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Factors associated with viral load suppression among HIV patients in Rutsiro District, Rwanda

Nzasabimana Pascal, Yves Urayeneza, Onesmus Marete

Nzasabimana Pascal is a student of Masters of Public Health (Global Health) in Mount Kenya University, Rwanda, Email: pascalnzasabimana@gmail.com

Yves Urayeneza is Dean of Public Health and Human Nutrition Faculty at Catholic University of Rwanda, Email: u_yves@yahoo.com

Onesmus Marete is Public Health Lecturer at Mount Kenya University Rwanda, Email: omarete@mku.ac.ke

ABSTRACT

Introduction: HIV/AIDS constitutes a global public health problem since the early 1980s. Globally, there was 37.9 million PLHIV with 79% informed of their status, of the 78% accessing ART and their 86% had viral load suppression in 2018 against 90.1% in Rwanda in 2019 after 3 years of treat all policy implementation but few studies have been done on factors associated viral load suppression in Rwanda and none in Rutsiro. The objective of this study was to assess the factors associated with viral load suppression among PLHIV in Rutsiro District, Rwanda.

Methods: A retrospective study randomly recorded information from 295 files among 1121 PLHIV enrolled in ART from July 2016 to December 2019 in Rutsiro District. Using IBM SPSS Statistics 27 software, descriptive frequencies and % were calculated and using the confidence interval of 95%, the margin error being at 5%, we used cross-tabulation to test the Chi-square and for confounder adjustment, the binary logistic regression was performed to assess associated factors.

Results: Of participants, 64.4% were in between 24-49 years old, females being 62%, while 50% were married. The viral load suppression rate was 84.7%. After adjustment, the very good adherence and good adherence had a 99.5 and 92.4 chances of reduction in the odds of having unsuppressed viral load with OR: .005 (CI: .001-.041, P-value <.001) and .074 (CI: .008-.657, P-value: .019) compared to those with poor adherence respectively; and alcohol consumers had a triple odds of having unsuppressed viral load compared to non-alcohol consumers (OR: 3.254, CI: 1.310-8.084, P-value: .011).

Conclusion: Based on findings, for PLHIV to achieve viral load suppression, they have to be encouraged to quitting alcohol consumption, and health care providers should encourage, guide, and monitor them to make sure they address any concern that can interfere with adherence on time.

Keywords: Antiretroviral, Viral load suppression, HIV/AIDS, adherence, alcohol consumption, HIV patients, Treat all.

1. INTRODUCTION

Globally, by June 2019, among 37.9 million PLHIV, only 24.5 million were on antiretroviral treatment, in a situation of a disease that had already killed 32.0 million persons since the start of the epidemic to the end of the year 2018 and has infected 1.7 million the same year, with a problem of about 8.1 million people living unknowingly they had HIV[1]. The WHO reported that of all PLHIV, 79% were cognizant of their HIV status and only 78% of them were on ART with a viral load suppression rate of 86% in 2018[2]. In Rwanda, by June 2019, only 186.000 over 220.000 (83%) PLHIV were on antiretroviral treatment [1], and the retention of PLHIV on treatment was 92% [3]. According to Rwanda population-based HIV impact assessment 2019, the viral load suppression considered as a wide measure for HIV treatment effects within a certain population was only 76% in adults living with HIV and 90.1% among those on ART [4].

Considering that HIV positive patients had not been spared of HAART's multiple life-threatening adverse drugs effect, toxicity, and often treatment failure for different reasons making very critical concerns within the HIV antiretroviral treatment management which needs to be strictly addressed, and challenging factors ranging from HIV itself, antiretroviral drugs, and host patients' related characteristics, which still make hard to get an effective long term treatment [5]; Rwanda introduced the "treat all" policy in 2016 to start it by its July [6] and this led to 83.8% of diagnostic, 97.5% for treatment and 90.1% for viral load suppression [4]. In Rutsiro District, 291 over 1121 PLHIV (5.3%) initiated in ART reported to have failed the viral load suppression with the first line ART by June 2019 [7] with no documented prevalence in all district PLHIV. With few studies on factors associated viral load suppression in Rwanda and none in Rutsiro, the study intended to investigate factors linked to viral load suppression among PLHIV in Rutsiro District Rwanda.

2. METHODOLOGY

Stud design: A retrospective study design was used to assess factors associated with viral load suppression among PLHIV in Rutsiro District and analyzed records of patients who received ART since the initiation of treat all policy for the period starting from July 2016 to December 2019.

Target population and setting: The population of 1121 PLHIV enrolled on ART in Rutsiro health facilities for those last 3 years was used. Secondary data from file records were analyzed with consideration of patients' files having complete records of social-demographic, lifestyle, and clinical information. In the 2012 census, Rutsiro District had an estimated 324.654 total population, representing 3% of the total population of Rwanda. Females were 52.6% versus 47.4% of males. The population aged between 0-19 years old was 57.2% and that between 20 and 49 years old was 34.2% whereas 50 to 85 years old represented 8.7%. Rutsiro District is nationally ranked ninth with the high level of the population facing extreme-poor at 24.4 % and 49.5% being poor[8]. Rutsiro District accounts 5435 PLHIV under all categories of ART including 1121 new enrolled since July 2016[7]. Only 39 % of women and 60% of men aged 15-49 years have the correct knowledge on transmission of HIV scoring the lowest in the Western Province, while the attitude towards accepting those living with HIV/AIDS is nationally the lowest at 36 % while it is well known that the general stigma and discrimination toward them can unfavorably disturb both people's readiness to be tested for HIV and adhere to ART [8].

Sampling and sample size determination: The Yamane formula applied and calculating the sample size at a confidence interval of

95%, the margin error being at 5% for this population of 1121 PLHIV enrolled on first-line ART from July 2016 to December 2019, the sample size was 295 participants

Sampling technique: Simple random sampling technique was used to get the sample. As participant's records were in different health facilities, the sample component for each health facility got extracted proportionally to the total district PLHIV eligible population and using an excel sheet's list extracted from the HMIS-HIV database with TRAC numbers of those files, the research assistant had to rotary chose any file number which whenever met criteria got considered for the study. Inclusion criteria were having been on ART in Rutsiro health facilities within the period running from July 2016 to December 2019 while exclusion criteria were having been enrolled to ART before July 2016 and later than December 2019, and having been enrolled out of Rutsiro health facilities for the period included in the study.

Data collection instrument and procedure: After a research assistant was trained on the procedure of collecting data and the use of the data collection sheet, sampled files meeting all defined criteria were used to complete social-demographic, lifestyle, and clinical information to the printed data collection sheet. The sheet contained information made of predefined variables as guided by 2016 Rwandan guidelines for HIV and STIs prevention and management.

Data analysis: Data cleaning and analysis used IBM SPSS Statistics 27 software. Descriptive frequencies and percentage were calculated and using the confidence interval of 95%, the margin error being at 5%, the cross-tabulation was done to test the Chi-square and identify factors associated to viral load suppression while the binary logistic regression was used for confounders' adjustment and elimination of non-strongly associated factors.

Ethical consideration: After the study proposal presentation, the researcher went through all recommended ethical procedures that allowed him to get the Research Authorization Letter from Mount Kenya University and Rutsiro District Authorities for data collection in Rutsiro health facilities. Thereafter, all data collection sheets with recorded information were not linked to any patient's name nor personal identifier. Data were confidentially stored and won't be accessible to any other third person except those who were involved in this research

3. RESULTS

Of 295 study participant's 64.4% were in the age group of 24-49 years old, females being 62%, and 50% married. Of them, 82.7 % had revealed their HIV status to their family members, about 74.2% were in the first and second wealthy social category, 50.8% were using one hour or less to reach the ART site, whereas about four-fifth of the participants (n=233, 79%) had a permanent residence within the health facility zone. To that, 58.6% had regular sexual partners while alcohol consumption and smoking have been reported by 142(48.1%) and 7(2.45) respectively. Moreover, the most clients

Table 1: Socio-demographic factors linked with viral load suppression

Variables	Viral load suppression at 6 months		χ ² Statistic	P-values
	Yes	No		
Age				
0-15 years	8	4	7.092574	0.131076
+15-19 years	7	2		
20-24 years	24	3		

+24-49 years	158	32		
50 years and plus	53	4		
Sex				
Male	94	156	0.093267	0.760064
Female	18	27		
Marital status				
Single	67	22	8.984187	0.029502
Married	134	16		
Separated/divorced	12	2		
Widow	37	5		
HIV status revealed to a family member				
Yes	211	33	3.266241	0.070720
No	39	12		
Wealth category				
Category I	92	14	2.580776	0.275164
Category II	91	22		
Category III	67	9		
Time to ART site				
1hour and less	129	21	0.371361	0.542263
More than 1hour	121	24		
Residence status				
Permanent residence within HF zone	129	34	0.474119	0.788944
Temporal residence within HF zone	99	4		
Permanent residence out of HF zone	30	7		

BMI at 6 months was 81% in the class of 19 to less than 25. It was clearly shown that the frequent mode of admission to ART among PLHIV was VCT representing 60.7% of participants. A considerable number of participants (n=267; 90.6%) had enrolled on ART within the first month. Only 28 (6.6%) of all participants took Pre-ART prophylaxis. The majority of participants (80.7%) were in the first WHO stage, and changes in ART regimen happened in 104 (35.3%) participants. In this context, the regimen changed among 101(34.2%), 2(0.7%), and 1(0.3%) due to changes in guidelines, sides effects, and drug interactions respectively. Out of 295 participants, 33(21.2%) patients had the associate health conditions. For instance, 29(9.8%) were using the modern family planning method, 3(1%) had tuberculosis and 1(0.3) was an epileptic patient. Of all participants, 242 (82.0%) had a very good adherence of 95% and more. Different regimen were used and the most frequent ARV regimen among our population was found to be the TDF+3TC+DTG as it was used by half of all participants (n=148, 50.2%). In addition to this 105(35.6%) participants used TDF+3TC+EFV as their ARV regimen.

Table 2: Lifestyle factors related to viral load suppression

Variables	Viral load suppression at 6 months		χ ² Statistic	P-values
	Yes	No		
Sexual Partner				
Regular	151	22	2.174234	0.337187
Irregular	80	18		
Not applicable	19	5		
Alcohol consumption				
Yes	111	31	9.160790	0.002473
Non	139	14		
Smoking				
Yes	7	0	1.290625	0.255933
Non	243	45		
6 Months BMI				

Less than 19	17	9	9.030976	0.060330
19- less than 25	206	33		
25- less than 30	22	3		
30 and over	2	0		
Child	3	0		

The prevalence of viral load suppression among PLHIV in Rutsiro District was 84.7% based on their sixth-month viral load test after being initiated on ART. It was revealed the significant association between marital status ($\chi^2=8.984187$, P-value 0.029502), alcohol consumption ($\chi^2=9.160790$, P-value: 0.002473), and adherence to ART ($\chi^2=121.504314$, P-value: <.001) with viral load suppression and it had no observed association with other studied socio-demographic, lifestyle and clinical factors.

Table 3: Clinical factors related to viral load suppression

Variables	Viral load suppression at 6 months		χ^2 Statistique	P-values
	Yes	No		
Admission mode				
VCT	148	31	2.117399	0.346907
PMTCT	53	9		
PIT	49	5		
Length for enrolment				
Within the first month	228	39	2.550090	0.279418
1-3 months	13	2		
Over 3 months	9	4		
Pre ART prophylaxis				
Yes	22	4	0.000375	0.984552
No	228	41		
Baseline WHO stage				
Stage I	206	32	5.188777	0.158485
Stage II	31	7		
Stage III	8	3		
Stage IV	5	3		
ART regime changes				
Yes	91	13	0.942576	0.331616
No	159	32		
Reasons for regimes changes				
Interaction	0	1	7.136764	0.067664
Side effects	2	0		
Guideline changes	89	12		
Not applicable	159	32		
Associated health conditions				
Asthma	1	0	6.854798	0.076673
Epilepsy	1	2		
Modern family planning	26	3		
No associated condition	222	40		
Adherence				
Very Good or 95% and more	229	13	121.504314	<.001
Good or 85-94%	20	17		
Poor or less than 85%	1	15		
ART Regime				
TDF+3TC+EFV	82	23	7.202288	0.302544
ABC+3TC+EFV	14	3		
AZT+3TC+EFV	1	0		
AZT+3TC+NVP	1	0		

TDF+3TC+DTG	133	15		
ABC+3TC+DTG	8	2		
Other	11	2		

After the marital status, adherence, and alcohol consumption were identified to have been associated with viral load suppression after cross-tabulation and chi-square test, they have been subject to adjustment to eliminate confounders, and results with the binary logistic regression found that the significantly viral load suppression factors were only adherence to ART and alcohol consumption as PLHIV with very good adherence of 95% and the more good adherence of 85-94%, were .005 (CI: .001-.041, P-value <.001) and .074 (CI: .008-.657, P-value: .019) less likely to have unsuppressed viral load respectively while those who drink alcohol were 3.254 times (CI: 1.310-8.084, P-value: .011) less likely to have the viral load suppression.

Table 4: Factors associated with viral load suppression at binary logistic regression analysis

Factors	OR	95% Confidence Interval	P-values
Marital status			
Single	1.518	.410-5.627	.532
Married	.703	.204-2.422	.577
Separated/divorced	.513	.050-5.272	.574
Widow	1		
Alcohol consumption			
Yes	3.254	1.310-8.084	.011
No	1		
Adherence			
Very Good or 95% and more	.005	.001-.041	<.001
Good or 85-94%	.074	.008-.657	.019
Poor or less than 85%	1		

4. DISCUSSIONS

The viral load test results showed viral load suppression in 250 patients (84.7%) which was below the UNAIDS 90-90-90 target [9]. However, this finding is quite similar to the findings of the study conducted in Uganda where 85.7% had achieved viral load suppression [10] but higher compared with 69% reported by Lokpo et al., (2020) in Ghana. In contrast, this prevalence is lower than 93% found in Vietnam [12], 89% in Uganda [13], and 91.8% found in South Africa [14].

Most participants (64.4%) were aged between +24-49 years, and many of the participants 163(62.0%) were female. These findings are almost similar to that of a study conducted in 5 countries (Eswatini, Lesotho, Malawi, Zambia, and Zimbabwe) where 64.2% were female and 62.9% were aged between +24-49 years [15]. And also it is in the same trends with other various studies which reported a big number of HIV infected female like in Uganda [10], Ghana [11], and Ethiopia [16]. According to the UNAIDS, this high prevalence of HIV observed among females is due to socio-cultural, economic and political inequality they face [17].

About a half of the participants (50.8%) were married and the majority of participants 244 (82.7%) did not reveal their HIV status to their family. This is in line with the fact that PLVIH tends to hide their HIV status to others as well as their family members due to fear of stigma and discrimination [18].

Previous studies conducted in Ho Municipality hospital in Ghana [11] and in Bulambuli district in eastern Uganda [10] revealed no considerable pattern in the rate of viral load suppression within the different age groups and this was supported by this current study.

In addition, the literature says that the distance from someone's residence to health facility has no effect on viral load suppression [10] but contrasted with the previous studies reported that sex [16] [19] [14], marital status, and residences [10] have the significant interaction with viral load suppression.

PLHIV tends to smoke and use alcohol in a harmful ways due to overwhelming stress and social isolation [20]. In this study, there was a slight difference between the alcohol consumers (48.1%) and those who didn't consume alcohol (51.9%). In addition to that, the number of smokers was much smaller (2.4%) compared to 11.2% reported in South Africa [14]. Similar to the report of Mogosetsi and colleagues, this study found that sexual partners and smoking had no significant link with viral load suppression [14].

On other hand, the cross-tabulation and chi-square test demonstrated a significant association between alcohol consumption and viral load suppression. Thereafter, the binary logistic regression revealed that those who consumed alcohol were 3.254 times more likely to have an unsuppressed viral load. This confirms the previous studies conducted in Rwanda and Morocco which had revealed that alcohol consumption increases the chance of not adhering to ART [21] and unsuppressed viral load [19] respectively.

Some previous studies [22] reported that the increase in BMI while on high active ART is a good sign for body rebuilding following ART usage. In this context lower BMI is associated with ART failure [23] which is consistent with the findings of this current study.

The majority (60.7%) was admitted through VCT, which is consistent with previous studies that revealed that VCT is the cornerstone in HIV services including prevention, risk reduction, treatment, and care provision [18]. Almost all participants (90.5%) had enrolled in ART within the first month following the diagnosis. This is a good indication of effective HIV management and prevention because early ART initiation, even on the day of diagnosis, improves the clinical outcomes especially for the clients with low CD4+ cell count [24] [22] and reduces the risk of transmission among discordant couples [25].

According to WHO staging, the biggest portion of participants (80.7%) were in the first stage. This was much greater when compared to 3% observed in South Africa [14] but in the same trends with studies done in Kenya [26] and Vietnam [12] where 83.6% and 94% of participants were in the first WHO baseline stage consecutively.

Several lines of evidence established that ART change is caused by drug toxicity, stock-out, associated health condition, and treatment failure [27] [28][29]. This study revealed that the ART regimen had been changed on 35.3% of participants and the most reasons were due to change in ART guidelines (97% or 101/104). In this line, no case of ARV toxicity had been reported and accused to be the causes for regimen change unlike in two studies conducted in Ethiopia [28][29] drug toxicity was reported as the most common cause of ART regimen change.

The findings demonstrated that one out of a hundred (1%) and three out of a thousand (0.03%) had tuberculosis and epilepsy respectively. This is different from the finding of JIMA and colleagues who reported only Tuberculosis as the only co-morbidity in their study conducted among patients on highly active ART in Ethiopia [30].

Regarding adherence to ART, 82% of participants had very good adherence ($\geq 95\%$) which is in concordance with the previous study conducted in Rwanda that reported a high level of adherence to the ART program among Rwandans [21]. Similarly, the studies conducted in Northern Ethiopia [31] and Eastern Uganda [10] revealed that 94.84% and 85.7% had good adherence, respectively.

Among clinical factors, only adherence had a significant relationship with viral load suppression during cross-tabulation and chi-

square tes. The binary logistic regression showed that very good adherence to ART regimen or having a good adherence reduces the odds of unsuppressed viral load by 99.5 and 99.24 chances respectively if compared with poor adherence. This was found to be in concordance with what was reported in Uganda where people with poor adherence were 4.55 times more likely to have an unsuppressed viral load compared to those who had good adherence [10]. Similarly, many others studies [31],[32],[13] have echoed crucial adherence as a factor for viral load suppression.

5. CONCLUSIONS

To sum up, the findings of this present study revealed the short prevalence of viral load suppression below the third 90 UNAIDS target. Indeed, alcohol consumption and adherence to ART were revealed as the main factors influencing the viral load suppression and they should be closely monitored among PLHIV to the extent level their influences on viral load suppression prevalence is well controlled. People living with HIV have to be encouraged to quitting alcohol consumption and health care providers should encourage, guide, and monitor them to make sure they address any concern that can interfere with adherence to ART on time.

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