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# PREVALENCE AND FACTORS ASSOCIATED WITH UNSUPPRESSED VIRAL LOADS AMONG ADOLESCENTS ON ART ATTENDING ART CLINIC AT BUSEMBATIA HEALTH CENTER III, BUGWERI DISTRICT, UGANDA. A CROSS-SECTIONAL STUDY.

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## Abstract.

### Background

Adolescents living with HIV are put on ART to improve their quality of life. The emerging failure to have their viral load suppressed is increasing. However, risk factors for failure of viral load suppression in a rural ART clinic are not well documented. This study sought to find out the prevalence and factors associated with unsuppressed viral loads among HIV/AIDS-positive adolescents in the ART clinic of Busembatia Health Centre III.

### Methodology.

A descriptive cross-sectional study was used for HIV positive adolescents attending ART Clinic at Busembatia Health Centre III, Bugweri District. A Kish and Leslie statistical formula was used to obtain the sample size and a random sampling technique was used among 92 adolescents. Data about the adolescents was both extracted from the Client forms and also obtained through questionnaires.

### Results.

51(55.44%) of the participants were female,50(54.35%) of the adolescents were aged 12-13 years and the majority of them were single 89(96.74%). 21% of the participants had unsuppressed viral loads. The established patient-related factors were; Substance abuse 16(84.21%), Sexual behaviors 10(52.63%), Knowledge about HIV 16(84.21%) and clinical-related factors were poor adherence 4(21.05%), Multimorbidity and opportunistic infections 6(31.58%), poor nutritional status 6(31.58%), 12(63.15%) were in WHO clinical stage and 4 (21.05%) of the unsuppressed adolescent had their regimen changed.

### Conclusion.

Prevalence of unsuppressed viral loads was high and the factors associated with viral load unsuppression are numerous, unique and thus require unique interventions.

### Recommendation.

The ART clinic personnels and Implementing partners should engage the adolescents on ART, parents/guardians and teachers in identifying their problems and the challenges and try to find and or address these problems.

***Keywords:*** *Prevalence of Unsuppressed viral loads, Adolescents on Antiretroviral therapy, Busembatia Health Centre III, Bugweri District, HIV/AIDS.*
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## Background.

Globally, 1.6 million adolescents who are aged 10-19 years were estimated to be living with HIV in 2018 and approximately 85% of them were residing in sub-Saharan Africa (UNICEF, 2020). Global estimates of rates of viral suppression among AYA vary widely (27%-90%) because of differences in age disaggregation and age-period-cohort effects (Ferrand et al, 2016). Despite the increasing access to ART, numerous studies have demonstrated suboptimal levels of viral suppression in different populations in many low-resource settings (Global Burden of Disease, 2015). Viral suppression in AYA in sub-Saharan Africa remains poorly characterized as viral load testing has only recently been introduced for routine monitoring (Ferrand et al, 2016).

In particular, ALHIV tends to experience worse immunological and viral suppression outcomes compared to adults (Jobanputon et al, 2015). In evaluations of program data from Kenya and Uganda; which are among the top five countries globally with the highest burden of adolescent HIV over a quarter of adolescents aged 10-19 years on ART for more than 6 months had a viral load of at least 1000 copies/ml, indicating possible virological failure (Bulage et al,2017).

Uganda ranked among the top 20 high burden countries contributing 5% of AIDS related deaths among adolescents in 2014. The deaths were attributed to late diagnosis and poor access to treatment with most perinatally infected children starting treatment later in life. In Uganda, information on viral suppression among adolescents aged 10-19 years is

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limited. This is because data for adolescents aged 10-15 years is lamped up under the age group of 0-14 years and that of adolescents aged 16-19 years is lamped up in the age group of adults (Gordon et al, 2022). This study sought to find out the prevalence and factors associated with unsuppressed viral loads among HIV/AIDS-positive adolescents in the ART clinic of Busembatia Health Centre III.

## Methodology.

### Study design.

A descriptive cross-sectional study design was used to obtain quantitative data from ART clinic records of HIV/AIDS-positive adolescents getting treatment in the facility. Also, adolescents on ART were issued questionnaires to find out some of the reasons why some HIV/AIDS-positive adolescents had unsuppressed viral loads despite being on treatment.

### Study area.

The study was conducted at Busembatia Health Centre III located in Busembatia Zone 2 along Luwuliza Road in Busembatia Town Council, Bugweri District. This is a government health facility that offers Outpatient and In-patient services, Antenatal, Maternity, Postnatal, ART Clinic, Young Child Clinic, Family Planning, and Immunization and also serves as a referral center for all the Health Centres IIs around it.

### Study population

The study considered HIV/AIDS-positive adolescents attending the ART Clinic of Busembatia Health Centre III.

### Inclusion criteria.

The study focused on HIV/AIDS-positive adolescents who had been in care and treatment for the last 6 months and above in the ART clinic of Busembatia Health Centre III and had consented to participate in the study.

### Exclusion criteria

The study excluded adolescents who were not HIV/AIDS positive, ART patients who were not adolescents, HIV/AIDS positive adolescents who were not in care, and those who did not give consent.

### Sample size determination.

The minimum sample size was estimated using a Kish and Leslie statistical formula as follows;

$n =$

$Z2PQ$

$e2$

Using the prevalence of 39% viral load suppression among adolescents in Uganda (UPHIA, 2016)

Where;

P=0.39, the estimated prevalence of the problem under study $Z^2$= 1.96 (standard normal value at α=5% level of significance n=Minimum required sample size e=precision which the investigator used was 0.1 Q=1-P Q=1-0.39 Q= 0.61

$n =$

(1.96)2(0.39) (0.61)

(0.1)2

$n =$

3.8416 × 0.2379

0.01

$n$ = 91.4Respondents approximately 92 since we couldn't have 0.4 respondents. The sample size was 92 respondents.

### Sampling methods

The study employed a simple random sampling technique to obtain the required adolescents on ART.

### Sampling procedure.

Simple random sampling was used where pieces of paper were written on 'A' or 'B ' and numbered 1-200. These papers were folded, mixed up, and put in a container. The researcher kindly requested the participants to pick the pieces of paper and those who picked a piece of paper labeled B were selected until the target sample size was obtained.

### Data collection method

Data was collected from the Health Centre using pretested questionnaires designed in English but were translated into the local language that was best understood by the respondents.

Data was also extracted from ART clinic records of Busembatia Health Centre III of the adolescents that were participating in the study using a data extraction form.

### Data collection tool.

A semi-structured questionnaire with both open-ended and closed-ended questions was used, designed for the adolescents on ART. The researcher also used a data extraction form that was attached to the questionnaire of the respondents on ART.

### Data collection procedure.

The researcher sought permission from the health facility in charge using the introductory letter from the institution and introduced himself to the respondents. Consent was obtained from the adolescents or their caretakers after questionnaires were given to them. The questionnaires were administered to the adolescents. Data was collected from the Health Centre using a pretested questionnaire designed in English but was also translated into a local language that was best understood by the respondents. Data was also extracted from ART clinic records of Busembatia Health Centre III of the adolescents that were participating in the study using a data extraction form and this was to be attached to their corresponding questionnaires.

### Study variables

### Dependent variable

Viral load suppression.

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## Independent variable

Patient-related and Clinical factors associated with unsuppressed viral load.

## Quality control

The proposal and report were supervised by the academic supervisor who guided the researcher on the research methodology, and the qualities of good data collection tools, and the proposal was submitted to the Institute for review and approval by the research supervisor and the Institute research team, suggested changes in methodology, data collection tools were pretested to ensure that the tools have suitable attributes of the questionnaire to collect quality data. The research assistants were trained on how to use the data-collecting tools and the tools were also pretested to make them suitable for the study. The data was to be collected on the data collection tools by the researcher and five research assistants. Fulfilled and completed tools were to be reviewed, those with errors were edited from the field daily and to ensure completeness, accuracy, and consistency. The researcher reviewed the field challenges daily and strategies were drawn to ease data collection.

## Data analysis and presentation

The data from the questionnaires and extraction forms was entered into a computer by the researcher. The data collected was compiled and tallied manually and later analyzed using Microsoft Excel and the results of the study were presented in the form of tables, pie-charts, and bar graphs as well as in text forms and percentages.

## Results.

### Prevalence of unsuppressed viral loads of adolescents on ART attending the ART Clinic at Busembatia Health Centre III

**Figure 1: Showing Viral load unsuppression of adolescents on ART attending the ART Clinic at Busembatia Health Centre III (n=92)**

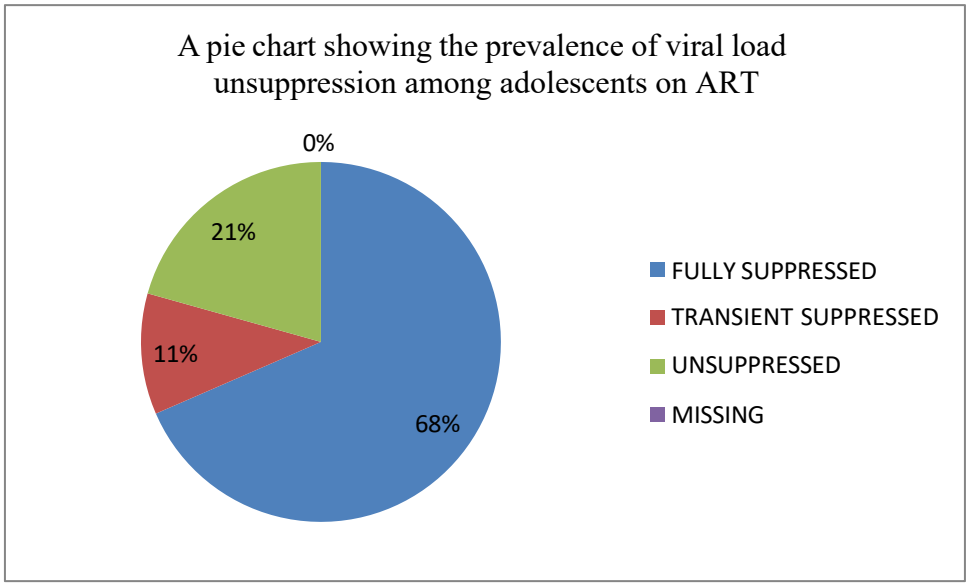


Figure 1: indicates that 68% had a suppressed viral load while 21% had unsuppressed viral loads,11% were transient suppressed and 0% were missing viral load result

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## Patient and Clinical factors of adolescents on ART attending the ART Clinic at Busembatia Health Centre III



**Table 1: Patient and Clinical factors of adolescents on ART attending the ART Clinic at Busembatia Health Centre III (n=92)**

| Factor | How it was assessed | Frequency(f) | Percentage (%) |
|---|---|---|---|
| Gender | Male | 41 | 44.56 |
| | Female | 51 | 55.44 |
| | **Sub-total** | **92** | **100** |
| Current age(years) | 10-11 | 10 | 11.08 |
| | 12-13 | 50 | 54.35 |
| | 14-15 | 06 | 6.52 |
| | 16-17 | 21 | 22.82 |
| | 18-19 | 05 | 5.44 |
| | **Sub-total** | **92** | **100** |
| Marital status | Married | 3 | 3.26 |
| | Single | 89 | 96.74 |
| | Divorced | 0 | 00 |
| | **Sub-total** | **92** | **100** |
| Substance abuse | Alcohol | 2 | 2.17 |
| | Miraa | 0 | 0 |
| | Tobacco | 1 | 1.08 |
| | Marijuana | 0 | 0 |
| | None | 89 | 98.67 |
| | Others | 0 | 0 |
| | **Sub-total** | **92** | **100** |
| Sexual behavior | 1 sexual partner | 10 | 10.87 |
| | 2 sexual partners | 05 | 5.43 |
| | >3 sexual partner | 15 | 16.30 |
| | None | 62 | 67.39 |
| | **Sub-total** | **92** | **100** |
| Aware of their status | YES | 71 | 77.17 |
| | NO | 21 | 22.83 |
| | **Sub-total** | **92** | **100** |
| Disclosure of status | YES | 88 | 95.65 |
| | NO | 4 | 4.35 |
| | **Sub-total** | **92** | **100** |
| Level of education | None | 11 | 11.96 |
| | Primary | 14 | 15.22 |
| | Secondary | 57 | 61.95 |
| | Tertiary | 10 | 10.86 |
| | **Sub-total** | **92** | **100** |
| Being a student | Day scholar | 69 | 75 |
| | Boarding student | 13 | 14.13 |
| | **Sub-total** | **92** | **100** |
| Faced a challenge concerning their health while at school | YES | 49 | 53.26 |
| | NO | 43 | 46.74 |
| | **Sub-total** | **92** | **100** |
| Primary caregiver | Mother | 20 | 21.74 |
| | Father | 12 | 13.04 |
| | Both parents | 28 | 3.04 |

| | | | |
|---|---|---|---|
| | Grandparents | 06 | 6.52 |
| | Aunt/uncle | 8 | 8.69 |
| | None | 8 | 8.69 |
| | Others | 10 | 10.86 |
| | **Sub-total** | **92** | **100** |
| Distance from health facility | Less than 5 km | 65 | 70.65 |
| | 5 km | 6 | 6.52 |
| | Over 5km | 21 | 22.83 |
| | **Sub-total** | **92** | **100** |
| Religion | Born again | 24 | 26.61 |
| | Anglican | 20 | 22.17 |
| | Moslem | 16 | 17.39 |
| | Catholic | 15 | 16.63 |
| | SDA | 7 | 7.61 |
| | Others | 10 | 10.86 |
| | **Sub-total** | **92** | **100** |
| Being prayed for about their status | YES | 2 | 2.17 |
| | NO | 90 | 97.83 |
| | **Sub-total** | **92** | **100** |
| Adherence to ART | Poor | 8 | 8.69 |
| | Fair | 12 | 13.04 |
| | Good | 72 | 78.26 |
| | **Sub-total** | **92** | **100** |
| Multimorbidity and Opportunistic infections | TB | 4 | 4.35 |
| | Meningitis | 0 | 0 |
| | Diabetes | 1 | 1.09 |
| | Cancer | 1 | 1.09 |
| | STI | 12 | 13.04 |
| | Others | 00 | 0 |
| | NO | 78 | 84.78 |
| | **Sub-total** | **92** | **100** |
| Initial WHO clinical staging | WHO stage I | 83 | 90.22 |
| | WHO stage II | 2 | 2.17 |
| | WHO stage III | 3 | 3.26 |
| | WHO stage IV | 4 | 4.35 |
| | **Sub-total** | **92** | **100** |
| WHO clinical staging | WHO Stage I | 84 | 91.30 |
| | WHO stage II | 2 | 2.17 |
| | WHO stage III | 5 | 5.45 |
| | WHO stage IV | 1 | 1.09 |
| | **Sub-total** | **92** | **100** |
| Duration on ART | <24 months | 13 | 14.13 |
| | >24 months | 79 | 85.87 |
| | **Sub-total** | **92** | **100** |
| ART regimen | First line | 76 | 84.26 |
| | Second line | 16 | 17.39 |
| | Third line | 0 | 0 |
| | **Sub-total** | **92** | **100** |
| Was the ART regimen changed | YES | 15 | 16.30 |

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| | | | |
|---|---|---|---|
| | NO | 77 | 83.69 |
| | **Sub-total** | **92** | **100** |
| Nutritional status (BMI) | <17 | 11 | 11.95 |
| | 17-18 | 35 | 38.04 |
| | 18-25 | 24 | 26.09 |
| | 25-30 | 22 | 23.91 |
| | >30 | 0 | 0 |
| | **Sub-total** | **92** | **100** |
| Cotrimoxazole prophylaxis treatment | YES | 92 | 100 |
| | NO | 0 | 0 |
| | **Sub-total** | **92** | **100** |
| Side effects due to ART drugs | YES | 1 | 1.1 |
| | NO | 91 | 98.9 |
| | **Sub-total** | **92** | **100** |

Table 1 shows that 51(55.44%) were female,50(54.35%) of the adolescents were aged 12-13 years, the majority of them were single 89(96.74%),62(67.39%) had no sexual partner,71(77.17%) of the respondents were aware of their status and only 21(22.83%) were not aware of their status, 88(95.65%) had a disclosed status,57(61.95%) reached secondary. Being a student,69(75%) were day scholars and 13(14.13) were boarding students. Also, 49(53.26%) reported having faced a challenge concerning their health while at school and 43(46.79%) did not.

The majority of them 28(3.04%) had both parents as primary caregivers,65(70.65%) reported a distance of less than 5km, and concerning religion majority were born again 24(26.61%). However, 2(2.17%) had been prayed for about their status, and 97.83%) had not. 72(78.26%) had a good adherence. For multimorbidity and Opportunistic infections,78(84.78%) had no whereas 12(13.04%) had STI,4(4.35%) had TB,1 (1.09) had diabetes and cancer respectively and 0(0%) had others. In initial WHO clinical staging,83(90.22%) had WHO stage I,84(91.30%) current WHO stage I,79(85.87%) had been on ART for a duration greater than 24 months whereas 13(14.13%) had a duration less than 24 months.

Concerning ART Regimen 76(84.26%) were on the first line and 77(83.69%) had not been changed and 15(16.30) had been changed. Concerning Nutritional Status 35(38.04%) had a BMI 17-18,92(100%) had a cotrimoxazole prophylaxis treatment and 0(0%) did not.

Regarding the side effects due to ART drugs 91 (98.9%) did not have whereas 1(1.1%) reported side effects.

**Table 2: Showing Patient-Related Factors Associated with Unsuppressed Viral Load Among Adolescents on ART Attending the ART Clinic(n=19)**

| **Factor** | **How it was assessed** | **Frequency** | **Percentage (%)** |
|---|---|---|---|
| Gender | Male | 8 | 42.1 |
| | Female | 11 | 57.9 |
| | **Sub-total** | **19** | **100** |
| Current age | 10-11 | 3 | 15.79 |
| | 12-13 | 3 | 15.79 |
| | 14-15 | 4 | 21.05 |
| | 16-17 | 1 | 5.26 |
| | 18-19 | 8 | 42.11 |
| | **Sub-total** | **19** | **100** |
| Marital status | Married | 2 | 10.53 |
| | Single | 17 | 89.47 |
| | Divorced | 0 | 0 |
| | **Sub-total** | **19** | **100** |
| Substance abuse | Alcohol | 2 | 10.53 |
| | Miraa | 0 | 0 |
| | Tobacco | 1 | 0.05 |
| | Marijuana | 0 | 0 |
| | None | 16 | 84.21 |

| | | | |
|---|---|---|---|
| | Others | 0 | 0 |
| | **Sub-total** | **19** | **100** |
| Sexual behavior | 1 sexual partner | 3 | 15.79 |
| | 2 sexual partners | 2 | 10.53 |
| | >3 sexual partner | 4 | 21.05 |
| | NONE | 10 | 52.63 |
| | **Sub-total** | **19** | **100** |
| Aware of their status | YES | 16 | 84.21 |
| | NO | 3 | 15.79 |
| | **Sub-total** | **19** | **100** |
| Disclosure of status | YES | 14 | 73.68 |
| | NO | 5 | 26.32 |
| | **Sub-total** | **19** | **100** |
| Level of education | None | 3 | 15.79 |
| | Primary | 9 | 47.36 |
| | Secondary | 5 | 26.32 |
| | Tertiary | 2 | 10.53 |
| | **Sub-total** | **19** | **100** |
| Being a student | Day scholar | 9 | 56.25 |
| | Boarding student | 7 | 43.75 |
| | **Sub-total** | **16** | **100** |
| Faced a challenge concerning their health while at school | YES | 5 | 31.25 |
| | NO | 11 | 68.75 |
| | **Sub-total** | **16** | **100** |
| Primary caregiver | Mother | 4 | 21.05 |
| | Father | 3 | 15.79 |
| | Both parents | 4 | 21.05 |
| | Grandparents | 2 | 10.53 |
| | Aunt/uncle | 3 | 15.79 |
| | None | 2 | 10.53 |
| | Others | 1 | 5.26 |
| | **Sub-total** | **19** | **100** |
| Distance from health facility | Less than 5 km | 4 | 21.05 |
| | 5 km | 9 | 47.36 |
| | Over 5km | 6 | 31.57 |
| | **Sub-total** | **19** | **100** |
| Religion | Born again | 12 | 63.16 |
| | Anglican | 3 | 15.79 |
| | Moslem | 2 | 10.53 |
| | Catholic | 2 | 10.53 |
| | SDA | 0 | 0 |
| | Others | 0 | 0 |
| | **Sub-total** | **19** | **100** |
| Being prayed for about their status | YES | 1 | 5.26 |
| | NO | 18 | 94.74 |
| | **Sub-total** | **19** | **100** |

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Table 2: shows that 8 (42.1%) were male,8(42.11%) of the adolescents were aged 18-19 years, the majority of them were single 17(89.47%), the majority of them that were interviewed 16(84.21%) don't abuse drugs.10(52.63%) had no sexual partner,16(84.21%) of the respondents were aware of their status and 14(73.68%) had a disclosed status,9(47.36%) reached primary,5(26.32%) reached secondary,3(15.79%) none and 2(10.53%) reached tertiary,9(56.25%) were day scholars and 7(43.75%) were boarding students. Also, 5(31.25%) reported having faced a challenge concerning their health while at school and 11(68.75%) did not.

Majority of them 4(21.05%) had a mother and both parents as primary caregivers respectively,

,9(47.36%) reported 5km, majority were born again 12(63.16%). However, 1(5.26%) had been prayed for about their status and 18(94.74%) hadn't.

## Clinical-related factors associated with unsuppressed viral load among adolescents on art attending the art clinic.

**Figure 2: Showing the clinical-related factors associated with unsuppressed viral load among adolescents on ART attending the ART clinic (n=19)**

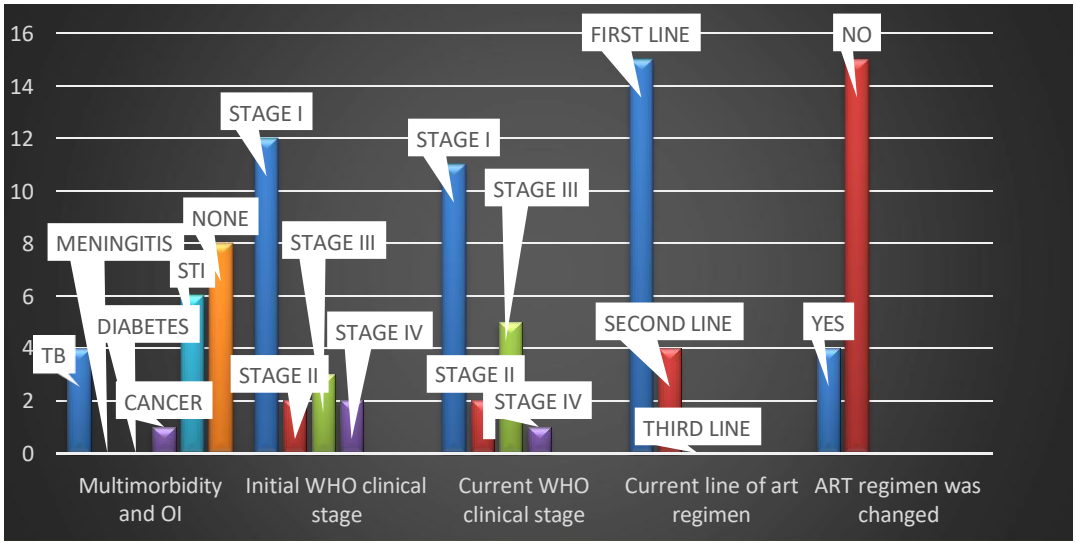


Figure 2: shows that 8 (42.11%) of them didn't have any multimorbidity and opportunistic infection,6(31.58%) had STI 4(21.05%) had TB and 1(5.26%) had cancer 0 (0%) didn't have diabetes, meningitis and others respectively. Out of 19 unsuppressed adolescents, their initial WHO clinical stage was,12(63.15%) were in WHO clinical stage I,3(15.79%) were in WHO clinical stage III, and 2 (10.53%) were in WHO clinical stage II and IV.

Current WHO clinical stage: Out of 19 unsuppressed adolescents 11(57.89%) of them were in stage I,5(26.32%) were in WHO clinical stage III, 2(10.53%) were in stage II, and 1(5.26%) was in WHO clinical stage IV. Current ART regimen: Out of the 19 unsuppressed adolescents 15 (78.95%) of them were on the first line,4 (26.67%) were on the second line and 0 were on the third line. ART regimen was changed: The study found out that 4 (21.05%) of the unsuppressed adolescent had their regimen changed while 15(78.95%) didn't have it changed.

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**Figure 3: showing other clinical factors associated with viral load unsuppression (n=19)**

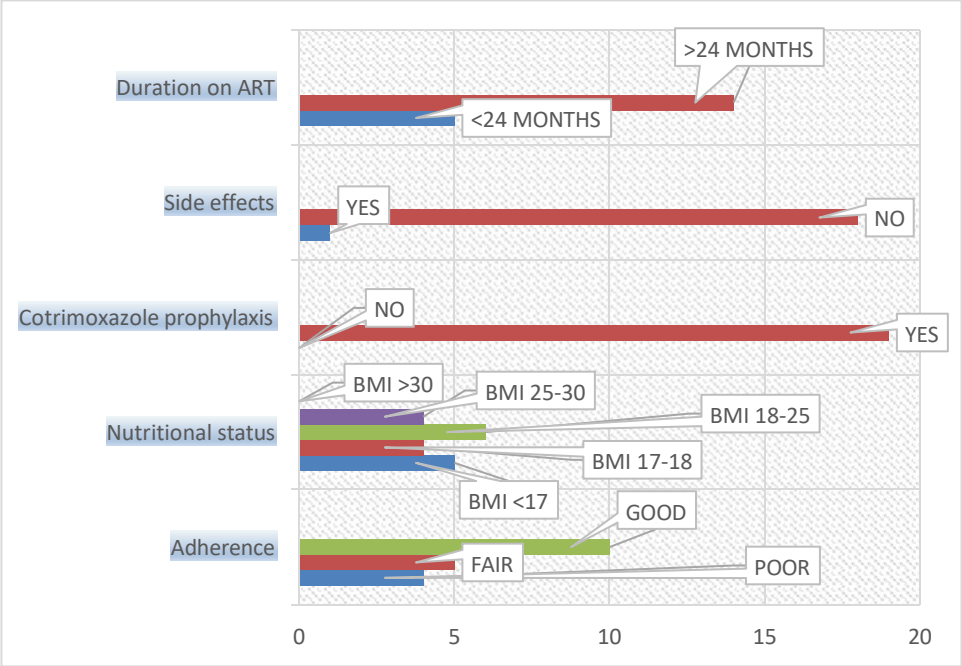


Figure 3, indicates that the majority of them 10(52.63%), had a good adherence 5(26.32%) of them had a fair adherence and lastly 4(21.05%) of them had poor adherence. Duration on ART: 14(73.68%) of the 19 unsuppressed adolescents had been on for >24 months while 5(26.32%) of the 19 unsuppressed adolescents had been on ART for <24 months.

Nutrition status: Out of the 19 unsuppressed adolescents 6 (31.58%) of them had a BMI of 18-25,5 (26.32%) of them had a BMI <17, 4(21.05%) of them had a BMI of 17-18 and 25-30 respectively and lastly 0 (0%) of them had a BMI >30

Cotrimoxazole prophylaxis treatment: From the study conducted out of the 19 unsuppressed,19(100%) of them had got cotrimoxazole prophylaxis whereas 0 didn't have.

Side Effects to ART. Out of the 19 unsuppressed adolescents 18 (94.57%) of them didn't experience side effects to ART whereas 1 (5.26%) reported to have experienced side effects to ART.

## Discussion of results.

### Prevalence of Adolescents on Art with Unsuppressed Viral Loads.

The prevalence of unsuppressed viral loads shows that Out of the 91 adolescents that were enrolled in the study, a total of (19) 21% of them were found to be unsuppressed. This was contrary to the findings of Maena et al, (2021) who found that 31.7% of the adolescents had viral non suppression during the study period.

### Patient-related factors associated with unsuppressed viral loads among adolescents on Art

The distribution of unsuppressed viral loads was more prevalent among those between 18-19 years. These findings are supported by a study that followed adolescents initiated on ART in public health facilities in Metropole District Health Services of the Western Cape province revealed that younger adolescents (10-14 years) had better VLS rates at months 4,12, and 24 compared to older adolescents (15-19) (Van Wyke et al,2020). This study found that of the virally unsuppressed adolescents (8) 42.1% were male and (11)57.9% were female, which contradicts Van Wyk et al, (2020) study in the Western Cape province, where adolescent males were found to be significantly more likely to be virologically suppressed compared to females over the first two years after ART initiation.

Being married was associated with a sense of responsibility, this study found out that of the adolescents with unsuppressed viral loads, majority of them were single 17(89.47%) and 2(10.53%) were married.

Although substance abuse was associated with unsuppressed viral loads, this study found that the majority of them don't abuse substances. However, this wasn't the case in a study by Huerga et al, (2018) carried out a study in rural communities of South Africa, Kwa-Zulu Natal, using both qualitative and quantitative methods; the study utilized 400 patients and found that almost half of the

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participants cited issues of lifestyles, sexual behaviors as critical factor predicting viral load suppression.

Furthermore, this study found that the majority of adolescents with unsuppressed viral loads had no sexual partners. These findings varied from those of a study by Huerga et al, (2018) carried out a study in rural communities of South Africa, Kwa-Zulu Natal, using both qualitative and quantitative methods; the study utilized 400 patients and found that almost half of the participants cited issues of lifestyles, sexual behaviors as a critical factor predicting viral load suppression. In this study majority of the adolescents with unsuppressed viral loads knew about HIV and were aware of their status. This wasn't by a study by Chhim et al, (2018) that reported that the proportion of adolescents having a VL ≥1000 RNA copies/ml was significantly higher among adolescents who believed that there was a cure for HIV compared to those who did not believe this. This study found that viral load unsuppression among adolescents was irrespective of disclosure status. This differed from a study by Atuyambe et al, (2014) found that nondisclosure of the HIV status of a child to other family members was linked to failure in VL suppression as the child was related to lack of family support.

This study found out that education level, being a day scholar student or boarding student and reporting to have faced a challenge due to their status was not associated with viral load unsuppression. This was contrary to a study conducted in Muranga in Central Kenya found that students in a day school were more likely to be adherent than students in boarding schools. Additionally, those in boarding schools lack privacy, which causes them to avoid taking their medicine. This leads to viral suppression, if students can go on without getting their treatment in time (Muyiro M et al, 2014) Accordingly, this study found that having any primary caregiver was associated with unsuppressed viral loads among adolescents. This wasn't by a study by Dahourou DL et al,(2017) which reported that having a caregiver other than the mother, experiencing a change in caregiver, and not having a caregiver attend a child ART clinic appointment was associated with lower adherence and higher odds of VL unsuppression among children and adolescents.

In this study regarding distance from health facility,9(47.36%) reported 5km, 6(31.57%) reported over 5km and lastly4(21.05%) reported less than 5 km. These findings were not similar to a study conducted by UNICEF, (2020) which reported that accessibility of health services has a direct impact on adherence, retention, and VL suppression. Adolescents were likely to have unsuppressed viral loads if they were Born again or Anglican, and have ever been prayed for. These findings were similar to a study conducted by Julian Natukunda et al, (2019) found that being Anglican or Moslem and having been prayed for were risk factors for failure for VL suppression.

It is known that viral load suppression is associated with poor adherence. This study reported that the majority of them 72(78.26%) had a good adherence,12(13.04%) had a fair and lastly 8(8.69%) had a poor adherence. This was consistent with a study conducted by Nabukeera et al, (2021) which found that the proportion of children with unsuppressed viral loads was higher among children with good adherence than in those with fair and poor adherence. From the study conducted out of the unsuppressed adolescents,8 (42.11%) of them didn't have any multimorbidity and opportunistic infection,6(31.58%) had STI while 4(21.05%) had TB and 1(5.26%) had cancer and 0 didn't have diabetes, meningitis and others respectively. These findings are in line with a study conducted in the Mbale district, which showed that having a comorbidity, such as tuberculosis in most cases, increased the odds of being virally unsuppressed (Maena et al,2021).

From the study conducted out of 19 unsuppressed adolescents, their initial WHO clinical Stage was;12 (63.19%) were in WHO Clinical Stage I,3(15.79%) were in WHO Clinical Stage III, and 2(10.53%) were in WHO clinical stage II and IV respectively. However, this slightly differs from a study by Nabukeera et al, (2021) found out that being at WHO clinical stage 4 at ART initiation was significantly associated with non-suppression. On the other hand, from a total of 19 unsuppressed adolescents who had their current WHO clinical staging;11(57.89%) of them were in stage I,5(26.32%) were in WHO clinical stage III, 2(10.53%) were in stage II and 1(5.26%) was in WHO clinical stage IV. Other authors in the literature contradict the results of this study such as Jobanputra et al, (2015) who explored factors associated with virological detectability of children and adults on ART in Swaziland and reported that patients with WHO stage III and IV were significantly more likely to have unsuppressed viral loads.

Furthermore, this study reported that adolescents who were on ART for >24 months had unsuppressed viral loads compared to those who were on ART for <24 months. This was similar to a study by Maena et al, (2021) that found out that the longer the adolescent is on ART, the higher their odds of viral load nonsuppression. It is plausible that since longer ART duration is typical of perinatally infected adolescents, non-suppression may be a result of drug resistance over time. The majority of the adolescents 15(78.95%) of them with unsuppressed viral loads were still on their first-line ART regimen and 4 of them were on the second-line ART regimen. This finding is contrary.

ART regimen was changed: The study found out that 4 (21.05%) of the unsuppressed adolescent had their regimen changed while 15 (78.95%) didn't have it changed. This didn't differ from a study conducted by Natukunda et al, (2019) which found that 14% were switched to the second-

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line treatment despite their viral outcome status. The majority (61%) who had not achieved suppression had not been switched, and no markers were in place to prioritize a change of regimen.

The findings indicate that adolescents with unsuppressed viral loads had both normal and underweight BMI respectively. Therefore, BMI of adolescents under care had high odds of influencing viral load suppression. This was in agreement with a study conducted in South- Western Ethiopia found that the odds of non-suppression were higher among those with low BMI (16-18.5kg/m2) (Waju et al, 2021).

This study conducted out of the 19 unsuppressed, 19(100%) of them had got cotrimoxazole prophylaxis whereas 0 didn't have. However, this was contrary to a study by Niyonziz. Z.Bitwale et al, (2021) found out children not on cotrimoxazole prophylaxis were much more likely to have virological treatment failure than those on prophylaxis.

Most of the adolescents with unsuppressed viral loads 18(94.74%) of them didn't experience side effects to ART whereas 1(5.26%) reported to have experienced side effects to ART. This didn't concur with the study that found out children who had ART-induced side-effects were more likely to have non-suppressed viral loads after six months of treatment (Nabukeera et al, 2021).

## Conclusion

In conclusion, this study found that for adolescents on ART attending ART clinic in Busembatia Health Centre III, that the prevalence of unsuppressed viral loads was 21% and the factors associated with viral load unsuppression are numerous, unique and thus require unique interventions.

## Limitations of the study.

The study was conducted for a short period of time, where the researcher had to forego other activities and carried out research in a period specified.

The finances were limited and this was solved by proper budgeting.

The respondents canceled out some data that was needed on person-related aspects due to their hidden safety reasons.

## Recommendations

The ministry of health should improve on regular viral load monitoring to adequately identify and manage ALHIV with unsuppressed viral load and subsequent switching to second line treatment. The ART clinic personnels and Implementing partners should engage the adolescents on ART, parents/guardians and teachers in identifying their problems and the challenges and try to find and or address these problems.

The government of Uganda through the Ministry of Health should set new guidelines on how to handle adolescents on ART to reduce on the viralogical failure.

Further studies that are aimed at finding out drug resistance and viral mutations as factors associated with unsuppressed viral loads among adolescents should be conducted

## List of abbreviations.

**AIDS:** Acquired Immunodeficiency Syndrome
**ART:** Antiretroviral Therapy
**AYA:** Adolescents and Young Adults
**ALHIV:** Adolescent Living with HIV
**HIV:** Human Immunodeficiency Virus
**TB:** Tuberculosis
**UNICEF:** United Nations Children's International Emergency
**VL:** Viral Load
**WHO:** World Health Organization
**VLS:** Viral Load suppression.
**RNA:** Ribonucleic Acid.
**BMI:** Body Mass Index

## Source of funding.

There is no source of funding.

## Conflict of interest.

The authors declare no conflict of interest.

## Availability of data.

Data used in this study is available upon request from the corresponding author.

## Authors contribution.

CG designed the study, conducted data collection, cleaned and analyzed data and draft the manuscript and FS supervised all stages of the study from conceptualization of the topic to manuscript writing and submission.

## Ethical approval.

An introductory letter was given to the researcher which he used to obtain permission from the DHO - Bugweri district to start conducting research in the study area. Using the same letter from the DHO, permission to conduct the study was sought from the In-charge Busembatia Health Centre III who then gave the permission to collect data at the health center.

## Informed consent.

All literate respondents were allowed to read the consent form and informed consent was obtained from the respondents before the data collection commenced. For the illiterate respondents, a thorough explanation of the consent form was made and in acceptance, the respondents consented by putting their thumbprints on the consent forms. For confidentiality, the names of the respondents were not included in the questionnaires but instead, codes were used. The respondents were informed that they were

not obliged to participate in the study and they were free to withdraw from the study even after signing the consent form.

## Authors biography.



Christopher Gubira is a student of diploma in clinical medicine and community health at St Elizabeth's Institute of Health Professionals.
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