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Research Article

Journal of Clinical Epidemiology and Public Health

Factors Associated with Viral Load Suppression Failure Among Adolescents Living with HIV/AIDS on Antiretroviral Therapy in Lusaka Urban District in Zambia: A Cross Sectional Study

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Submitted: 16 August 2024 **Accepted:** 21 August 2024 **Published:** 28 August 2024

Citation: *Esther Mukumbuta, Rosemary Ndonyo Likwa, Twaambo Euphemia Hamoonga, and Jeremia Banda (2024) Factors Associated with Viral Load Suppression Failure Among Adolescents Living with HIV/AIDS on Antiretroviral Therapy in Lusaka Urban District in Zambia: A Cross Sectional Study. J of Clini Epi & Public Health 3(3), 01-09.*

Abstract

Background: *HIV continues to be a major global public health issue. More adolescents than adults living with HIV die from AIDS related causes. The key goal of antiretroviral therapy (ART) is to achieve and maintain durable viral suppression to undetectable levels. This study investigated factors associated with viral load suppression failure among adolescents living with HIV/AIDS on ART in Lusaka Zambia.*

Methods: *A cross sectional study was conducted using simple random sampling to select a representative sample of 294 adolescents from 6 Level one Hospitals in Lusaka. Viral load results, CD4 counts, recent WHO clinical stage, ART regimen, TB co-infection status, and a list of adolescents with viral load readings were extracted from the Electronic Health Records System (EHRS). For this study, Viral load suppression failure was defined as having two consecutive viral load measurements of >1000 copies per m/L within a three to six months' interval.*

Multiple logistic regression was performed to determine factors associated with viral load suppression failure among adolescents on ART. Odds ratios were used to report the strength of association at the 5% level of significance and the associated 95% confidence intervals. All analyses were conducted in Stata version 14.

Results: *The majority (66%) of the adolescents on ART were aged between 15-19 years while 34% were aged between 10-14 years. Females constituted 54.4% of the participants and 45.6% were males. Adolescents who missed taking their drugs had higher odds of experiencing viral load suppression failure compared to those who did not miss taking their drugs (UOR=8.90, 95% CI: 5.19-15.27, p<0.001).*

Adolescents who had a CD4 count below 200 cell/mm3 at ART initiation had higher odds of experiencing viral load suppression failure compared to those adolescents who had CD4 count above 200 cell/mm3 (UOR=4.07, 95% CI: 1.25-13.26, p=0.010).

Conclusion: *Generally, not attaining any formal education, having a CD4 count below 200 cell/mm3, and missing taking drugs are among several factors that contribute to viral load suppression failure among adolescents living with HIV/AIDS in Lusaka. Screening for other co-morbidities, such as tuberculosis, must be conducted on every visit to ensure adolescents are receiving optimal treatment.*

Keywords: HIV/AIDS, Viral load Suppression, Antiretroviral therapy (ART), Adolescents, Lusaka, Zambia

Abbreviations

- **ART:** Anti-retroviral Therapy.
- **AIDS:** Acquired Immunodeficiency Syndrome
- **ALWHIV:** Adolescents Living with HIV
- **CD4:** Cluster of Differentiation 4
- **CSO:** Central Statistical Office
- **EHRS:** Electronic Health Record System
- **HIV:** Human Immunodeficiency **Virus**
- **LPV/r:** Lopinavir/ritonavir
- **MoH**: Ministry of Health
- **NNRTIs:** Non-Nucleoside Reverse Transcriptase Inhibitor
- **NVP:** Nevirapine
- **RNA:** Ribonucleic Acid
- **TB:** Tuberculosis
- **UNAIDS:** Joint United Nations Program on HIV/AIDS
- **VLS:** Viral Load Suppression
- **WHO:** World Health Organisation
- **ZAMPHIA:** Zambia Population-based HIV Impact Assessment
- **ZAMSTATS:** Zambia Statistics Agency
- **ZDHS:** Zambia Demographic Health Survey

Background

Human Immunodeficiency Virus (HIV) continues to be a major global public health issue. More adolescents than adults die from AIDS-related causes [1]. Globally, 1.65 million adolescents were living with HIV and an estimated 190 000 were newly infected with HIV in 2018. Approximately, 84% of all adolescents living with HIV (ALHIV) live in sub-Saharan Africa, with 60% residing in Eastern and Southern Africa [2].

Zambia is among the Sub-Saharan African countries that has been worst affected by the HIV pandemic. Adolescents and young people are severely affected by the epidemic. According to the Zambia Population-based HIV/AIDS Impact Assessment report, HIV prevalence was 2.9% among those aged 15 to 19 years. It is estimated that 68,000 adolescents were living with HIV in Zambia and only 60% were on ART [3, 4].

Viral load suppression is considered crucial for HIV-positive people receiving ART for timely detection of treatment failures, and identification of patients who need enhanced adherence and counselling [7]. Achieving viral load suppression of RNA <1000 copies per m/l among the adolescents remains a challenge [5].

In Zambia, viral load suppression is higher among adults aged 20 years and above living with HIV than among adolescents. In 2016, viral load suppression prevalence was 59.2% among adults aged 15 to 59 years and 30.7% among adolescents aged 15 to 19 years [6].

Despite the government as well as other non-governmental organization's efforts to increase access to ART, there is still a substantial gap in adolescents achieving viral load suppression which is a key indicator to treatment success [1]. In order to inform health promotion messaging aimed at improving adherence to ART among adolescents, we determined factors associated with viral load suppression failure among adolescents aged 10 to 19 years on ART in Lusaka.

Methods

Study Design and Setting

A quantitative cross sectional study was conducted to determine factors associated with viral load suppression failure at six first level hospitals in Lusaka District.

Sampling Methods

Simple random selection was used to select a representative sample of adolescents receiving ARV drugs with recorded viral load measurements from the selected facilities in the district.

Study Population and Eligibility

The study population comprised of adolescents aged 10-19 years living with HIV, who were at the time of data collection receiving ART, with two consecutive viral load measurements after at least six months of using triple combination ARV drugs. Participants were recruited from the six study sites in the District.

Inclusion Criteria

The study population included all adolescents who were current on ART for at least 6 months with two consecutive viral load measurements and consented to be part of the study.

Exclusion Criteria

Adolescents whose records were missing key information such as past TB history, clinical staging at ART initiation, and adolescents transferred in from another health facility six months prior to data collection were excluded.

Sample Size and Sampling

The sample size for this study was 294 adolescents on ART who were randomly selected from a list of adolescents living with HIV on ART in the six selected facilities in Lusaka district. The sample size was arrived at using the prevalence formula (n=(Z^2*P(1-P))/(e^2)), where the
standard normal variate (z) was set at 1.96 to correspond to 95% confidence level.

The measure of precision, thus the margin of error (e) was set at 0.05, and the prevalence (p) used was 0.307 (30.7%), based on the ZAMPHIA study which was conducted in 2016. The total sample size was uniformly distributed in the six level one health facilities sampled within the district.

Data Collection

The study used both primary and secondary data in order to determine factors associated with viral load suppression failure among adolescents. In the first step, the EHRS was reviewed and a list of all adolescents receiving ARV drugs for at least 6 months with two consecutive viral load measurements generated.

Next, we used a structured questionnaire to collect participant's socio-demographic and behavioural characteristics. The questionnaire was administered to participants by members of the study team, in English and three local languages commonly spoken in the study areas (Nyanja, Bemba and Lozi). These face-to-face interviews were followed by extraction of data pertaining to date of initiation on ART, CD4 count, recent WHO clinical stage, ART regimen, TB co-infection status, and viral load test results from the EHRS.

Data Analysis

Data was cleaned in excel and exported to Stata/SE statistical software package version 14 for analysis. Descriptive statistics of background characteristics were produced. Categorical variables were presented as proportions and frequencies. Continuous variables were presented using means and associated, standard deviations.

The Pearson's Chi-squared test was used to examine the association between the dependent variable (viral load suppression failure) and independent variables (Socio-demographic characteristics, CD4 count at ART initiation and behavioural characteristics). Multiple logistic regression analysis was performed to estimate the strength of association between viral load suppression failure and several independent variables at the 5% level of significance and the associated 95% confidence intervals.

Ethical Considerations

Ethical approval to conduct this study was obtained from the University of Zambia Biomedical Research Ethics Committee (UNZABREC). We also got permission to conduct the study from the National Health Research Authority (NHRA) and from Lusaka Provincial Health Office and Lusaka District Health Office prior to data collection. Each study participant completed a consent form before participating in the study.

Information on the study as well as all possible risks of participating in the study were communicated to participants in order to respect their autonomous decision on whether to participate in the study or not. For participants below the age of 18 years, consent was sought from their parents/guardians in addition to them signing assent forms.

Results

Socio-demographic Characteristics

We recruited 294 adolescents between July and September 2021 to respond to our questionnaire on factors associated with viral load suppression failure. Majority (66%) of the adolescents on ART were aged between 15-19 years while 34% were aged between 10-14 years (Table 1). The average age of adolescents was 16 years (SD 2.8) and the median age at ART initiation was 9 years (IQR 6-13 years). Females constituted 54.4% of the participants and 45.6% were males. Most of the adolescents had attained primary education (55.1%) and only 3.4% had attained tertiary education.

The majority of adolescents on ART were never married and they were staying with their parents/guardians (93%). About 97% of adolescents were not in any form of employment while 90% of them had parents/guardians who were in employment.

Table 1: Taxi driver and vehicle-related factors among drivers in Bole sub-city, Addis Ababa, 2023

Variables	Respondents n=294 (%)
Age Group	
10-14	100 (34.0)
15-19	194 (66.0)
Mean age in years (Std. Dev)	15.8 (2.8)
Median age (years) at ART initiation (IQR)	9 (6-13)
Education	
No Education	10 (3.4)
Primary	162 (55.1)
Secondary	112 (38.1)
Tertiary	10 (3.4)
Sex	
Male	134 (45.6)
Female	160 (54.4)
Marital Status	
Married	20 (6.8)
Never Married	274 (93.2)
Staying with Parents	
Yes	274 (93.2)
No	20 (6.8)
Adolescents employment status	
Yes	10 (3.4)
No	284 (96.6)
Parents employment status	
Employed	264 (89.9)
Not Employed	30 (10.2)

Table 2 below shows the chi square test of association between socio demographic factors and viral load suppression failure. Level of education had a statistically significant relationship with adolescents' viral load suppression failure (p<0.001). The other factors associated with adolescents' viral load suppression failure were sex (p =0.006), age group (p<0.001) and employment status of the adolescents' (p=0.001). There was no statistically significant association between viral load suppression failure and marital status, staying with parents, and employment status of the parents.

Table 2: Behavioral and related factors among drivers in Bole sub-city, Addis Ababa, 2023

Age Group	Adolescents Viral Load		P value
	Above 1000 (%)	Below 1000 (%)	
10-14	36(36.0)	64(64.0)	0.001*
15-19	118(60.8)	76(39.2)	
Education			
No Education	10(100.0)	0(0.0)	<0.001*
Primary	69 (42.6)	93(57.4)	
Secondary	65(58.0)	47(42.0)	
Tertiary	10(100.0)	0(0.0)	
Sex			
Male	82 (61.2)	52(38.8)	0.006*
Female	72 (45.0)	88(55.0)	
Marital Status			
Married	9(45.0)	11(55.0)	0.494
Never married	145(53.0)	129(47.1)	
Staying with Parents			
Yes	145(53.0)	129(47.1)	0.494
No	9 (45.0)	11(55.0)	
Employment			
Yes	0 (0.0)	10(100.0)	0.001*
No	154(54.2)	130(45.8)	
Parents Employment Status			
Employed	134(50.8)	130(49.2)	0.098
Not Employed	20(66.7)	10(33.3)	

Behavioural and Clinical Characteristics Associated with Viral Load Suppression Failure

Table 3 below shows the cross tabulation between the behavioural and clinical characteristics associated with viral load suppression failure among adolescents. Viral load suppression failure was associated with missing clinical/drug appointments (p<0.001), missing taking drugs (p<0.001), someone to remind you (p<0.001), taking any other medication (p<0.001), alcohol consumption (p=0.009), being sexually active (p=0.005), number of sexual partners (p<0.001) and belonging to a community support group (p=0.003).

CD4 count at ART initiation (p=0.028), having TB (p<0.001), current ART regimen (p<0.001) and current ART dosage frequency (p=0.002) had a statistically significant relationship with adolescent viral load suppression failure. However, clinical staging at ART initiation and total duration on ART were not statistically significant with viral load suppression failure p=0.606 and p=0.667 respectively.

Table 3: Behavioural and Clinical Characteristics Associated with Viral Load Suppression Failure

Variable	Adolescents Viral Load (copies)		P value
	Above 1000 (%)	Below 1000 (%)	
Missed clinical visit in 6 Months			
Yes	85 (75.9)	27(24.1)	<0.001*
No	69 (37.9)	113(62.1)	
Missed taking Drugs in the last 7 days			
Yes	126(72.8)	47(27.2)	<0.001*
No	28(23.1)	93(76.9)	
Someone to remind you take pills			

Yes	102(45.5)	122(54.5)	<0.001*
No	52(74.3)	18(25.7)	
Taking any other medication			
Yes	27(90.0)	3(10.0)	<0.001*
No	127(48.1)	137(51.9)	
Alcohol consumption			0.009*
Yes	53(64.6)	29(35.4)	
No	101(47.6)	111(52.4)	
Sexually Active			0.005*
Yes	99(59.6)	67(40.4)	
No	55(43.0)	73(57.0)	
Number of partners			<0.001*
one	59(41.8)	82(58.1)	
two	85(59.4)	58(40.6)	
More than two	10(100)	0(0.0)	
Condom Use			0.936
Yes	59(52.7)	53(47.3)	
No	95(52.2)	87(47.8)	
Disclosure to Partner			0.587
Yes	45(50.0)	45(50.0)	
No	109(53.4)	95(46.7)	
Community Support Group		0.003*	
Yes	67(44.1)	85(55.9)	
No	87(61.3)	55(38.7)	
Clinical Stage at ART Initiation			
Stage 1	52(48.2)	56(51.9)	0.606
Stage 2	54(55.1)	44(44.9)	
Stage 3	28(58.3)	20(41.7)	
Stage 4	20(50.0)	20(50.0)	
CD4 count at ART Initiation			
1. Above 500 cell/mm3	2(20.0)	8(80.0)	0.028*
2. 200-500 cell/mm3	37(45.7)	44(54.3)	
3. below 200 cell/mm3	115(56.7)	88(43.4)	
Tuberculosis			
Yes	72(64.9)	39(35.1)	0.001*
No	82(44.8)	101(55.2)	
Total duration on ART in years			
1-4	44(54.3)	37(45.7)	0.667
5-9	71(53.8)	61(46.2)	
10+	39(48.2)	42(51.9)	
Current ART Regimen			
1st Line	94(46.3)	109(53.7)	<0.001*
2nd Line	60(65.9)	31(34.1)	
Current Dosage frequency			
Once a day	94(46.3)	109(53.7)	0.002*
Twice a day	60(65.9)	31(34.1)	

C = Chi square test, * = statistically significant at p<0.05

Bivariate Logistic Regression Analysis

The table below shows that female adolescents were 0.52 times less likely to have viral load suppression failure than male adolescents (UOR=0.52, 95% CI: 0.33-0.83, p=0.006)]. Adolescents in the age group of 15-19 years had lower odds of experiencing viral load suppression failure compared to those in the age group of 10-14 years (UOR=0.36, 95% CI: 0.22-0.60, p<0.001).

Adolescents who missed their clinical appointments 6 months prior to the study and those who missed taking drugs had higher odds of experiencing viral load suppression failure (UOR=5.16, 95% CI: 3.05-8.73, p<0.001) and (UOR=8.90, 95% CI: 5.19-15.27, p<0.001) respectively. Adolescents who were sexually active were 1.96 times more likely to have viral load suppression failure than their counter parts who were not sexually active (UOR=1.96; 95% CI: 1.23-3.13, p=0.005).

Adolescents who had a CD4 count below 200 cell/mm3 at ART initiation had higher of experiencing viral load suppression failure than their counterparts had a CD4 count above 200 cell/mm3 (UOR=4.07, 95% CI: 1.25-13.26, p=0.010). The table further shows that those who had TB were 2.27 times more likely to have viral load suppression failure than those who did not have TB (UOR=2.27, 95% CI: 1.40-3.70, p<0.001).

Table 4: Unadjusted Estimates of Factors Associated with Viral Load Suppression Failure Among Adolescents.

Variable	Sample (%)	uOR (95%CI)	p value
Age group			
10-14	34	1.00	
15-19	66	0.36(0.22-0.60)	<0.001
Sex			
Male	45.6	1.00	
Female	54.4	0.52 (0.33-0.83)	0.006
Level of education			
No education	3.4	1.00	
Primary	55.1	0.67(0.46-0.98)	0.035
Secondary	38.1	0.63(0.23-0.82)	0.048
Tertiary	3.4	0.74(0.47-1.04)	0.051
Missed clinical visit in 6 Months			
No	62.0	1.00	
Yes	38.1	5.16 (3.05-8.73)	<0.001
Missed taking drugs in the last 7 days			
No	41.2	1.00	
Yes	58.8	8.90(5.19-15.27)	<0.001
Someone to remind you take pills			
No	23.8	1.00	
Yes	76.2	0.29(0.16-0.53)	<0.001
Taking any other medication			
No	89.8	1.00	
Yes	10.2	9.71(2.88-32.79)	<0.001
Alcohol consumption			
No	72.1	1.00	
Yes	27.9	2.01(1.19-3.40)	0.009
Sexually Active			
No	43.5	1	
Yes	56.5	1.96(1.23-3.13)	0.005
Number of sexual partners			
One	48	1	
Two	48.6	0.41(0.28-0.64)	<0.001
Multiple	3.4	1.48(1.06- 2.13)	0.022
Community Support Group			
No	48.3	1	
Yes	51.7	0.50(0.31-0.79)	0.003
CD4 count at ART Initiation			
Above 500 cell/mm3	3.4	1	
200-500 cell/mm3	27.6	0.57(0.37-0.88)	0.02

Below 200 cell/mm3	69.1	4.07(1.25-13.26)	0.01
Tuberculosis			
No	62.2	1	
Yes	37.8	2.27(1.40-3.70)	<0.001
Current ART Regimen			
1st Line	69.0	1	
2nd Line	31.0	1.01(0.89-1.14)	0.903
Current Dosage frequency			
Once a day	69.1	1	
Twice a day	30.9	0.45(0.27-0.75)	0.002
Twice a day	30.9	0.45(0.27-0.75)	0.002

Multivariate Logistic Regression Analysis

After adjusting for the effect of other factors, adolescents who missed their clinical appointments 6 months prior to the study and those who missed taking drugs had higher odds of experiencing viral load suppression failure (OR=3.54, 95% CI: 1.07-11.76, p=0.039) and (OR=6.82, 95% CI: 2.75-16.87, p<0.001) respectively. Adolescents who had a CD4 count below 200 cell/mm3 at ART initiation were 1.85 times more likely to have viral load suppression failure than their counterparts had a CD4 count above 200 (OR=1.85, 95% CI: 0.20-4.29, p=0.014).

Table 5: Multivariate Analysis of Factors Associated with Viral Load Suppression Failure Among Adolescents.

Variable	Study sample (%)	aOR (95% CI)	p value
Missed taking Drugs in the last 7 days			
No	41.2	1	
Yes	58.8	6.82(2.75-16.87)	<0.001*
Missed clinical visit in 6 Months			
No	62.0	1	
Yes	38.1	3.54 (1.07-11.76)	0.039*
Sexually Active			
No	43.5	1	
Yes	56.5	0.20(0.05- 0.84)	0.028*
CD4 count at ART Initiation			
Above 500 cell/mm3	3.4	1	
200-500 cell/mm3	27.6	0.41(0.18-0.96)	0.116
Below 200 cell/mm3	69.1	1.85(0.20-4.29)	0.014*

Discussion

SOCIO-Demographic Factors

This study shows females constituted 54.4% of the participants and 45.6% were males. Female adolescents were less likely to have viral load suppression failure than male adolescents. This might be due to the fact that males even from a young age are associated with poor attitude towards health which makes them to have poor adherence to medication [8]. Similarly, a study conducted in Ethiopia found that male patients living with HIV tend to have viral suppression failure compared to women [9].

Majority (66%) of adolescents were aged between 15-19 years while 44% were aged between 10-14 years. Adolescents aged 10-14 were more likely to experience viral load suppression failure than those aged 15-19 years. This is because young adolescents may struggle to adhere to their ART regimen due to various reasons such as forgetfulness, fear of stigma, side effects of medication, or lack of understanding about the importance of adherence. Poor adherence can lead to treatment failure and the development of drug-resistant strains of HIV [10].

Adolescents who did not attain any formal education were more likely to have viral load suppression failure than their counterparts who attained education. This is because those who at least attained a form of education from primary to tertiary appreciated more the importance of taking medication. Similarly, a study conducted in Ethiopia, found that adolescents with no formal education were more likely to have viral load suppression failure compared to those who are educated [11].

However, a study in Uganda found that adolescents who attended school, especially higher school, had inferior ART adherence and this was attributed to the stigma and lack of privacy in a school setting for poor adherence and outcomes [12].

Behavioural Characteristics and Clinical Characteristics

This study revealed that adolescents who missed their clinical appointments 6 months prior to the study and those who missed taking drugs had higher odds of experiencing viral load suppression failure. Poor adherence to ART among adolescents living with HIV can have significant implications for viral load suppression and overall health outcomes.

Similar findings in a study conducted in Kenya reveal that adolescents with low adherence to treatment, especially those that miss taking medication have viral suppression failure [13].

Consistent clinical visit attendance provides opportunities for healthcare providers to evaluate for opportunistic infections, encourage medication adherence and health promoting behaviours, manage side effects, detect drug toxicities, and modify ART when needed, with potential population level reductions in HIV transmission [14].

The study revealed that 56% of adolescents were sexually active while 44% were not sexually active. Being sexually active increased the odds of experiencing viral load suppression failure among adolescents. This is because adolescents who are sexually active may engage in behaviours that increase the risk of HIV transmission, such as unprotected sex or multiple sexual partners. These behaviours can lead to higher viral loads and increase the likelihood of transmitting HIV to sexual partners [15].

A similar study conducted in USA found that adolescents who have HIV/AIDS and are sexually active may not use condoms thereby increasing their chances of getting re-infected thus making the virus in the body to multiply. [8].

The study shows that 69% of adolescents had a CD4 count below 200 cell/mm3 at ART initiation. Adolescents who had a CD4 count below 200 cell/mm3 were four times more likely to experience viral load suppression failure compared to adolescents who had a CD4 count of 200 cell/mm3 and above. This may be due to the fact that having a CD4 count below 200 cell/mm3 is mainly associated with advanced HIV cases which may later result in a failed viral load suppression [16].

Similarly, a study conducted in Ethiopia showed that a low CD4 was associated with viral suppression failure. This is because viral clearance might be slow in patients on ART with low CD4 count [17].

The findings of this study also shows that adolescents who had TB had higher odds of experiencing viral load suppression failure than their counterparts with no TB. This finding is supported by a study conducted in South Africa which reveals that HIV patients who have an active opportunistic infection like TB are likely to have viral load suppression failure [17].

Being on second line ART regimen was associated with viral load suppression failure. The study revealed that adolescents who were on second line were more likely to have viral load suppression failure. This may be due to the fact that those on second line regimen have a history of treatment disturbances like poor adherence, which leads to VL suppression failure (Sithole, 2018). A study conducted in Eswatini equally indicated that being on the second-line of ART increased the odds of being VL suppression failure [16].

Conclusion

Our study found that 48% of adolescents who participated in the study were virally suppressed. However, this was below the UNAIDS target of 95% of people on ART to be virally suppressed. Viral load suppression failure among adolescents is caused by several factors which include; not attaining any formal education, missing taking drugs, missing clinical appointments, being sexually active, having a CD4 count below 200 cell/mm3 at ART initiation and having TB.

Therefore, programs providing care to adolescents should focus on providing routine and intensive adherence counselling to prevent treatment interruptions and occurrence of opportunistic infections like TB.

Limitations

This study has a number of limitations which should be considered when interpreting the results presented above. First, adolescents who accessed care from health post facilities providing care to less than 10 adolescents were excluded, which may bias the results given that volume of patients is a key determinant of provider competency and patient outcomes. Secondly, adherence to treatment was difficult to guarantee.

This is because the research team did not conduct a pill count for the adolescents interviewed to ascertain whether drugs were taken without missing doses, but rather relied on self-reported data. Despite these limitations, the study was cost effective in that conducting pill counts for each participant could have been resource-intensive and costly.

By relying on self-reported data, the study may have been more feasible to conduct within the available budget and time constraints.

Declarations

Ethics Approval and Consent to Participate

Ethical approval to conduct this study was obtained from the University of Zambia Biomedical Research Ethics Committee (UNZABREC). We also got permission to conduct the study from the National Health Research Authority (NHRA) and from Lusaka Provincial Health Office and Lusaka District Health Office prior to data collection.

Each study participant completed a consent form before participating in the study. Information on the study as well as all possible risks of participating in the study were communicated to participants in order to respect their autonomous decision on whether to participate in the study or not. For participants below the age of 18 years, consent was sought from their parents/guardians in addition to them signing assent forms.

Consent for Publication

Not applicable

Availability of Data and Materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request with permission of the University of Zambia.

Competing Interests
The authors declare that they have no competing interests.

Funding
The University of Zambia-World Bank ACEIDHA funded the data collection for this study.

Authors' Contributions
EM and RN conceptualised and designed the study. EM did the data collection, analysis and drafted the article. RN and TH supervised the data collection and analysis. TH, RN and JB revised the article for critical intellectual content. All authors approved the final version of the manuscript as submitted.

Acknowledgements
The authors would like to thank the Lusaka Provincial Health Office and Lusaka District Medical Office team for making it easy for us to conduct this study in the district. We further extend our thanks to all the medical staff at facility level for the critical role they played in ensuring that study participants were made available when needed. We would also like to thank the respondents for their willingness to participate in this study. The authors would also like to thank the University of Zambia-World Bank ACEIDHA for funding the data collection for this study.

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