ISSN: 2474-3658

Yesuf et al. J Infect Dis Epidemiol 2022, 8:283
DOI: 10.23937/2474-3658/1510283
Volume 8 | Issue 11
Open Access

Journal of
Infectious Diseases and Epidemiology

ORIGINAL ARTICLE

Magnitude of Unsuppressed HIV Viral Load at Amhara Public Health Institute Dessie Branch, Northeast Ethiopia

Mohammed Seid Yesuf*, Daniel Dagne, Minwuyelet Maru, Birtukan Shiferaw, Assefa Missaye and Seid Ali Desalegn

Amhara Public Health Institute Dessie Branch, Dessie, Ethiopia

***Corresponding author:** *Mohammed Seid Yesuf, Molecular Biology Laboratory Section, Department of Microbiology, Amhara Public Health Institute Dessie Branch, Dessie, Ethiopia, Tel: +251-920-27-24-20, Fax: +251-331-12-04-43*

Abstract

Background: Human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS)/is the leading cause of global burden of disease. The main goal of antiretroviral treatment is to suppress the replication of the virus in the body. Suppressed viral replication facilitates restoration of the immune function and significantly reduces the risk of HIV transmission. Viral load testing is the most recommended method to diagnose and confirm antiretroviral treatment failure. Epidemiological data on viral suppression status are very important for program managers so as to implement successful treatment regimen and design the correct prevention strategy.

Objective: The aim of this study was to determine the magnitude of unsuppressed HIV viral load from patients referred for HIV viral load testing at Amhara Public Health Institute Dessie Branch Regional Reference laboratory from January 1/2017 to January 1/2019.

Methods: An institution based retrospective cross sectional study was conducted from January 1/2017 to January 1/2019. After obtaining permission from all concerned bodies, data were collected from the viral load request paper, viral load result registration book and from the viral load and early infant diagnosis (EID) data base using a standard checklist. Data were checked for completeness, entered and analyzed using Statistical Package for Social Sciences (SPSS) version 21 computer software. Descriptive statistics and logistic regression analysis were employed to examine the possible risk factors of unsuppressed viral load. P-value less than 0.05 were considered statistically significant.

Result: A total of 32,778 participants were included in this study and their mean age was 36 years. About 63.5% participants were females and 36.5% were males. The overall magnitude of unsuppressed HIV viral load was 15.1%. Being male (AOR = 1.300, 95% CI: 1.213-1.392), lower age, WHO clinical stage IV (AOR 75.352; 95% CI 48.831-116.277) and participants with targeted repeat viral load test (AOR 23.131; 95% CI 18.249-29.318) were significantly associated with viral un-suppression status. On the other hand there was no statistically significant association between pregnancy status, poor adherence and age greater than 40 years with viral un-suppression.

Conclusion: The viral suppression status in this study, 84.9% were low when compared with the UNAIDS 95% target to be achieved in 2030. Lower age, male gender, fair adherence, advanced WHO clinical stage and participants with targeted repeat viral load test were significantly associated with viral un-suppression status. Comprehensive close follow up and intensified targeted adherence support should be provided for lower aged ART users and for those first viral load test exceed 1000 copies/ml.

Keywords

Viral load, Viral un-suppression, Viral suppression, Dessie branch

Abbreviations

AIDS: Acquired Immunodeficiency Syndrome; ART: Antiretroviral Treatment; CD: Cluster of Differentiation; EID: Early Infant Diagnosis; HIV: Human Immunodeficiency Virus; Km: Kilometer; ml: Milliliter; RNA: Ribonucleic Acid; SPSS: Statistical Package for Social Sciences; UNAIDS: United Nations Program on HIV/AIDS; µl: Microliter; WHO: World Health Organization

Introduction

Human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS)/is the leading cause of global burden of disease. About 35.4 million people have died from AIDS related illnesses since the start of

Citation: Yesuf MS, Dagne D, Maru M, Shiferaw B, Missaye A, et al. (2022) Magnitude of Unsuppressed HIV Viral Load at Amhara Public Health Institute Dessie Branch, Northeast Ethiopia. J Infect Dis Epidemiol 8:283. doi.org/10.23937/2474-3658/1510283

Accepted: November 28, 2022: **Published:** November 30, 2022

the epidemic globally. World Health Organization (WHO) estimates about 36.9 million people living with HIV/AIDS in 2017 around the world and about 9.4 million people did not know that they were living with HIV [1,2]. In the year 2017, about 1.8 million people were newly infected with the virus and nearly one million HIV/AIDS/ related deaths were recorded globally [1]. East and Southern Africa is the region most affected by HIV in the world and about 19.6 million people living with HIV; accounting for about 53% of people living with HIV; found in this region [2,3]. Based on 2017 WHO data, among people accessing treatment about 81% were virally suppressed and only about 47% of all people living with HIV were virally suppressed [2].

In 2017 there were 610,000 people living with HIV, 16,000 new HIV infections and 15,000 AIDS related deaths in Ethiopia [1]. According to Ethiopia Demographic and Health Survey (EDHS) 2016, the prevalence of HIV in Ethiopia is 0.9%. The prevalence is relatively higher among women than men, with a prevalence of 1.2% and 0.6%, respectively. Similarly, the prevalence among young women and men aged 15-24 years-old is 0.3% and 0.1% respectively. The overall prevalence of HIV in Amhara Region is 1.2% [4].

Human immunodeficiency virus infection can transmit from person to person through different modes. The main modes of transmission routes of the virus are: Unprotected sexual intercourse with an infected partner; injection or transfusion of contaminated blood or blood products; sharing contaminated injection equipment that has been previously used by someone who is infected; and mother to child transmission (during pregnancy, at birth, and through breastfeeding). From the aforementioned transmission mechanisms, unprotected sexual contact plays the major role for the transmission and distribution of HIV infection around the world. Transmission through unprotected sexual contact is mainly determined by the concentration of the virus in blood and body fluids. That is; the lower the viral load in blood and body fluids; the less infectious the individual is. The higher the viral load the more infectious the individual. This is especially true for patients during acute HIV infection [5,6].

In 1996, the first effective antiretroviral treatment (ART) program introduced and lead to dramatic reductions in morbidity and mortality of HIV/AIDS related cases [5]. In recent years, significant progress has been made in increasing access to ART for people living with HIV. Global scale-up of ART plays an important role in achieving about 48% decline in deaths due to AIDS - related causes, from a peak of 1.9 million in 2005 to 1.0 million in 2016 [7,8]. The main goal of ART is to keep people living with HIV in good health condition by suppressing the replication of the virus in the blood to levels that are undetectable by standard laboratory tests. Suppressed viral replication facilitates restoration of the immune function and significantly reduces the risk of HIV transmission [6,8]. Currently, WHO recommended that ART should be initiated in all people living with HIV, including children, adolescents and adults, pregnant and breastfeeding women regardless of clinical status and CD4 cell count, then the treatment should be provided lifelong [8].

Monitoring individuals receiving ART is important to ensure successful treatment, identify adherence problems and determine whether and which ART regimens should be switched in case of treatment failure. Antiretroviral treatment failure is defined as progression of disease and high risk of mortality after beginning of highly active ART in people living with HIV. It can be assessed by clinical failure, immunologic failure, or virological failure [9]. Viral load testing plays an essential role in evaluating ART success in people living with HIV. It is the gold standard method for monitoring the response to ART drugs and recommended by WHO as the preferred monitoring approach to diagnose and confirm ART failure [9,10]. The WHO 2015 guideline on the use of antiretroviral drugs for treating and preventing HIV infection recommend routine viral load testing as a more sensitive and early indicator of treatment failure. According to this recommendation routine viral load testing should be done at 6 month, at 12 months of initiating ART and then every 12 months thereafter in order to detect treatment failure [9,11].

In the year 2014 the Joint United Nations Program on HIV/AIDS (UNAIDS) set a three “90” target (90 - 90 - 90) to be achieved in 2020 to help ending the AIDS pandemic. In this target by 2020; 90% of all people living with HIV know their HIV status, 90% of all people with diagnosed HIV infection will receive sustained ART and 90% of all people receiving ART will have viral suppression status [12]. Another target of the UNAIDS is ending the AIDS epidemic by 2030 through fast tracking 95 - 95 - 95 targets. Although, the UNAIDS set the above targets, it requires coordinated effort to achieve the target globally because currently the viral suppression target is not being achieved [13-15].

In Ethiopia, ART success monitoring using viral load determination has started recently because of resource limitation and absence of infrastructure to establish viral load testing laboratories. Ethiopia accepts and implements the above WHO recommendation for monitoring of ART success using routine viral load by preparing Ethiopian national guidelines for comprehensive HIV prevention, care and treatment in 2018 [16]. The aim of the present study is to provide information on the magnitude and associated risk factors of unsuppressed HIV viral load on patients receiving ART at health institutions in East Amhara that refer blood specimen for HIV viral load testing at Amhara Public Health Institute Dessie Branch Regional Reference Laboratory from January 1/2017 to January 1/2019.

Methods

Study design and setting

An institution based retrospective cross sectional study was conducted from January 1/2017 to January 1/2019. The study was conducted at Amhara Public Health Institute Dessie Branch. Dessie town is located in the Northeast part of Ethiopia in the South Wollo administrative zone of the Amhara Region, which is 401 km away from the capital city, Addis Ababa.

Population

The source population was all ART patients who have access to attend at ART clinics that collect and refer blood specimens for viral load testing to be analyzed at Amhara Public Health Institute Dessie Branch Regional Reference laboratory. Whereas, the study population was include all ART patients who attend at ART clinics who are eligible for viral load testing and gave blood specimens during the study period.

Variables

Dependent variables

- Viral suppression status

Independent variables

- Age
- Sex
- WHO staging
- Adherence status
- Pregnancy status
- Breast feeding status
- Test reason

Data collection

Data were collected from the viral load request paper, viral load result registration book and from the viral load and early infant diagnosis (EID) data base using a standard checklist at Amhara Public Health Institute Dessie Branch regional reference laboratory.

Quality control

To assure the quality of the data training was given for data collectors and supervisors. Data collection formats were checked for competence before the start of data collection. Regular follow up and supervision was conducted by supervisors and principal investigator throughout the data collection period. Finally; after collecting the data, the data were checked for completeness.

Data analysis and interpretation

After completion of data collection, the data were checked for completeness. Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 21. Descriptive statistical analysis was conducted. Association between viral suppression status and factors were determined by using univariate and multivariate logistic regression analysis. Odds ratio was used as a measure of strength of association. The 95% confidence interval and P - value less than 0.05 was taken as statistically significant.

Ethical consideration

We have got institutional ethical clearance from Ethical Review Committee of the Amhara Public Health Institute. Confidentiality were kept for all the data gained in the process by anonymous data collection and restricting access of people other than data collectors to the data.

Result

Socio-demographic characteristics

A total of 32,778 participants were tested for HIV viral load during the study period. Of these tested participants, majority were females 20,819 (63.5%) and the remaining 11,959 (36.5%) were males. The mean (Standard Deviation) age of the participants at the study time was 36 (± 11.8) years (ranging from 1-81 years). The majority of the study participants 12547 (38.3%) were aged from 30-39 years-old and a small number of participants aged under five years old 90 (0.3%). Based on the place of residence, almost all of the study participants 32,672 (99.7%) were from the Amhara region (Table 1).

Clinical profile and viral suppression status

On the bases of test reason participants were categorized in to three: as first viral load test at six months or longer post ART, routine (annual) viral load test and targeted repeat viral load test at three months of previous viral load test result ≥ 1000 copies/ml. Accordingly, from a total of 32,778 participants tested for HIV viral load determination in plasma specimen, 14,638 (44.7%) were for routine monitoring of viral load, 17,737 (54.1%) were first viral load test at six months or longer after the initiation of ART, and 403 (1.2%) were targeted repeat viral load test at three months of previous viral load test result ≥ 1000 copies/ml.

Majority of the participants (93.7%) had WHO stage one category and only 220 (0.7%) of participants had WHO stage four category. More than 99% of the participants had a good HIV treatment adherence. Out of the total female participants only 246 (1.2) were pregnant and 206 (1%) were breast feeding mothers during the study period (Table 2).

Of the total 32,778 participants tested for HIV viral load determination in plasma specimen, 27,833 (84.9%) participants had suppressed viral load. In other words the viral suppression rate was 84.9% and 4,945 (15.1%)

Table 1: Socio-demographic characteristics of HIV infected patients referred for HIV viral load testing at Amhara Public Health Institute Dessie Branch Regional Reference laboratory from January 1/2017 to January 1/2019.

Variables	Category	Frequency (n)	Percentage (%)
Gender			
	Female	*20819*	*63.5*
	Male	*11959*	*36.5*
Age			
	1-4	90	0.3
	5-9	533	1.6
	10-14	1150	3.5
	15-19	896	2.7
	20-24	1307	4.0
	25-29	4176	12.7
	30-34	6196	18.9
	35-39	6351	19.4
	40-44	4760	14.5
	45-49	3030	9.2
	≥ 50	4289	13.1
Region			
	Amhara	32672	99.7
	Afar	106	0.3

Table 2: Clinical characteristics of HIV infected patients referred for HIV viral load testing at Amhara Public Health Institute Dessie Branch Regional Reference laboratory from January 1/2017 to January 1/2019.

Variables	Category	Frequency (n)	Percentage (%)
Test Reason	*Routine viral load test*	14638	44.7
	First viral load test	17737	54.1
	Targeted repeat viral load test	403	1.2
WHO Stage	I	30729	93.7
	II	1494	4.6
	III	335	1
	IV	320	0.7
Adherence	Good	32725	99.8
	Fair	48	0.1
	Poor	5	0.02
Pregnancy Status	Yes	246	1.2
	No	20573	98.8
Breastfeeding Status	Yes	206	1
	No	20613	99
Viral Load	Undetected	26674	81.4
	Detected	6104	18.6
Viral Suppression	Suppressed	27833	84.9
	Unsuppressed	4945	15.1

of participants had unsuppressed HIV viral load. Out of a total of 27, 833 participants who achieved viral suppression, 26, 674 (95.8%) had undetectable viral loads (< 150 copies/ml), and 1,159 (4.2%) had detectable suppressed viral load status with a viral copy of 151-999 copies/ml (Table 2).

Factors associated with viral un-suppression

In order to investigate the association of socio-demographic variables and other factors with unsuppressed HIV viral load status, both bivariate and multivariate logistic regression analysis were done in this study.

Bivariate logistic regression analysis showed that age (COR 0.973; 95% CI 0.970-0.975, P < 0.001 and sex (COR 1.285; 95% CI 1.208-1.366, P < 0.001) were significantly associated with viral un-suppression. Similarly, WHO staging and test reason were significantly associated with viral un-suppression status. On the other hand, there was no statistically significant association between place of residence (region) and breast feeding status with that of viral un-suppression among study participants (Table 3).

Table 3: Factors associated with viral un-suppression among HIV infected patients referred for HIV viral load testing at Amhara Public Health Institute Dessie Branch Regional Reference laboratory from January 1/2017 to January 1/2019. (N = 32,778)

Variables	Viral Suppression Status				P - Value
Categories	Suppressed n (%)	Unsuppressed n (%)	COR (95% CI)	AOR (95% CI)	
Gender					
Female	17927 (86.1)	2892 (13.9)	1	-	-
Male	9906 (82.8)	2053 (17.2)	1.285 (1.208-1.366)	1.300 (1.213-1.392)	< 0.001
Age					
1-4	45 (50)	45 (50)	6.208 (4.070-9.469)	8.526 (8.476-13.276)	< 0.001
5-9	325 (61)	208 (39)	3.973 (3.271-4.826)	5.530 (4.489-6.812	< 0.001
10-14	740 (64.3)	410 (35.7)	3.440 (2.965-3.991)	5.024 (4.267-5.916)	< 0.001
15-19	584 (65.2)	312 (34.8)	3.317 (2.820-3.902)	4.810 (4.024-5.750)	< 0.001
20-24	1059 (81)	248 (19)	1.454 (1.235-1.712)	2.177 (1.823-2.600)	< 0.001
25-29	3614 (86.5)	562 (13.5)	0.965 (0.853-1.093)	1.422 (1.236-1.636)	< 0.001
30-34	5349 (86.3)	847 (13.7)	0.983 (0.878-1.101)	1.478 (1.299-1.682)	< 0.001
35-39	5566 (87.6)	785 (12.4)	0.876 (0.781-0.982)	1.273 (1.118-1.451)	< 0.001
40-44	4185 (87.9)	575 (12.1)	0.853 (0.754-0.965)	1.124 (0.977-1.292)	0.101
45-49	2672 (88.2)	358 (11.8)	0.832 (0.723-0.957)	1.013 (0.864-1.188)	0.869
> 50	3694 (86.1)	595 (13.9)	1	-	-
Region					
Afar	92 (86.8)	14 (13.2	1.168 (0.665-2.051)	-	-
Amhara	27741 (84.9)	4931(15.1)	1	-	-
Test Reason					
Routine VL	13157 (89.9	1481 (10.1)	1	1	
First VL	14568 (82.1)	3169 (17.9)	1.933 (1.809-2.064)	1.936 (1.805-2.077)	< 0.001
Targeted repeat VL	108 (26.8)	295 (73.2	24.266 (19.340-30.446)	23.131 (18.249-29.318)	< 0.001
WHO Stage					
Stage I	26645 (86.7)	4084 (13.3)	1	1	
Stage II	11.03 (73.8)	391 (26.2)	2.313 (2.051-2.608)	2.544 (2.238-2.891)	< 0.001
Stage III	61 (18.2)	274 (81.8)	29.306 (22.161-38.753)	37.454 (28.113-49.899)	< 0.001
Stage IV	24 (10.9)	196 (89.1)	53.281 (34.829-81.510)	75.352 (48.831-116.277)	< 0.001
Adherence					
Good	27812 (85)	4913 (15)	1	1	
Fair	19 (39.6)	29 (60.4)	8.640 (8.841-15.421)	6.838 (3.516-13.299)	< 0.001
Poor	2 (40)	3 (60)	8.491 (1.418-50.831)	2.986 (0.343-26.001)	0.322
Pregnancy Status					
Yes	223 (90.7)	23 (9.3)	1.728 (1.124-2.658)	0.752 (0.485-1.168)	0.205
No	17704 (86.1)	2869 (13.9)	1	1	
Breastfeeding Status					
Yes	168 (81.6)	38 (18.4)	0.784 (0.551-1.117)	1.628 (1.119-2.368)	0.011
No	17759 (86.2)	2854 (13.8)	1	1	

COR: Crude Odds Ratio; AOR: Adjusted Odds Ratio; CI: Confidence Interval

Multivariate logistic regression analysis showed that being male in gender (AOR = 1.300, 95% CI: 1.213-1.392), age categories from 1to 4 (AOR = 8.526, 95% CI: 8.476-13.276), 5 to 9 years (AOR = 5.530, 95% CI: 4.489-6.812), 10 to 14 years (AOR = 5.024, 95% CI: 4.26-5.916) , 15 to19 years (AOR = 4.810, 95% CI: 4.024-5.750), 20 to 24 years (AOR = 2.177, 95% CI: 1.823-2.600), 25 to 29 years (AOR = 1.422, 95% CI: 1.236-1.636), 30 to 34 years (AOR = 1.478, 95% CI: 1.299-1.682), 35 to 39 years (AOR = 1.273, 95% CI: 1.118-1.451), were significantly associated with unsuppressed viral load status.

Status of WHO staging was also found determinant factor for viral un-suppression in the multivariate model and participants with WHO stage IV had a higher risk of developing unsuppressed viral load (AOR 75.352; 95% CI 48.831-116.277) than participants that had WHO stage I. Similarly, when compared with test reason: participants with targeted repeat viral load test at three months of previous viral load test result > 1000 copies/ml were 23 times (AOR 23.131; 95% CI 18.249-29.318), more likely of being unsuppressed than participants with routine annual viral load testers. Likewise participants having history of breast feeding status were at a higher risk of developing unsuppressed viral load status. Nevertheless, there was no statistically significant association between pregnancy status (P = 0.205), poor adherence (P = 0.322) and age categories from 40-44 (P = 0.101) and 45-49 (P = 0.869) with unsuppressed viral load status (Table 3).

Discussion

Viral load is the preferred monitoring approach to diagnose and confirm treatment failure for patients receiving ART and early identification of un-suppression status is very important to take appropriate intervention [11]. This study evaluated the magnitude of unsuppressed viral load and identifies factors associated with unsuppressed viral load among individuals tested at Amhara Public Health Institute Dessie Branch regional reference laboratory. In this study, we found that the magnitude of unsuppressed HIV viral load was 15.1%. This shows the viral suppression rate was 84.9%.

The magnitude of unsuppressed HIV viral load found in this study was in line with studies reported from Addis Ababa which was 14% [17] and Gondar town which was 14.7% [18]. Similarly, different reports showed comparable result from Ethiopia and from other parts of the world. Some of the studies showed that 11.5% in Tigray Regional state; Ethiopia [19], 11.3% in Adam city; Ethiopia [20], 15% in South Africa [21], 16.33% in Nigeria [22], 11% in Uganda [23], 17% in Morocco [24] and 15% in Peru [25]. On the other hand, lower magnitude of unsuppressed HIV viral load was reported in Addis Ababa 5.5% [26], South Africa 8.2% [27] and Vitnam 7% [28]. The lower un-suppression rate in these previous studies might be due to differences in the study settings and in the quality of care in the ART service delivery activities among the different study settings. However, higher un-suppression rate were reported in Tigray Regional state; Ethiopia 26.39% [29], in Bahir Dar city; Ethiopia 28% [30], Keneya 38.8% [31] and Cambodia 23.2% [32]. These discrepancies in the un-suppression rate of HIV viral load might be due to the difference in ART regimen given, difference in the study population [30], the differences in demographic characteristics of the study population such as awareness about risk factors, traditional practices and nutritional status.

The viral suppression rate in this study was low compared to the UNAIDS 90% target to be achieved in 2020 or the UNAIDS 95% target to be achieved in 2030 [14,15]. An unsuppressed HIV viral load indicates poor adherence or resistance. According to WHO recommendation routine viral load monitoring should be carried out at 6 months, at 12 months and then annually thereafter if the patient is stable on ART. Viral failure is defined by a persistently detectable viral load exceeding 1000 copies/mL i.e., two consecutive viral load measurements within three months interval with adherence support between measurements; after at least six months of starting a new ART regimen [8].

In our study, males were associated with a higher risk of developing unsuppressed HIV viral load with odds of 1.3 times more likely when compared with females. This finding was in agreement with studies conducted in Tigray Regional State, Ethiopia [19,29], South Africa [21], and Morocco [24]. The reason why male participants were associated with unsuppressed viral load status may be explained by low health seeking behavior of males than females [33,34]. In the present study, the magnitude of unsuppressed HIV viral load was found inversely associated with increasing age. Participants at lower age had a higher risk of developing unsuppressed viral load status than participants at higher age. In this study, the likelihood of developing unsuppressed HIV viral load status for participants aged 0 to 4 years was almost 8.5 times (AOR = 8.526 , 95% CI: 8.476-13.276) more likely when compared with participants aged ≥ 50 years. This finding is in line with a study conducted in Uganda among the same study population [23]. Also another study conducted in South Africa showed that children and adolescents have increased odds of having unsuppressed viral load status than older aged participants. This might be due to the increasing treatment experience among older long term survivors and behavioral factors, like taking medication daily and as prescribed appropriately [21,32].

Our study showed that WHO clinical staging was significantly associated with unsuppressed viral load status with the likelihood of developing unsuppressed viral load status for patients in WHO stage IV was 75 times (AOR = 75.352, 95% CI: 48.831-116.277), WHO stage III was 37 times (AOR = 37.454, 95% CI: 28.113-49.899), WHO stage II was 2.5 times (AOR = 2.544,

95% CI: 2.238-2.891) more likely when compared with patients in WHO stage I. This finding was consistent with the studies done in Nigeria [22], in Kenya [35], Tigray Regional State, Ethiopia [29], and Addis Ababa, Ethiopia [17]. However, other studies revealed that no relationship between the WHO HIV clinical staging of patients and their viral load un-suppression status [26,27].

In the present study participants with targeted repeat or repeat testers were 23 times (AOR 23.131; 95% CI 18.249-29.318), more likely of being unsuppressed when compared to participants with routine annual viral load testers. This finding was also supported by another studies conducted in Uganda [23], in Nigeria [22] and in Sub-Saharan Africa [36].

Another finding of this study is that participants who were fairly adherent to the ART drugs were 6.8 times (AOR = 6.838, 95% CI: 3.516-13.299) more likely to develop viral un-suppression as compared with patients with good adherence. Other studies have also reported that poor and fair adherence were associated with viral un-suppression status [17,19,23]. This might be due to the presence of low concentration of ART drugs in the blood of non - adherent participants that may lead to increase in viral concentration in blood. But in our study there was no statistically significant association between unsuppressed HIV viral load and participants with poor adherence status in multivariate logistic regression analysis ($P > 0.05$). The reason for this might be due to the presence of very small number of participants with poor adherence status in our data compared to participants with good and fair adherence status.

Limitation of the Study

Due to the nature of a secondary data, the data misses some important variables like type of ART treatment regimen used, base line and current CD_4 counts in the ART patients. The viral load analysis was based on a single test; hence it may not properly identify transit un-suppresser from long term un-suppresser. We were unable to identify whether the repeat tester is the same individual or not. That means we were unable to link current viral load result with previous unsuppressed viral load result at individual level.

Conclusion and Recommendation

This study has found that HIV viral suppression rate at Amhara Public Health Institute Dessie Branch Regional Reference laboratory was 15.1%. Result from this study have shown that a relatively low un-suppression rate when compared with UNAIDS 90% target to be achieved in 2020 or the UNAIDS 95% target to be achieved in 2030. Lower age, male gender, fair adherence and advanced WHO clinical stage were significantly associated with viral un-suppression status.

Comprehensive close follow up and intensified targeted adherence support should be provided for lower aged ART users and for those first viral load test exceed 1000 copies/ml. Farther prospective study should be conducted in the area to know the exact status of viral un-suppression rate and associated factors.

Acknowledgements

We would like thank the staff of Amhara Public Health Institute Dessie Branch for their unreserved guidance, constructive suggestions, comments and encouragement on every stage of this work.

Authors Declaration

All authors discussed the results and contributed to the final manuscript.

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