

Predictors of Loss to Follow-Up among Adult Patients Initiated on Antiretroviral Therapy in Nakuru West Sub-County Health Facilities, Kenya

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Abstract: *The loss to follow up (LTFU) has reversed the successful strengthening of antiretroviral therapy (ART) programmes globally. The factors associated with LTFU still remain a challenge to many countries including Kenya, a critical barrier to effective scale-up of human immunodeficiency virus (HIV) services. Kenya is one of the four HIV high burden countries in Africa (alongside Mozambique and Uganda). HIV prevalence in the country is at 5.9% with 29% adult HIV co-morbidities, overburdening the health care system and the country's economy. UNAIDS targeted to achieve 90% in three key areas of HIV: identification in HIV positive patients; prompt linkage to treatment; and viral suppression by the year 2020. The second and third has not been met in Nakuru West Sub-county. This study aimed at determining predictors of LTFU among adult patients initiated on ART in Nakuru West Sub-County health facilities. A retrospective cohort study design was employed and 1131 participants enrolled/initiated on ART within 1st January 2016 to 31st December 2018 in the County Referral hospital, Kapkures and Rhonda health centers were examined for three years to determine their outcomes. Baseline patient records were extracted from Electronic Master Facility and ART Cohort registers. First, data were entered in SPSS version 21.0. Survival data analysis was done using Cox regression analysis. Kaplan Meier (KM) curves were drawn to estimate the probability of LTFU and proportionality hazards assumption was checked for covariates intended to be included in the final Cox model. From the results, a total of 1131 patients, had an overall LTFU prevalence of 29.8% (337/1131). Four predictive variables were statistically significantly associated with LTFU in the final Cox regression model: low BMI of less than 18.4, (AHR = 1.88; 95%CI: 1.40 – 2.54; $p < 0.0001$); attending rural facility (AHR: 0.58; 95%CI: 0.36 – 0.76; $p < 0.0001$); using IPT AHR: 1.34; 95%CI: 0.84 – 1.57; $p < 0.0001$ and high Viral Load (VL) (AHR: 0.59; 95%CI: 0.17 – 1.00; $p < 0.0001$). In order to minimize LTFU and meet UNAIDS targets, interventions should be geared towards close supervision of all CCC patients with CD4 < 200 cells/mm³, high VL, attending rural facility and users of IPT. In addition, this study recommends that, the Ministry of Health, Nakuru County government, APHIA-PLUS and all other stakeholders should build capacity of health care personnel to improve provision of HIV care services, ensure availability of adequate resources and address challenges that impede the implementation of HIV/AIDS management policies. This will, in turn, curb LTFU, enhance patient retention, patient survival and improve quality of life.*

Keywords: ART, LTFU, HIV, Follow-up, Predictors, Nakuru-West, Kenya

1. Introduction

There has been a growing concern on the increasing rates of LTFU globally, among clients already on treatment (Tadesse & Haile, 2014) ranging from, 0.3% to 50% (Agwu, *et al.*, 2016; Meloni, *et al.*, 2014). LTFU compromises the long-term success of ART worldwide (Berheto, *et al.*, 2014) and patients' survival (Saumu, 2017). Those affected may increase the risk of HIV transmission and deterioration of their health condition due to unchecked HIV status (Meloni, *et al.*, 2014). The United Nations Program on HIV/AIDS (UNAIDS) strategy is to achieve 90% identification of HIV positives; prompt linkage to treatment; and viral suppression by year 2020 (UNAIDS, 2018). The expansion of the ART programme has had a substantial impact on the outcomes of HIV-positive patients (De La Mata, *et al.*, 2018). In order to realize the three strategies, improvement in management of people on ARTs as well as close follow up of patients is essential (Yehia, *et al.*, 2015; Tweya, Obono & Gugsu, 2018). Failure to observe the appointment dates, leads to unscheduled visits (Ministry of Health [MOH]/NASCOP, 2016), and subsequently loss to follow up (LTFU) which is defined as failure to attend clinics for more than three months for refill. Such people should not be classified as

'dead' or 'transferred-out' (Megerso, *et al.*, 2016; Berheto, *et al.*, 2014).

In Africa, it has been observed that the successful scale-up of ART coverage (Saumu, 2017) has vastly changed the outcomes of HIV, shifting the disease from once uniformly fatal to a chronic disease (Meloni *et al.*, 2014). However, LTFU cases have been identified as an impediment in the effective scale-up of HIV programme (Hassan, *et al.*, 2012; Saumu, 2017). Sub-Saharan Africa (SSA) studies revealed that, the incidence of attrition after ART initiation at 6 months, is about 20% to 87% and increases with time (Berheto *et al.*, 2014 & Honge, *et al.*, 2013). LTFU negatively impacts on the immunological benefit of ART, leading to drug toxicity, treatment failure and drug resistance, increased AIDS-related morbidity, hospitalizations and mortality (Berheto, *et al.*, 2014). The factors associated with LTFU still remain a challenge in many countries (Mehari, *et al.*, 2017) including Kenya, although age, gender, and clinical factors have been reported (Eguzo, *et al.*, 2015).

Kenya is one of the four HIV high burden countries in Africa (alongside Mozambique and Uganda) (Kimani,

2013). Cumulatively an estimated 2.2 million AIDS deaths have occurred throughout the HIV epidemic till 2017 (National Aids Control Council, 2018). There has been rapid scale-up of ART services evidenced by an increase in treatment sites (NASCO/MOH, 2018 and Saumu, 2017). Since this scale-up, 1,035, 615 (75%) adults have been enrolled to ART leading to approximated 635,500 AIDS related deaths aversion, since 2004 through to 2017 having achieved 89.9% retention rate and 77% viral suppression (National Aids Control Council, 2018). The HIV prevalence in the country is at 5.9% with 29% adult HIV co-morbidities overburdening the health care system and economy (NASCO, 2016).

Nakuru County is one of the 47 counties in Kenya and has been ranked number nine nationally, with an estimated 37,619 HIV positives adults on ART. Although the county has achieved 83% adult ART coverage (National Aids Control Council, 2018), it is currently experiencing an increasing cases of: attrition from care, HIV and AIDS co-morbidities with drug resistance leading to patients affected being switched to second-line drug regimen (County Government of Nakuru, 2018). Little information is available on the prevalence and predictors of LTFU. Therefore, this study sought to determine, the predictors of LTFU among adult patients initiated on ART in Nakuru West Sub-County health facilities. The study will contribute in identifying factors that would help informing programme improvement and patient follow-up.

2. Methodology

A retrospective cohort study design was adopted. Data was extracted from the electronic master facility register and the ART cohort register.

3. Study Area

The study was conducted in Nakuru County, which is one of the 47 Counties in the Republic of Kenya lying within the Great Rift Valley about 90km from Nairobi. The County headquarters is Nakuru Town. It has 11 Sub-counties with an estimated population of 2,821,237 people as at the year 2018. Thirty-three percent of the population lives below the poverty line. The population growth rate is estimated at 2.84% p.a. currently with a density of 290.4 persons per square km. The county has a total of 674 health facilities, including 26 hospitals, 630 primary care facilities and 2 community health units. There are 14 Comprehensive Care Centre (CCC) in Nakuru west Sub-County offering comprehensive HIV care services. Each centre has specially trained team that provide the following services: *clinical care* -counselling and voluntary testing, enrollment to ART and follow-up, prophylaxis of opportunistic infection, management of HIV related illness such as opportunistic infections; *nutritional counselling* -malnourished patients are provided nutritional support; *psychological counselling and palliative care* -patients are offered psychological, spiritual counselling and palliative care; *referral* -the centre acts as a referral centre for all sites offering testing services; and *stress management* -to promote psychological wellbeing and adaptive coping among people living with human immunodeficiency

virus/acquired immune deficiency syndrome. Patients currently on ART as at July 2018 from the 14 health facilities were 10,296 among whom 93% were adult patients with over 80% attending CCC at County Referral Hospital (DHRIS, 2018).

Target population

HIV/AIDS positive patients who were initiated on ART at Comprehensive Care Centre (CCC) clinics of Nakuru West sub-County MOH facilities were included in the study.

Sampling method/ size

Stratified sampling method was initially used to group the facilities offering CCC services into urban or rural setting depending on their location. Purposively, county referral hospital was identified to represent urban facilities for it has high volume of patients with over 80% of all HIV patients on ART in the county seeking services in the facility. Two rural facilities (Kapkures and Rhonda health centers) were also purposively selected as they were only rural facilities offering CCC services in the sub-county. Census inquiry method was used to select 1131 patients' records. These were patients who were initiated on ART from 1st January 2016 to 31st December 2018 and their attendance followed up for three-years.

Data collection procedure

A standardized data collection transcription form was prepared by the researcher and data extracted from the Electronic Master Facility Register (urban facility) and ART Cohort Register (rural facilities). Pilot test was conducted in the urban facility prior to the initiation of the study and the tool modified accordingly. The transcription form consisted of variables registered during ART initiation and follow up and included: sex, age, weight, BMI, residence, CD4 Count, VL, IPT provision, TB status, patient status, original drug regimen, current regimen, reasons for drug substitution, among others. Two research assistants were trained on how to extract data and ethical issues that were to be observed.

Ethical consideration

The study proposal was approved by Masinde Muliro University of Science and Technology (MMUST) Institutional Ethics Review Committee (IERC). A research authorization permit was then obtained from National Commission for Science and Technology (NACOSTI) and an official data collection permission letter was obtained from the Chief Officer of Health (COH) Nakuru County through the respective institutional IERC. The information collected was handled as private and confidential during all phases of research activities and stored safely in lockable cabinets. Soft copies were secured by the use of a password known by the researcher only.

Data analysis

First, data were entered and cleaned using SPSS version 21.0. Survival data analysis was done using Cox regression analysis. Log rank test was used to select categorical predictors. Decision was based on a p-value of 0.07 in bivariate analysis for potential candidate variables selection to be considered in the final model. Variables with a p-value of less than 0.05 were considered as statistically significant predictors of LTFU after interaction effects and model

diagnostics checked. Finally, the Adjusted Hazard Ratio and 95% CI were interpreted for the statistically significant predictors of LTFU in the final Cox model.

4. Results

Baseline characteristics of study participants

A total of 1,131 patients, were reviewed over three years study period in the three health facilities. Among 1131 patients, cases of LTFU were 337 (29.8%). Most of the LTFU (36.5%) among the males were aged 35 – 44 years while the age group among females experiencing higher LTFU (46.8%) were younger and aged between 25 – 34 years. Median age for male was higher (39.5 years) than that of females (33.0 years). A comparatively higher proportion of females who were LTFU (43.4%) visited rural facilities than males (37.7%). On the contrary there were more males

LTFU cases (30.1%) than females (21.7%) who visited urban facility.

Notably, most of cases of LTFU among males (62.5%) and females (66.1%) were in Stage 1 of WHO classification. Majority of males (88.5%) and females (86.7%) who were lost to follow-up were on IPT. The same was true of LTFU cases who did not have TB where 95.2% of males and 96.5% of the females were LTFU. The results also show that a higher proportion of females (73.8%) than males (56.7%) had lower BMI (> 18.4) were cases of LTFU. More females (76.0%) than males (69.2%) who had less than 200 cell/mm³ CD4 count were lost to follow-up. Further analysis shows that more males (75.0%) than females (64.4%) with higher VL were cases of LTFU. Majority of males (93.3%) and females (89.3%) who were cases of LTFU were on AF2B.

Table 1: Baseline socio-demographic and clinico-immunologic characteristics of patients

Variables	Male		Female	
	LTFU n (%)	Non-LTFU n (%)	LTFU n (%)	Non-LTFU n (%)
Age group in years				
15 – 24	5 (4.8)	12 (5.5)	28 (12.0)	54 (9.4)
25 – 34	31 (29.8)	57 (26.3)	109 (46.8)	222 (38.5)
35 – 44	38 (36.5)	79 (36.4)	61 (26.2)	192 (33.3)
45 – 54	18 (17.3)	50 (23.0)	30 (12.9)	66 (11.4)
≥55	12 (11.5)	19 (8.8)	5 (2.2)	43 (7.5)
Median age (Range)	39.5 (16.0 – 70.0)	40.0 (15.0 – 73.0)	33.0 (18.0 – 62.0)	35.0 (15.0 – 76.0)
Facility Type				
Urban	67 (64.4)	156 (71.9)	118 (50.6)	427 (74.0)
Rural	37 (35.6)	61 (28.1)	115 (49.4)	150 (26.0)
WHO Staging				
I	65 (62.5)	153 (70.5)	154 (66.1)	419 (72.6)
II	13 (12.5)	27 (12.4)	32 (13.7)	77 (13.3)
III	20 (19.2)	33 (15.2)	41 (17.6)	63 (10.9)
IV	6 (5.8)	4 (1.8)	6 (2.6)	18 (3.1)
IPT				
Yes	12 (11.5)	154 (71.0)	31 (13.3)	363 (62.9)
No	92 (88.5)	63 (29.0)	202 (86.7)	214 (37.1)
TB Status				
Yes	5 (4.8)	7 (3.2)	8 (3.5)	20 (3.5)
No	99 (95.2)	210 (96.8)	221 (96.5)	556 (96.5)
BMI				
< 18.4	45 (43.3)	105 (48.4)	61 (26.2)	217 (37.6)
≥ 18.4	59 (56.7)	112 (51.6)	172 (73.8)	360 (62.4)
CD4 Count				
< 200	72 (69.2)	117 (53.9)	177 (76.0)	314 (54.4)
≥ 200	32 (30.8)	100 (46.1)	56 (24.0)	263 (45.6)
VL				
Low	26 (25.0)	145 (66.8)	83 (35.6)	358 (62.1)
High	78 (75.0)	72 (33.2)	150 (64.4)	219 (37.9)
ART Regimen				
AF2B	97 (93.3)	124 (57.1)	208 (89.3)	514 (89.1)
AF2E	4 (3.8)	87 (40.1)	7 (3.0)	37 (6.4)
Other	3 (2.9)	6 (2.8)	18 (7.7)	26 (4.5)

Patient factors influencing LTFU

Patients Hazard Ratios (HR) of LTFU in various variables is as shown in Table 2. The median LTFU time in study participants aged less than 35 years was 0.15 (95%CI: 0.08 – 0.23) compared to those aged 35 years and above with median LTFU time of 0.11 (95%CI: 0.03 – 0.19). Log rank test for a difference in the survival probability of the two age groups has an associated p value of 0.49, suggesting no

significant difference in the LTFU time experience of the two age groups.

Gender had an impact on LTFU. More males (n=233) than females (n=104) experienced LTFU. Median LTFU time for males was 0.06 (95%CI: 0.00 – 0.16) compared with females with a corresponding value of 0.18 (95%CI: 0.08 – 0.25; p = 0.02) confirming significant differences in hazard ratios.

A comparison of LTFU between urban and rural facilities was made. Results show a significant difference in LTFU median time experienced by patients in rural facilities (AHR: 0.58; 95%CI: 0.36 – 0.76) than urban facility (AHR: 0.02; 95%CI: 0.00 – 0.05). LTFU median time was significantly different between the two groups ($p < 0.0001$).

The hazard rates for WHO staging was statistically significantly different in terms of LTFU median time for the two categories. The median LTFU time in study participants with Stage 1 and 2 was 0.17 (95%CI: 0.08 – 0.24) in contrast to participants in stage 3 and 4 (HR: 0.04; 95%CI: 0.00 – 0.16) and a p value of 0.05.

LTFU median time of 1.34 (95%CI: 0.84 – 1.57) for patients on IPT was significantly different from those who were not on IPT (AHR: 0.07; 95%CI: 0.04 – 0.13). The median LTFU time experience for the former group was significantly higher for IPT users ($p = 0.0004$). A comparison of LTFU median time for patients without TB (AHR: 0.16; 95%CI: 0.08 – 0.19), versus those with TB (AHR: 0.00; 95%CI: 0.00 – 0.13) shows a statistically lower ($p = 0.0016$) compared to those with TB.

The LTFU median time for patients with BMI of 18.4 (AHR: 0.17; 95% CI: 0.08 – 0.23) was significantly different from that of patients with higher BMI (AHR: 0.04; 95%CI: 0.00 – 0.15) suggesting that, patients with higher BMI stayed in ART programme for a longer time compared with those with lower BMI ($p = 0.0014$). There is a difference between the two groups in the probability of LTFU at any point during the study. Further analysis shows a significant difference between LTFU median time for patients with high VL (AHR: 0.59; 95%CI: 0.17 – 1.00) compared with their counterparts who had lower VL (AHR: 0.06; 95%CI: 0.03 – 0.14) and a p value of <0.0001 . Time to LTFU was significantly different for the two groups CD4 count and ART regimen showed no significant difference in LTFU median time experienced by the patients with low versus higher CD4 counts and patients on AF2B drugs compared with those on other ARTs.

Table 2: Hazard ratios from LTFU

Variable	n	Hazard ratio	95% CI	P value
Age groups				
<35	173	0.15	0.08 – 0.23	0.49*
≥35	164	0.11	0.03 – 0.19	
Gender				
Male	233	0.06	0.00 – 0.16	0.02
Female	104	0.18	0.08 – 0.25	
Facility Type				
Urban	185	0.02	0.00 – 0.05	<0.0001
Rural	152	0.58	0.36 – 0.76	
WHO Staging				
III & IV	73	0.17	0.08 – 0.24	0.05 β
I & II	264	0.04	0.00 – 0.16	
IPT				
Yes	43	1.34	0.84 – 1.57	0.0004
No	294	0.07	0.04 – 0.13	
TB Status				
Yes	13	0.00	0.00 – 0.13	0.0016
No	324	0.16	0.08 – 0.19	
BMI				
< 18.4	62	0.17	0.08 – 0.23	0.0014

≥ 18.4	275	0.04	0.00 – 0.15	
CD4 Count				
< 200	249	0.11	0.07 – 0.19	0.8309
≥ 200	88	0.17	0.04 – 0.21	
VL				
High	109	0.59	0.17 – 1.00	<0.0001
Low	228	0.06	0.03 – 0.14	
ART Regimen				
AF2B	305	0.16	0.08 – 0.19	0.597
Other ARTs	32	0.08	0.00 – 0.35	

*Log Rank Test
 β Wilcoxon test

Predictors of LTFU among adult patients with HIV in the final cox model

Four variables were statistically significant in the final Cox Regression model as shown in Table 3. Low BMI of less than 18.4 increased the risk of LTFU by almost two times (AHR = 1.88; 95%CI: 1.40 – 2.54; $p < 0.0001$). On the other hand, attending urban facility (AHR = 0.73; 95% CI: 0.58 – 0.92; $p = 0.008$), not using IPT (AHR = 0.11; 95%CI: 0.08 – 0.16; $p < 0.0001$) and having undetectable VL (AHR = 0.33; 95%CI: 0.26 – 0.42; $p < 0.0001$) decreased the risk of LTFU. Thus, patients with low BMI were two-fold more likely to drop out from ART program than those with higher BMI. However, patients attending rural facilities, and those not using IPT or with low VL were 27%, 89% and 67% protected against LTFU than their counterpart reference categories, respectively.

Table 3: Predictors of LTFU among adult patients with HIV in the final cox model

Variable	Estimate	AHR	95% CI	P value
Male vs Female	0.16	1.17	0.92 – 1.49	0.1952
Urban vs Rural	-0.31	0.73	0.58 – 0.92	0.0081
WHO stage III & IV vs I & II	-0.078	0.92	0.70 – 1.22	0.5798
On IPT vs No IPT	-2.19	0.11	0.08 – 0.16	<0.0001
TB vs No TB	-0.33	0.72	0.41 – 1.27	0.2537
BMI < 18.4 vs ≥ 18.4	0.63	1.88	1.40 – 2.54	<.0001
Low VL vs High VL	-1.11	0.33	0.26 – 0.42	<.0001

5. Discussion

A total 1,131 eligible patients were subjected for analysis. Among them, 337 (29.8%) were LTFU. This rate of LTFU was higher compared to other study findings but was within the global range of 0.3% to 50% (Agwu, *et al.*, 2016 and Meloni, *et al.*, 2014). According to Dessalegn, *et al.*, (2015) and Mehari, *et al.*, (2017), their study revealed a rate of 11% and 11.6%, respectively, which are much lower compared to our study findings. Mberu, *et al.*, (2015), also reported a lower LTFU (23.4%). LTFU, has compromised the long-term success of scaling up of ART interventions worldwide (Berheto, *et al.*, 2014) affecting patients' survival (Saumu, 2017). LTFU may lead to deteriorating health of HIV patients if left unchecked (Meloni, *et al.*, 2014).

In addition, the study revealed that higher proportions of LTFU, 77% (259) often occurs during the first year of ART initiation, but declines with time the patients stay on ART. According to Berheto, *et al.*, (2014) patients discontinue treatment within the first 6 months of ART initiation and decline with time relating it to inadequate counseling and

high cost of calling the patients. On the contrary Honge, *et al.*, (2013) reported an incidence rate of attrition after ART initiation at 6 months of about 20% which is lower than that reported in the current study though no explanation was provided.

This current study also demonstrated significant association between socio-demographic characteristics and LTFU. Females (69%) were more likely to have experienced LTFU compared to their male counterparts. This could be justified by the fact that majority of women depend on men to finance for their transport to the health facilities. This finding was comparable with the studies conducted by Dessalegn, *et al.*, (2015); Tweya, *et al.*, (2018) and Eguzo, *et al.*, (2015).

In contrast, a comparatively higher proportion of males visiting urban facilities (42.9%) than females (27.6%) were LTFU. Megerso, *et al.*, (2016) and Clouse, *et al.*, (2014), revealed that, males were more likely to be LTFU compared to females because of the former's nature of work, involving traveling, sometimes for long distances which keeps them away from their home (Tadesse & Haile, (2014) and Arnesen, *et al.*, (2017). Lastly, male patients drop out either because of the history of high VL and/or over-representation (Magala, Tapati, & Nalubega, 2018). However, according to findings from Berheto, *et al.*, (2014), there was no gender differences in LTFU.

Age at ART initiation; was also found to be a significant factor of LTFU in this study. Most of the LTFU (36.5%) among the males were aged 35 – 44 years compared to females who were mostly of aged 25 – 34 years (46.8%). Median age for male was higher (39.5 years) than that of females (33.0 years). Similar findings were obtained in studies conducted by Mugisha, *et al.*, (2014) and Clouse, *et al.*, (2014), where they revealed that, patients who were younger in age were commonly linked to LTFU as opposed to senior age group. In addition, De La Mata, *et al.*, (2018) results were agreeable with our finding, that the older generation (above 50 years) were less likely to be LTFU compared to the younger generation (aged 30 or below). The explanation given was that the younger age-group experiences stigma and discrimination. In addition, Megerso, *et al.*, (2016) and Eguzo, *et al.*, (2015) reasoned that patients who were below 25 years were more likely to be LTFU compared to the older population due to the former's dependency (Dewi, *et al.*, 2015). Recent evidence suggests that social factors, such as stability (income, education, occupation), are associated with LTFU (Falagas, *et al.*, 2008). Notably, in Africa, both social and economic stability increases with age. Reports show that most women aged 35 years and above are in marital relationships and the probability of being employed is substantially greater at old than young ages (younger women are more likely to be in education, according to Krishnan, *et al.*, (2011).

Residential setting was found to be a predictor of LTFU in this study. Results show higher proportions of LTFU (42%) among patients who attended rural facilities compared to those who attended urban facilities (24%). According to Berheto, *et al.*, (2014), rural settings are characterized by poor patient tracing. Furthermore, LTFU occurs more commonly where people experience problems of

infrastructure and where patients have to cover long distances on foot to access health care hence increasing the chances of LTFU (Megerso, *et al.*, 2016). In contrast, Tweya, *et al.*, (2018) study revealed a high patient turnover in urban clinics which was attributed to increased patient-to-provider ratios. Patients did not have adequate time for counselling before initiation of ART. In addition, LTFU occurs mainly in clinics with many patients compared to those clinics with fewer patients. High volume clinic, experience between 30 and 40% cases of LTFU (Dessalegn, *et al.*, 2015). Moreso, Mecha *et al.*, (2016) also suggested that, patients who reside in urban areas, were more likely to get lost in care compared to their counterparts though no explanation was given.

Clinico-immunologic characteristics, have been identified to be associated with LTFU. Notably, a higher proportion of females (76.0%) than males (69.2%) who were LTFU had a CD4 count <200 cells/mm³. The results are supported by other study finding that linked low CD4 cell count of <200 cells/mm³ during ART initiation and LTFU (Grimsrud, 2015 and Mberi, *et al.*, 2015). A divergent finding reported by Grimsrud, (2015) and Mecha, *et al.*, (2016) showed that patients with higher CD4 cell count had increased risk of LTFU and early disengagement from care. This was also noted by Mugisha, *et al.*, (2014), who reported associated between high CD4 count <350 cells/mm³ with LTFU. Cutsem, *et al.*, (2011) were of the view that patients who initiate ART at higher CD4 counts may be at an increased risk of being lost to care as ART services have been designed to support acutely ill HIV patients with lower CD4 counts. Apparently, patients who initiate ART at higher CD4 counts without an illness experience are not catered for in the services, and they may not experience any immediate benefits of ART and thus, disengage from care early.

The study results show that having undetectable VL, decreased the risk of LTFU. According to Arnesen, *et al.*, (2017) and Agwu, *et al.*, (2016) a patient with high/detectable VL, were more likely to disengage from treatment. Chendi, *et al.*, (2019) gave an explanation that, poor adherence, treatment interruption due to dosage and LTFU are factors reported most likely to influence virological failure responses. As reported in similar studies, a high VL in a person on treatment is an indication either that the medication is not being taken properly or that the virus is becoming resistant to the medication (UNAIDS, 2016).

The study also examined the relationship between users of IPT and LTFU. Majority of patients who were LTFU were IPT users. This could arise due to increased pill burden experienced, where the patient is required to take IPT for six months continuously with ART. This finding is in line with that of Assemie, *et al.*, (2018) who reported a relationship between patient on IPT and LTFU. On the other hand, Berheto, *et al.*, (2014) and Dessalegn, *et al.*, (2015) found out that non-IPT users were more likely to be LTFU compared to their counterpart because of the increased reinforced counseling given to patients taking IPT, therefore contributing to better follow-up.

The results identified BMI as a predictor of LTFU. This was justified by the finding that those with BMI < 18.4,

increased the risk of LTFU by almost two times compared to their counterparts. This finding was in line with that of Tweya, *et al.*, (2018) showing that, those patients with BMI less than 18.4 at ART initiation were associated with LTFU. In addition, Tadesse & Haile, (2014), pointed out that, “the rate of LTFU was associated with a baseline body weight of patients.” Having weight of more than 60 kg lowers the risk of being LTFU compared to weigh less than 60 kg. Patients with normal weight would like to maintain their wellbeing. Patients with no weight gain at six months were more likely to discontinue treatment compared to those who had weight gain (Kan, *et al.*, 2014). Mukumbang, *et al.*, (2017) suggested that patients do stop taking their medication after they realize that they have started to look healthy and experience an increase in body weight after having been initiated on ART.

6. Conclusion

The study reported a higher LTFU rate of 29.8% as compared to other studies globally. Kenya is the fourth in Africa in terms of high LTFU rate and Nakuru County is 9th nationally. A greater proportion of patient (76%) were identified as LTFU within the first year of ART initiation. A quarter (25%) and half (50%) of LTFU cases occur in rural and urban facilities, respectfully. This happens during the initial visit of ART enrollment/ initiation.

The following four variables were identified in the quantitative analysis to be statistically significantly associated with LTFU: low BMI of less than 18.4; attending rural facilities; high VL and using IPT.

7. Recommendation

- This study recommends that, the Ministry of Health, County government and all other stakeholders should build capacity of health care personnel working at CCC/HIV clinic to improve provision of HIV care services; they also need to address availability of resources and challenges that impede the implementation of HIV/AIDS management policies. Referral planning should commence soon as patients are enrolled into the programme. Patients need to be informed about transfer to the nearest facilities for ease follow up and reducing transportation cost. In addition, they need to be encouraged to provide and update their contact/location with every visit.
- In order to minimize LTFU and to realize the second and third UNAIDS HIV implementation strategies, interventions should be geared towards close supervision. There is need to prioritize all HIV adults with low BMI of less than 18.4; high VL; attending rural facility and using IPT as they are more at risk of being LTFU. Further care and continual counselling should be provided to younger population who are on ART to ensure that they do not disengage from care, thus reducing the risk of ART transmission to the un-infected population.

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