HIV positive clients enrolled into HIV care from May 1, 2007 to December 31, 2007; while that of Maitama District Hospital included 910 HIV positive clients enrolled into HIV care from March 1, 2007 to December 31, 2007. This gave a total of 1766 HIV positive clients enrolled into HIV care in both health facilities. From this population, a total of 1098 clients comprising of 388 clients enrolled into HIV care from May 1, 2007 to December 31, 2007 in General Hospital Minna and 710 clients enrolled into HIV care from March 1, 2007 to December 31, 2007 in Maitama District Hospital, Abuja were randomly selected. The sample size was determined in a manner to include at least 10% of the study population [9].

2.4. Inclusion/Exclusion Criteria

All HIV positive clients who were enrolled into HIV care by registration in the pre-ART register within the study period (May 1, 2007 to December 31, 2007 for General Hospital Minna and March 1, 2007 to December 31, 2007 for Maitama District Hospital, Abuja) were eligible to be included in the study. All HIV positive clients who did not meet the above criteria were excluded from the study.

2.5. Outcome Variables

The main outcome variables included attrition and retention rates. Retention in "pre-ART care" was defined as remaining connected to medical care, once entered [10]. This terminates when the patients become eligible and commenced ART, loss to care or transferred out to another health facility to continue pre-ART care. We used at least one visit every 6 months as a measure of retention to accommodate for those in chronic maintenance as well as those in early stages of management [11]. Poor retention in HIV care was defined as visits less than four in six-month blocks in the first two years after initiating

HIV care, and "loss to care" as failing two consecutive visits in six-month blocks per year for any reasons (death, discontinuation/stopped pre-ART care or loss to follow up). Attrition refers to the patients who were loss to care. Lost to follow up (LTFU) in this study refers to failing two consecutive visits in six-month blocks per year for any unknown reasons. A patient was deemed to have "discontinued/stopped pre-ART care" when s/he stopped pre-ART care clinic visits for any known reasons including medico-social reasons; while "dead" patients were those known to have died. Explanatory variables considered were patients' age, sex, CD4 cells count, WHO clinical stage, TB status and whether the patient started Cotrimoxazole (CPT) or not at pre-ART enrolment.

2.6. Ethical Consideration

The ethical approval for the study was obtained from National Health Research Ethics Committee (NHREC) Abuja, Nigeria. Confidentiality was assured by excluding the patients' identifiers during the analysis.

2.7. Data Collection and Management

An unobtrusive technique was used to extract relevant data from the routinely collected data in the patients' hospital records using a standard data extraction form. The cut-off date of follow up data extraction was 30th April 2012. The data collection was carried out by the researchers and two trained research assistants over 2 months period. The researcher and the assistants used clients' identifiers to sort and filter out duplicate registrations (if any) and assigned a code to each of the client's data before data entry. One-tenth of data extracted from the patients' hospital records were randomly verified from source documents and any discrepancies were reconciled where possible.

2.8. Data Analysis

The data were analyzed using PASW Statistics 18. Descriptive statistics were used for sample characteristics. The total time of follow up in pre-ART care contributed by each patient was summed up to obtain the total person-years of follow up. The time in pre-ART care (years) was calculated using the time interval between the date of pre-ART registration or enrolment and 1) date of known death 2) date of leaving the programme due to loss to follow up (LTFU), or discontinuing/stopping of pre-ART care and 3) date 5 years of follow-up had accrued. The attrition rates was calculated as a proportion of patients lost to care through death, LTFU and those who discontinued/stopped pre-ART care at 1, 2, 3, 4 and 5 years observation period. The probability of retention in care was estimated using Kaplan-Meier survival method. Potential explanatory variables of attrition were checked for significance with the log-rank test. A multivariable analysis for attrition was conducted using Cox proportional hazards models. Patients who were loss to care (through death, discontinued/stopped pre-ART care or LTFU) were grouped under attrition and a binary outcome 1 was designated; whereas a value of 0, denoted retention in pre-ART care at the end of the observation period. Patients who were loss to care were censored at time of occurrence of attrition. Patients who were retained in care (active in pre-ART care and those retained until ART start or transferred out) were censored at the end of the observation period. The incidence rates of attrition (death, lost to follow up and discontinued/stopped pre-ART care) was expressed as the number of patients with at least one occurrence of the given event per 100 person-years. Chi-square was used for inferential statistics. All reported *P*-values were 2-sided, and $P < 0.05$ used to determine statistical significance.

3. Results

3.1. Socio-Demographic Characteristics of Patients

The mean age of participants was 33.1 (95% CI, 32.6 - 33.6) years old; 65.1% were female, 53.4% were aged 30 - 34 years; and 39.4% were married. Of the participant, 19.9% had secondary level education and 21.0% were employees (**Table 1**).

3.2. Retention and Attrition Rates in Pre-ART Care

Patients were followed up in pre-ART care for 512.6 person-years. Of the patients who were loss to follow up, 88.0% occurred in the first one year of pre-ART care. All cases of death occurred in the first 6 months of pre-ART care. Only 0.9% of patients were still active on pre-ART care at the end of observation period (**Table 2**). Of the 628 (59.0%) retained in pre-ART care, 589 (93.8%) started ART, 29 (4.6%) were transferred out and 10 (1.6%) patients were still active in pre-ART care at the end of observation period. Of the 436 (41.0%) patients loss to care (attrition), 432 (99.1%) were loss to follow up and 4 (0.9%) were reported dead at the end of observation period (**Table 2**).

The retention rates on pre-ART care at 1, 2, 3, 4 and 5 years observation period were 36.1 cases per 100 person-years, 17.4 cases per 100 person-years, 9.6 cases per 100 person-years, 3.7 cases per 100 person-years and 0.6 cases per 100 person-years respectively.

The differences in retention rates over the observation periods were statistically significant ($P < 0.05$). Of the patients retained in the first year of pre-ART care, 83.6%

Table 1. Distribution of socio-demographic characteristics of patients, N = 1098.

Characteristics	Frequency	Percent
Sex		
Male	360	32.8
Female	715	65.1
Not indicated	23	2.1
Age group (years)		
<15	5	0.5
15 - 29	354	32.2
30 - 44	586	53.4
45 - 59	113	10.3
>59	8	0.7
Not indicated	32	2.9
Educational status		
None	34	3.1
Primary	108	9.8
Secondary	219	19.9
Post-secondary	193	17.6
Not indicated	544	49.5
Marital status		
Single	201	18.3
Married	433	39.4
Divorced	8	0.7
Widowed	44	4.0
Not indicated	412	37.5
Employment status		
Student	41	3.7
Unemployed	210	19.1
Employee	231	21.0
Self-employed	205	18.7
Retired	7	0.6
Not indicated	404	36.8

of them started ART and 3.7% were transferred out to continue care elsewhere. The proportions of patients on pre-ART care who started ART at 1, 2, 3, 4 and 5 years observation period were 62.6%, 65.4%, 69.2%, 22.2% and 14.3% respectively.

The incidence rates of attrition from pre-ART care at 1, 2, 3, 4 and 5 years observation period were 66.5 cases per 100 person-years, 4.3 cases per 100 person-years, 2.3 cases per 100 person-years, 2.7 cases per 100 person-years, and 0.8 cases per 100 person-years respectively. The overall mean estimate of patients' attrition time on pre-ART care was 1.9 (95% CI, 1.7 - 2.1) years. The mean estimate of attrition time for patients who started cotrimoxazole prophylaxis (CPT) at pre-ART care enrolment was 2.4 (95% CI, 2.1-2.7) years whereas that for patients who were not started on CPT was 0.9 (95% CI, 0.7 - 1.1) years. The difference in attritions between these two categories of patients was statistically significant ($P = 0.000$). **Table 3** displays the Kaplan-Meier survival table of patients on pre-ART care. The cumulative proportion of patients surviving/retained at the time of attrition were higher for patients who started CPT compared to those who did not receive CPT at pre-ART care enrolment (**Table 3**).

3.3. Risk Factors for Attrition in Pre-ART Care

Patients who started CPT at pre-ART care enrolment had 54.0% reduction in risk of attrition and increased retention time after adjustment for the other explanatory variables in the model compared to those who did not start CPT at enrolment [HR = 0.460, 95% CI: 0.321 - 0.660; $P = 0.000$]. The *P*-value was statistically significant and the 95% confidence interval for the hazard ratio did not include 1, suggesting a difference in attrition rates between these two categories of patients (**Table 4**).

The differences in attrition rates of subcategories of socio-demographic categories, baseline CD4 cells count, baseline WHO clinical stage, baseline TB status and presence of OIs at pre-ART enrolment were not statistically significant ($P > 0.05$), **Table 4**. Male patients had increased risk of attrition from pre-ART care of 1.266 times that of female patients [HR = 1.266, 95% CI: 0.866 - 1.850; $P = 0.224$]. However, the *P*-value was not statistically significant and the 95% confidence interval for the hazard ratio included 1, suggesting no difference in attrition rates between male and female patients. There was a 15.3% reduction in risk of attrition among patients who presented with opportunistic infections at pre-ART care enrolment [HR = 0.847, 95% CI: 0.573 - 1.253; $P = 0.406$] compared to those without OIs; however, this reduction was not statistically significant (**Table 4**).

4. Discussion

The proportion of pre-ART patients retained continuously in care was poor (less than three-fifth), though higher compared to less than one-third of pre-ART patients suggested by Rosen and Fox [1]. The majority of the retained pre-ART patients started ART, whereas minority was either transferred out to continue care elsewhere or active in pre-ART care at the end of observation period.

Table 2. Distribution of pre-ART outcomes segregated by duration the patients were on pre-ART care; N = 1064.

Duration on pre-ART care (months)	Pre-ART outcomes					
	Dead	Loss to follow up	Transferred out	ART start	Active in pre-ART care	Total, N
<1	1 (25.0)	276 (63.9)	10 (34.5)	209 (35.5)	0 (0.0)	498 (46.6)
1 - 6	3 (75.0)	73 (16.9)	10 (34.5)	259 (44.0)	0 (0.0)	345 (32.4)
7 - 12	0 (0.0)	31 (7.2)	3 (10.3)	57 (9.7)	0 (0.0)	91 (8.6)
13 - 18	0 (0.0)	13 (3.0)	4 (13.8)	15 (2.5)	0 (0.0)	32 (3.0)
19 - 24	0 (0.0)	9 (2.1)	0 (0.0)	17 (2.9)	0 (0.0)	26 (2.4)
25 - 30	0 (0.0)	8 (1.9)	2 (6.9)	9 (1.5)	0 (0.0)	19 (1.8)
31 - 36	0 (0.0)	4 (0.9)	0 (0.0)	9 (1.5)	0 (0.0)	13 (1.2)
37 - 42	0 (0.0)	6 (1.4)	0 (0.0)	9 (1.5)	0 (0.0)	15 (1.4)
43 - 48	0 (0.0)	7 (1.6)	0 (0.0)	2 (0.3)	0 (0.0)	9 (0.8)
49 - 54	0 (0.0)	3 (0.7)	0 (0.0)	2 (0.3)	6 (60.0)	11 (1.0)
55 - 60	0 (0.0)	2 (0.5)	0 (0.0)	1 (0.2)	4 (40.0)	7 (0.7)
Total	4 (0.4)	432 (40.6)	29 (2.7)	589 (55.4)	10 (0.9)	1064 (100)

Table 3. Comparison of the pre-ART care attritions of patients segregated by CPT status at enrolment, Kaplan-Meier survival table*.

CPT	Time of attrition (months)	Cumulative proportion surviving at the time of attrition		N of cumulative events (attritions)	N of remaining cases (retentions)
		Estimate	SE		
Yes	<1	0.868	0.012	99	649
	1 - 6	0.781	0.017	144	407
	7 - 12	0.679	0.025	166	146
	13 - 18	0.615	0.030	175	86
	19 - 24	0.571	0.034	180	65
	25 - 30	0.502	0.040	186	44
	31 - 36	0.459	0.043	189	32
	37 - 42	0.424	0.047	191	24
	43 - 48	0.349	0.055	194	14
	49 - 54	0.295	0.058	196	11
	55 - 60	0.177	0.074	198	3
No	<1	0.448	0.031	139	113
	1 - 6	0.324	0.030	166	70
	7 - 12	0.263	0.031	175	39
	13 - 18	0.232	0.031	179	30
	19 - 24	0.199	0.031	183	24
	25 - 30	0.181	0.030	185	20
	31 - 36	0.171	0.030	186	17
	37 - 42	0.122	0.030	190	10
	43 - 48	0.076	0.028	195	5
	49 - 54	-	-	-	-
	55 - 60	-	-	-	-

CPT, Cotrimoxazole prophylaxis; SE, Standard Error; *only patients with known CPT status at pre-ART care enrolment were included in the analysis.

Table 4. Cox proportional hazard model for attrition and the associated predictor variables.

Characteristics	Regression coefficient	SE	Hazard ratio, HR (95% CI)	*P*-value
Sex				
Male	0.236	0.194	1.266 (0.866 - 1.850)	0.224
Female				
Age (years)				
<15	−0.356	1.046	0.701 (0.090 - 5.448)	0.734
15 - 29	−1.107	1.153	0.330 (0.035 - 3.165)	0.337
30 - 44	−0.899	1.154	0.407 (0.042 - 3.906)	0.436
45 - 59	−0.855	1.155	0.425 (0.044 - 4.088)	0.459
>59				
Educational status				
None	0.174	0.363	1.190 (0.585 - 2.423)	0.631
Primary	0.161	0.234	1.175 (0.742 - 1.859)	0.492
Secondary	−0.207	0.205	0.813 (0.543 - 1.216)	0.313
Post-secondary				
Marital status				
Single	0.547	0.436	1.729 (0.735 - 4.063)	0.209
Married	0.674	0.421	1.962 (0.860 - 4.476)	0.109
Divorced	1.055	0.839	2.873 (0.555 - 14.876)	0.209
Widowed				
Employment status				
Student	−0.210	0.917	0.811 (0.134 - 4.890)	0.819
Unemployed	−0.856	0.863	0.425 (0.078 - 2.307)	0.321
Employee	−0.721	0.852	0.486 (0.091 - 2.585)	0.398
Self-employed	−0.531	0.863	0.588 (0.108 - 3.193)	0.538
Retired				
Baseline CD4 cells count (cells/mm^3)				
<50	0.079	0.312	1.082 (0.587 - 1.995)	0.800
50 - 149	−0.412	0.319	0.662 (0.354 - 1.238)	0.197
150 - 249	−0.415	0.292	0.660 (0.372 - 1.170)	0.155
250 - 349	−0.053	0.235	0.949 (0.599 - 1.503)	0.822
350 and above				
Baseline WHO clinical stage				
Stage I	−0.352	0.740	0.703 (0.165 - 2.997)	0.634
Stage II	0.092	0.740	1.096 (0.257 - 4.672)	0.901
Stage III	−0.075	0.743	0.928 (0.216 - 3.980)	0.920
Stage IV				
Baseline TB status				
Asymptomatic	0.245	1.028	1.278 (0.170 - 9.585)	0.812
TB suspected	0.458	1.076	1.580 (0.192 - 13.016)	0.671
TB positive not on drugs	0.194	1.258	1.214 (0.103 - 14.300)	0.878
TB treatment				
Presence of OIs at pre-ART enrolment				
Yes	−0.166	0.199	0.847 (0.573 - 1.253)	0.406
No				
CPT at pre-ART enrolment				
Yes	−0.776	0.184	0.460 (0.321 - 0.660)	**0.000**
No				

OIs, opportunistic infections; CPT, cotrimoxazole prophylaxis; SE, standard error.

The proportion of pre-ART patients loss to care (attrition) were 41.0% which is comparable to unacceptably high levels of pre-ART attrition of 49% in Cambodia [6], a much higher level of 76% in Malawi [5] and a much lower level of 18% in Kenya [7]. The pre-ART patients that were loss to care (attrition) included mainly those that were loss to follow up (99.1%) and few others that were reported dead (0.9%) at the end of observation period. There was a more than two-fold yearly decrease in the rates of retention in pre-ART care over the 5 years observation period. Over three-quarter of pre-ART patients that were loss to follow up occurred in the first one year and all cases of death occurred in the first 6 months. The incidence rate of pre-ART attrition was highest in the first year of pre-ART care. Poor retention in pre-ART care is one major cause of late ART initiation [1]. This is not desirable as the odds of ART success are lower in patients initiating ART late, with very low CD4 counts [1,3,4]. Earlier initiation of ART requires earlier diagnosis, regular monitoring and retention in pre-ART care until treatment eligibility. Closer monitoring and effective tracking of defaulting pre-ART patients should be instituted during this period to reduce attrition from pre-ART care and enhance earlier ART eligibility determination and eventual initiation.

Majority of patients who had baseline CD4 cells count $\geq$ 350 cells/mm^3 were loss to follow up. The proportion of pre-ART patients who were loss to follow up was higher (two-fifth) among patients with baseline WHO clinical stage I and II compared to other categories. These groups of patients need to be monitored closely and tracked effectively when they default to improve retention in pre-ART care. Over three-quarter of pre-ART patients who did not commence CPT at enrolment were loss to follow up compared to about 25% loss to follow up reported among those who started CPT at enrolment. The attrition time for patients who started co-trimoxazole prophylaxis (CPT) at pre-ART care enrolment was more than two-fold higher than those patients who were not started on CPT. Furthermore, the patients on CPT had over 50% reduction in risk of attrition and increased retention time after adjustment for the other explanatory variables compared to those who did not start CPT at enrolment; and the difference was statistically significant. Therefore, increasing the uptake of CPT among pre-ART patients can promote retention in pre-ART care in this setting. This preventive intervention should be scaled up in a manner that ensured all CPT-eligible pre-ART patients get this intervention promptly. The risk of attrition was not significantly associated with any of the socio-demographic variables, baseline CD4 cells count, WHO clinical stage, TB status and presence of opportunistic infections (OIs) at pre-ART enrolment. This is contrary to study findings that some demographic characteristics and opportunistic diseases were found to be significantly associated with pre-ART attrition [7,8]. All pre-ART patients should be provided periodic ongoing counselling, health education and periodic CD4+ estimation [2] to promote retention.

This is the first study that reported retention rates among patients testing positive for HIV and enrolled into pre-ART care in Nigeria to our knowledge. In addition, a large number of patients were studied over 5-year period, and findings are likely to reflect the operational reality as the data comes from a programme setting. There are some limitations that should be acknowledged. The exact cause(s) of attrition (loss to follow up and deaths) could not be determined and consequently the attributed cause(s) might be inaccurate. This may overestimate attrition as some patients declared lost to follow up might include undeclared cases of transfers out of patients to other health facilities to continue pre-ART care, and unascertained cases of deaths. This may be due to lack active tracing systems for patients during the pre-ART phase. There was also a limitation of missing data which may bias the distribution of the study findings especially the sample characteristics. This may affect the generalization of the study findings.

Retention in pre-ART care was somewhat poor and majority of patients retained were started on ART. Socio-demographic characteristics, CD4 cells count and WHO clinical stage at pre-ART enrolment were not associated with attrition. Uptake of CPT significantly improved retention. Majority of attrition occurred in the first year of pre-ART care. Close monitoring and tracking of pre-ART patients during this period is highly recommended to reduce attrition and enhance earlier ART eligibility determination and eventual initiation.

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