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Research Article

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Factors Associated with Virological Non-Suppression Among Adult Plhiv after Receiving Intensive Adherence Counseling at Taso Mbale, Eastern Uganda: A Retrospective Cohort Study

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ABSTRACT

Background: According to the Joint United Nations Program (JUNP) on HIV/AIDS through the ambitious 95-95-95 target, 95% of people living with HIV (PLHIV) on antiretroviral treatment (ART) should be virally suppressed. Viral load (VL) non-suppression has be found to be associated with ART adherence, and intensive adherence counseling (IAC) has been shown to lead VL re-suppression by over 70% in PLHIV on ART. Although Uganda has employed the IAC intervention program since 2015, there is paucity of research data on HIV viral load non-suppression after IAC.

Methodology: This was a retrospective cohort study, conducted in TASO Mbale. Data were abstracted for all clients with non-suppressed viral load between Jan 2018 to August 2021 from the TASO Mbale program database and various parameters were considered. These parameters included the IACs done, the time the repeat VL was done, presence of an opportunistic infection, sex. The age, and the current regimen. A client was considered to have a non-virological status if there were >1000 copies of CD4 cells. The clients were followed for a maximum period of 43 months. A total of 13428 person months was observed for different periods. The data were then analyzed using statistical software Stata version 14. Bivariate analysis was done for all covariates. Hazard ratios (HRs) were estimated as a degree of association between viral non-suppression and client features, via a Cox proportional hazards regression.

Results: A total of 442 PLHIV after IAC were enrolled, of whom 60 (13.6%) had VL non suppression following IAC. The overall rate of VL non-suppression was 4.47 (3.41-5.75) per 1000 person-months (PM) of observation after IAC. ART regimen was statistically significant with viral load non-suppression especially DTG-3TC-LPV/r based regimen had (AHR=5.78, 95%CI, 1.137-29.384, p=0.034). Poor adherence level to ART had significant contribution to viral load non-suppression (AHR=4.88, 95%CI: 1. 607-14.836, p=0.005).

Conclusion: Virological non-suppression after IAC was found at 13.6% and associated with patients' good adherence level, ART drug regimen specifically DTG-3TC-LPV/r and AZT-3TC-LPV/r based regimens. The findings lend a huge boost towards the third UNAIDS target of 95%.

Keywords: Virological, Non-Suppression, Intensive Adherence Counseling, Adult Plhiv, Facotors

Introduction

According to UNAIDS, 95% of PLHIV on ART should be virally suppressed as was ambitiously set through United Nations' 95-95-95 target. Fast tracking the sustainable development goal to end the HIV epidemic by 2030. Globally, in 2020, out of 37.7 million PLHIV, 73% had access to ART and 66% had achieved viral suppression. Uganda in particular, by 2020, out of the 1.4 million PLHIV, 91% knew their HIV status, 90% were on ART and 82% had viral suppression. In order to achieve benefits of early ART initiation, PLHIV on ART must be virologically suppressed, which hinges on effective behavior change interventions by HIV care providers, health sector leadership and PLHIV themselves to facilitate good adherence to ART [1-8].

Good ART adherence can be defined as properly following treatment provider recommendations regarding ART dosage, frequency and timing of swallowing medication. Poor ART adherence is a major cause of treatment failure in PLHIV and ensuring sustained adherence to ART can achieve viral

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suppression except for presence of HIV drug resistance. If a person living with HIV is virally unsuppressed, he or she will have slow immune system recovery, HIV disease advancement, increased morbidity and an enhanced HIV infection transmission risk. ART-associated side effects, younger age, substance use, depression and forgetting dosing time are linked to sub-optimal ART adherence. Additionally, individual ART initiation incentive, education level, duration on ART, stigmatization and HIV status disclosure affect ART adherence [9-13].

HIV virological failure is a common challenging problem, even after Intensive Adherence Counseling of adult PLHIV. According to the recent Uganda Population-Based HIV Impact Assessment 2020-2021, the prevalence of Viral Load Suppression (VLS) among adults (ages 15 years and older) living with HIV in Uganda stands at 75.4% [14]. TASO Mbale treatment centre is located in Mid-Eastern of Uganda, which has registered a lowest VLS (60.3%) as compared to Southwestern region (82.8%). A study conducted in central Uganda showed that the proportion of children living with HIV receiving ART who had a VL non-suppression after six months of ART at the pediatric HIV/AIDS clinic at Joint Clinic Research Centre (JCRC) was 23% (Nabukeera S, Kagaayi J, Makumbi FE, Mugerwa H, Matovu JKB, 2021). Whereas this study enrolled caregivers of children living with HIV, it did not look at the adult PLHIV. The proportion of adult PLHIV with non-suppressed VL after IAC is not known and the factors for Non-suppression are equally not known, for which this study was conducted. No such a study has been conducted in eastern Uganda specifically Mbale.

In addition to that, there have been few studies on the factors associated with of virological non-suppression after IAC among adult patients on antiretroviral therapy in Uganda in general, and there is variation across clients and settings for unknown reasons. Some identified predictors of non-suppression such as; poor drug adherence, use of sub-optimal drug combinations, previous ARV exposure alcohol or drug abuse, stage in which the patient is based on WHO, low CD4 +count, high viral load, TB co-infection, time on ART, Time from HIV diagnosis to ART start (weeks), non-Adherence to ARVs, duration on treatment and Treatment line [1]. The aim of this study was to determine the factors associated with virological non-suppression among adult PLHIV after intensive adherence counseling at TASO Mbale treatment centre, Eastern Uganda.

Methods

Study Design and Setting

This was a retrospective cohort study design. The study used TASO Mbale program data for the period between Jan 2018 and August 2021. The study was conducted in TASO Mbale center of Excellence, located in Mbale Hospital, Mbale Town/ Municipality in Mbale District in Eastern Uganda. TASO Mbale is one of the 11 centers of TASO Organizations that provide prevention, care and treatment for people living with HIV/AIDS/ TB. It has a population of over 7,285 active clients on ART. VL-testing as a model of monitoring treatment adherence was rolled out by MOH and adapted in 2015/2016 at TASO Mbale. Mbale city is approximately 210km from the Kampala city. It has two HCIVs and one regional referral hospital.

TASO Mbale, which is within Mbale city provides comprehensive HIV/AIDS prevention, care, and support to the population of Mbale, Sironko, Budaka, Kibuku, Kumi, Butaleja, Bulambuli, Manafwa, Butebu, Palisa, Bukedea, Kacumbala, Budadiri, Bududa, Tororo, Jinja among other places around Mbale.

Study Population And Sample Selection

Figure 2 below shows a schematic flow chart showing how participants were enrolled for analysis. A total of 607 clients with VL ≥ 1000 copies/ml who were receiving treatment at TASO Mbale were retrieved for the period Jan 2018 to August 2021. Of which 450 clients were active and 157 were inactive (died or lost to follow-up). Four hundred forty two (442) of the active clients had undergone IAC whereas 8 clients did not undergo IAC at the time of follow-up visit. The 442 clients following IAC were followed for different time periods and considered for analysis

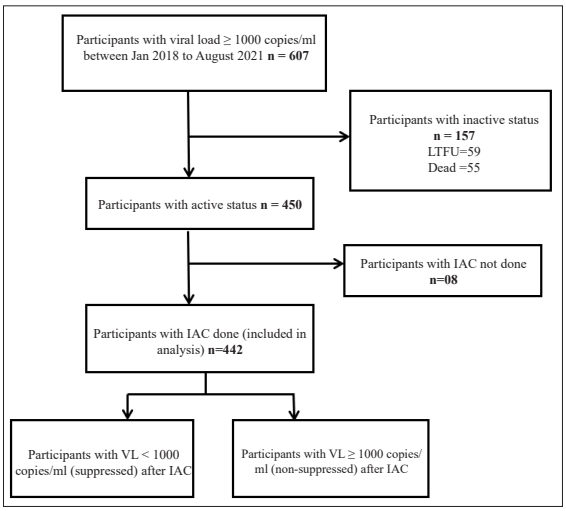

Figure 2: Schematic Presentation of Participants' Selection at Tsao Mbale Centre Between Jan 2018 and August 2021

Study Variables and Measurement

Dependent Variable

The study looked at the viral load outcomes of patients with suppressed and /or non-suppressed viral load among clients in TASO Mbale Centre

The independent Variables

Are age -we considered adults 18years and above, sex-male and female, the WHO staging (stage 1, 2, 3 & 4). The intensive adherence counseling (IAC), the regimen-baseline and current regimen, nutritional status-green-well nourished, Red-severe malnutrition and yellow-moderate malnutrition, treatment supporter-present or absent and residence-Urban within Mbale city and Rural-outside Mbale municipality.

Inclusion and Exclusion

Inclusion Criteria

All clients who had been on ART for at least 6 months, have had a viral load measure done with results in the system and VL ≥ 1000C/ml are active

Exclusion Criteria

- Those not completing 3 sessions of EAC after first high viral load results

- Participants below the age of 18 years old
- Those living with HIV, not on Antiretroviral therapy
- The study also excluded all clients who are inactive (lost to follow up, dead, and transferred out)

Data Source

Secondary data were retrieved from TASO Mbale treatment centre database. Data were retrieved from PLHIV on ART who had their viral load measured between Jan 2018 and August 2021. The retrieval was conducted in December 2022.

Data Abstraction

The data were abstracted from the TASO Mbale program database regarding the PLHIV socio demographic and clinical, ART drug regimen, and virological characteristics. The abstraction was done December 2022 for the period; January 2018 through August 2021.

Data Management and Quality Control

The data retrieved from TASO Mbale program database for the period Jan 2018 to August 2021 were extracted in spreadsheet format. Data cleaned, and sorted, then exported to STATA for analysis. The validity of the data was enhanced by a standardized record-keeping system of the TASO Mbale treatment centre database. These records are normally readily available and regularly updated by the Monitoring and Evaluation officers and data clerks during each Patient visit. Data recorded from the register at the treatment centre were found to be similar to the data in the database. The reliability of this study was ensured by consistently using the same data entered on the treatment centre database from the registers.

Data Processing and Analysis

The data were declared as survival time-data using stset command in STATA version 14.0 package (StataCorp. 2014. Stata Statistical Software: Release 14. College Station, TX: Stata-Corp LLC). The follow-up time in months was set as the failure time. Whereas the failure variable was referred to as VL non-suppression. The follow-up time in months was computed as the difference in dates of VL tests after IAC during the follow-up period. This was done to obtain the total time at risk and overall contribution of a patient time during the follow-up period.

Descriptive statistics were summarized using frequency and proportions for categorical variables, whereas continuous variables were summarized with a measure of central tendency with corresponding measures of dispersion. Incident rates were estimated for the events of viral load suppression and viral load non-suppression. Bivariate analysis was done for all covariates. Hazard ratios (CHRs) were estimated as a degree of association between viral non-suppression and client features, via a Cox proportional hazards regression. Variables with p-values less than 0.10 in the bivariate analysis were included in the multivariable analysis reporting adjusted hazard ratios (AHRs), whereas variables with a p-value ≤ 0.05 were measured as statistically significant determinants of viral non-suppression, with a 95% CI.

Ethical Consideration

Ethical approval was sought from the Research Ethics Committee, REC Mbale Hospital. The study administrative clearances from both department of public health of Busitema University and TASO Mbale treatment centre. A wavier of consent was obtained from the IRB since the study was retrospective and will use the identified data for analysis. The Uganda National council for science and technology also provided approval. The data retrieved from TASO Mbale treatment centre was kept confidential and patients' identity was not retrieved.

Results

Socio-Demographic Characteristics

Table 1 below shows the socio-demographic characteristics of PLHIV. Four hundred forty two (442) PLHIV underwent through Intensive Adherence Counseling at TASO Mbale for the period Jan 2018 to August 2021. Of these, 361(81.67) aged more than 35 years. The mean age was 45.46 years with standard deviation 13.05 years

Table 1: Socio-demographic characteristics of PLHIV receiving treatment at TASO Mbale from Jan 2018 – August 2021

Characteristic	Sub-category	Frequency	Percentage (%)
Age(years)	18-35	81	18.33
	>35	361	81.67
Mean ± Stdev	45.46±13.05		
Sex	Female	289	65.38
	Male	153	34.62
Place of residence			
	Rural	336	76.02
	Urban	106	23.98
Treatment supporter			
	No	166	37.56
	Yes	276	62.44
Stay together with treatment supporter			
	No	413	93.44
	Yes	29	06.56

The Clinical and Behavioral Characteristics

The clinical characteristics in this study were the timing of ART initiation, WHO clinical stages of HIV, baseline ART drug regimens, co-infections such as TB and ART regimen after IAC. Meanwhile, the behavioral characteristics were the adherence levels and nutritional status. At the time of ART initiation, 292 (66.06%) of the PLHIV were initiated late on ART, 337(76.24) were at the WHO clinical stage 2 of HIV. On the baseline ART regimen, 140 (31.67%) were on AZT-3TC-NVP and 174(39.37%) were on other 1st line ART drug regimen not specified in the data. After IAC, 367(83.03%) PLHIV had been switched to TDF/3TC/DTG regimen.

Table 2: Clinical and Behavioral Characteristics of PLHIV Receiving Treatment at TASO Mbale from Jan 2018 – August 2021

Characteristic	Sub-category	Frequency	Percentage
Timing of ART initiation	Early initiation	150	33.94
	Late initiation	292	66.06
WHO Clinical stage			
	WHO clinical stage 1	99	22.40
	WHO clinical stage 2	337	76.24
	WHO clinical stage 3	05	01.13
	WHO clinical stage 4	01	00.23
Baseline ART Drug Regimen			
	ABC-3TC-EFV	01	00.23
	AZT-3TC-EFV	52	11.76
	AZT-3TC-NVP	140	31.67
	D4T-3TC-EFV	05	01.13
	D4T-3TC-NVP	17	03.85
	TDF-3TC-EFV	10	02.26
	TDF-3TC-NVP	36	08.14
	TDF-FTC-NVP	01	00.23
	Other 1st line Regimen	174	39.37
	Missing baseline Regimen	06	01.36
Adherence level			
	Poor Adherence	08	01.81
	Good Adherence	434	98.19
TB status			
	No	431	97.51
	Yes	11	02.49
Nutritional status/MUAC			
	Green	422	95.48
	Red	03	00.68
	Yellow	17	03.85
ART Regimen after IAC			
	ABC-3TC-ATV/r	21	04.75
	ABC-3TC-LPV/r	02	00.45
	ABC/3TC/DTG	14	03.17
	AZT-3TC-ATV/r	06	01.36
	AZT-3TC-LPV/r	01	00.23
	AZT/3TC/DTG	08	01.81
	TDF-3TC-ATV/r	12	02.71
	TDF-3TC-EFV	03	00.68
	TDF-3TC-LPV/r	06	01.36
	TDF/3TC/DTG	367	83.03
	OTHER	02	00.45

The Proportion of Virological Suppression and Non-Suppression of Plhiv After Iac Receiving Treatment at Taso Mbale Centre Between Jan 2018 and August 2021

The PLHIV who received IAC were followed for different periods with a total of 13, 428 person-months (PM) of observations. In this follow-up period, a total of 382 (86.4%) were virologically suppressed and their counterparts developed viral load non-suppression 60(13.6%) (Figure 3). Hence, the overall rates of VL suppression was 28.45 (25.70-31.40) and that of VL non-suppression was 4.47 (3.41-5.75) per 1000 person-months (PM) of observation after IAC.

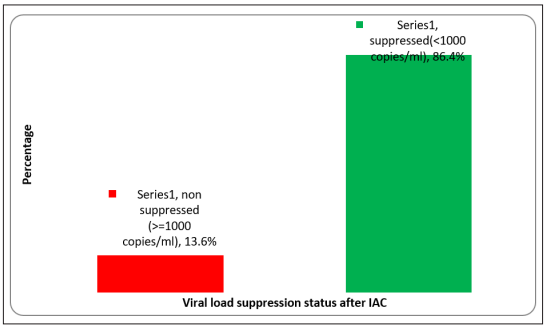

Figure 3: The Proportion of Virological Suppression Status of Plhiv After Iac at Taso Mbale Between Jan 2018 and August 2021

Bivariate Analysis

In the bivariate analysis, Cox proportional hazard regression analysis reporting crude Hazard ratio (CHR) for socio-demographics and clinical characteristics of PLHIV; sex, age, residence, treatment supporter availability, staying with treatment supporter, ART regimen, ART adherence level, nutritional status, and clinical stage were all ran independently with VL non-suppression. Five variables emerged to be significantly associated with VL non-suppression that is ART regimen, nutritional status, clinical stage, ART adherence level and client staying with a treatment supporter.

Table 3: Bivariate Analysis for Factors Associated With Viral Load Non-Suppression Among Adult Plhiv After Iac in Eastern Region-Uganda From January 2018 to August 2021 (N=442)

Variable & category	Total (N=442)	Non-suppression, n (%)	CHR (95% CI)	p-value
Age				
18-35	81(100.00)	15(18.52)	Ref.	
≥35	361(100.00)	45(12.47)	0.64(0.354-1.147)	0.113
Sex				
Female	289(100.00)	37(12.80)	Ref.	
Male	153(100.00)	23(15.03)	1.33(0.795-2.255)	0.272
Place of residence				
Rural	336(100.00)	49(14.58)	Ref.	
Urban	106(100.00)	11(10.38)	0.77(0.397-1.475)	0.424
Treatment supporter				
No	166(100.00)	21(12.65)	Ref.	
Yes	276(100.00)	39(14.13)	1.27(0.748-2.169)	0.374
Stay together with treatment supporter				
No	413(100.00)	51(12.35)	Ref.	
Yes	29(100.00)	09(31.03)	2.84(1.395-5.794)	0.004*
Timing of ART initiation				
Early initiation	150(100.00)	21(14.00)	Ref.	
Late initiation	292(100.00)	39(13.36)	0.74(0.435-1.260)	0.268
WHO Clinical stage				
WHO clinical stage 1	99(100.00)	13(13.13)	Ref.	
WHO clinical stage 2	337(100.00)	44(13.06)	1.22(0.656-2.269)	0.530
WHO clinical stage 3	05(100.00)	03(60.00)	3.43(0.948-12.378)	0.060*
WHO clinical stage 4	01(100.00)	00(00.00)	5.22e-15	1.000
Adherence level				
Good Adherence	434(100.00)	55(12.67)	Ref.	
Poor Adherence	08(100.00)	05(62.50)	4.02(1.568-10.304)	0.004*
TB status				
No	431(100.00)	57(13.23)	Ref.	
Yes	11(100.00)	03(27.27)	2.01(0.627-6.433)	0.240

Nutritional status/MUAC				
Green	422(100.00)	56(13.27)	Ref.	
Red	03(100.00)	01(33.33)	8.59(1.152-63.962)	0.036*
Yellow	17(100.00)	03(17.65)	1.15(0.358-3.706)	0.813
ART Regimen after IAC				
ABC-3TC-ATV/r	21(100.00)	06(28.57)	Ref.	
ABC-3TC-LPV/r	02(100.00)	00(00.00)	6.85e 19	-
ABC/3TC/DTG	14(100.00)	03(21.43)	1.25(0.306-5.071)	0.759
AZT-3TC-ATV/r	06(100.00)	03(50.00)	1.94(0.479-7.826)	0.354
AZT-3TC-LPV/r	01(100.00)	01(100.00)	8.62(1.006-73.791)	0.049*
AZT/3TC/DTG	08(100.00)	02(25.00)	2.90(0.565-14.839)	0.202
TDF-3TC-ATV/r	12(100.00)	02(16.67)	1.00(0.195-4.883)	0.976
TDF-3TC-EFV	03(100.00)	01(33.33)	2.75(0.327-23.200)	0.351
TDF-3TC-LPV/r	06(100.00)	03(50.00)	3.94(0.963-16.113)	0.056*
TDF/3TC/DTG	367(100.00)	39(10.63)	0.47(0.198-1.113)	0.086*
OTHER	02(100.00)	00(00.00)	6.52e 19(0 -)	1.000
Statistical Note: Asterisk (*) p<0.1				

Multivariable Analysis

In multivariable analysis after adjusting for sex, age, residence, treatment supporter availability, staying with treatment supporter, ART regimen, ART adherence level, nutritional status, and clinical stage, two factor variables emerged to be significantly associated with VL non-suppression including ART regimen and ART adherence level.

Table 4: Multivariable Analysis for Factors Associated with Viral Load Non-Suppression Among Adult Plhiv After Iac in Eastern Region-Uganda from January 2018 to August 2021 (N=442)

Variable & category	Total(N=442)	Non-suppression, n (%)	AHR (95% CI)	p-value
Stay together with treatment supporter				
No	413(100.00)	51(12.35)	Ref.	
Yes	29(100.00)	09(31.03)	2.02(0.893-4.548)	0.091
WHO Clinical stage				
WHO clinical stage 1	99(100.00)	13(13.13)	Ref.	
WHO clinical stage 2	337(100.00)	44(13.06)	1.13(0.570-2.220)	0.570
WHO clinical stage 3	05(100.00)	03(60.00)	0.63(0.112-3.563)	0.604
WHO clinical stage 4	01(100.00)	00(00.00)	8.68e-19(-)	-
Adherence level				
Good Adherence	434(100.00)	55(12.67)	Ref.	
Poor Adherence	08(100.00)	05(62.50)	4.88(1.607-14.836)	0.005***
Nutritional status/MUAC				
Green	422(100.00)	56(13.27)	Ref.	
Red	03(100.00)	01(33.33)	3.12(0.336-29.042)	0.317
Yellow	17(100.00)	03(17.65)	0.35(0.065-1.822)	0.210
ART Regimen after IAC				
ABC-3TC-ATV/r	21(100.00)	06(28.57)	Ref.	
ABC-3TC-LPV/r	02(100.00)	00(00.00)	4.48e-19(-)	-
ABC/3TC/DTG	14(100.00)	03(21.43)	0.97(0.232-4.027)	0.963
AZT-3TC-ATV/r	06(100.00)	03(50.00)	1.22(0.271-5.496)	0.795
AZT-3TC-LPV/r	01(100.00)	01(100.00)	44.70(1.579-1265.056)	0.026**
AZT/3TC/DTG	08(100.00)	02(25.00)	1.96(0.338-11.396)	0.452
TDF-3TC-ATV/r	12(100.00)	02(16.67)	0.86(0.170-4.323)	0.852
TDF-3TC-EFV	03(100.00)	01(33.33)	2.71(0.323-22.840)	0.358

TDF-3TC-LPV/r	06(100.00)	03(50.00)	5.78(1.137-29.384)	0.034**
TDF/3TC/DTG	367(100.00)	39(10.63)	0.43(0.178-1.048)	0.063
OTHER	02(100.00)	00(00.00)	1.55e-19(-)	-
*Statistical Note: Asterisk (**) p<0.05, ***p<0.01*				

Discussion

The proportion Virological Non-Suppression Among Adult PLHIV After IAC

The virological non-suppression (13.6%) found in the current study is significantly lower than the third UNAIDS set goal of having a viral suppression of 95% on ART. The result from this study is similar with that from Cameroon, where the virological non-suppression was reported at 11.8% [15,16]. These results are attributed to enhanced education of patient during their treatment visits and IAC.

The finding in this study is inconsistent with results from similar studies conducted in Uganda, Kenya, South Africa and Tanzania (20-32.8%) [10]. This variation may be attributed to the differences in the quality of care in service delivery more so IAC and other adherence support activities [10,17].

Factors Associated with Virological Non-Suppression Among Plhiv After Iac at Taso Mbale

Our study found a significant association between adherence level and HIV virological non-suppression, (AHR=4.88, 95% CI: 1.607-14.836 p=0.005). For example, patients who had Poor adherence level had a five-fold risk of being VL non-suppressed as compared to patients with good adherence levels. This is in agreement of findings of other. Good adherence level has been associated with better virological suppression as well as improved immunological and clinical outcomes [10,18].

The study further reports a significant association between virological suppression and ART drug regimen after IAC. Whereas there is a variation in drug regimens the NVP-based and the DTG-based regimens. The TDF/3TC/DTG regimen was significantly associated with viral load suppression, AHR=5.78, 95% CI: 1.137-29.384, p=0.034. Patients who were switched to TDF/3TC/DTG ARV regimen were 5.0 times likely to virological loads unsuppressed as compared to those on other ARV regimens. This finding is comparable to another study conducted in Uganda. In general, these finding seem to lend support to the WHO current guidelines as the first ART regimen. The regimen has a higher barrier to resistance compared with NRTIs and NNRTIs-based regimens [10,19].

This study also indicated that the place of residence of the patients and viral load suppression had no association, meaning that the place of residence whether rural or urban does not in any way significantly affect the viral load suppression. This finding is in agreement with the growing body of literature that provides evidence that location where the patient resides in terms of distance from the treatment centre is not necessarily a barrier that can affect viral load suppression [20].

About age and virological non-suppression, since the current study was conducted among adults, it is conceivable that adults usually have been on ART for long periods, therefore they suffer medication fatigue and miss appointments leading to poor adherence. Surprisingly, the findings from this study did not show any significant association between age and virological non-suppression. This finding is consistent with those in Kenya and Tanzania who also found no significant association between age and virological non-suppression [21-23]. The study found no association between TB co-infection with virological non-suppression, which was also reported in previous studies[19, 24]. The possible explanation to this lack of association could be attributed to the small number of participants diagnosed with TB.

The current study did not show a significant association between WHO clinical stages. This is in agreement with another study conducted in Uganda. However, this is inconsistent with a study in Ethiopia that showed increased likelihood of virological non-suppression in WHO clinical stage 2 compared to stage 1. Furthermore, studies in Swaziland and Nigeria found that WHO clinical stages 3 or 4 were significantly associated with virological non-suppression. To explain this variation, in the current study there were very few patients in WHO clinical stages 3 and 4. This might have contributed to no significant association during the analysis in this study.

Strengths and Limitations of the Study

To the best of the researcher's knowledge, this is the first study to provide up-to-date findings on proportion of virologically non-suppressed PLHIV after IAC and the determinants using TASO Mbale centre program data.

Nonetheless, this study has some limitations that must be acknowledged. The major limitation was the usage of program data that was not collected for research purposes, which handicapped the researcher as regards the exposure variables that could be studied. The limitation was that the researcher did not analyze variables such marital status, distance from the treatment centre, income levels, education status, occupation, culture and religion. These variables could have concealed socio-demographic confounders because they not routinely collected at the TASO treatment centre. The study is also limited by the fact that it is based on retrospective information provided by the respondents at the time of each visit at the treatment centre which may subject to recall bias. Furthermore, some participants were either lost to follow up, dead or transferred out patients, which might have caused an under or over estimation virological non-suppression.

Conclusion

In conclusion, Out of 442 clients with non-suppressed viral load retrieved after IAC, 13.6% did not achieve viral load suppression after IAC. This could be as a result of poor adherence levels to ART. The study revealed that poor adherence to ART was significantly associated with VL non-suppression following IAC. The ART regimen of the patient, especially DTG and AZT based

regimen contributed to many clients being able to achieve viral load suppression. Viral load non-suppression was statistically significant to the TDF-3TC-LPV/r ART regimen of the clients. The Socio-demographic and clinical characteristics including; age, sex, treatment supporter, TB status, and nutritional status did not have any significant statistical relationship in VL non-suppression. The virological suppression of PLHIV after IAC is very vital towards the achievement of MoH adopted 95-95-95 targets. To avert the gaps in HIV treatment at regional, national and international levels. We recommend that, there is need to do more drug resistance testing for clients who do not achieve viral load suppression after IAC, all clients who are switched to DTG based regimen and do not achieve viral load suppression will benefit from drug resistance testing and clients with persistent viral load non-suppression should be switched to another regimen after IAC as per the Uganda Ministry of Health guidelines.

Supplementary Materials: The following supporting information can be downloaded at

Author Contributions

[a short paragraph specifying their individual contributions must be provided]. The following statements should be used "Conceptualization, X.X. and Y.Y.; methodology, X.X.; software, X.X.; validation, X.X., Y.Y. and Z.Z.; formal analysis, X.X.; investigation, X.X.; resources, X.X.; data curation, X.X.; writing—original draft preparation, X.X.; writing—review and editing, X.X.; visualization, X.X.; supervision, X.X.; funding acquisition, Y.Y. All authors have read and agreed to the published version of the manuscript."

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Data Availability Statement

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix All appendix sections must be cited in the main text. In the appendices, Figures, Tables, etc. should be labeled starting with "A"-e.g., Figure A1, Figure A2, etc.

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