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**Depression, Anxiety and Well-Being Among HIV-Positive Adolescents in Lagos, Nigeria**

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doi: 10.51505/ijmshr.2021.5502

URL: <http://dx.doi.org/10.51505/ijmshr.2021.5502>

**ABSTRACT**

**Objective:** To determine the prevalence and correlates of depression and anxiety among HIV-positive adolescents attending the HIV-clinic at Lagos state University Teaching Hospital, Nigeria.

**Methods:** This was a cross-sectional study of 155 HIV-positive adolescents (between the ages of 10 to 18 years) who were recruited using total sampling method at a Pediatric HIV/AIDS Out-Patient clinic in Lagos, Nigeria. Questionnaires used were: MINI-KID (MINI International Neuropsychiatric Inventory (for children and adolescents), MINI-KID Screen, Jacoby Stigma Scale, Pediatric Quality of Life Inventory, Morisky Medication Adherence Scale and Oslo Social Support Scale. All these questionnaires have been demonstrated to have good internal consistency (>0.70) and validity.

**Results**

The prevalence of depression and anxiety were 23.9% and 12.9% respectively. Correlates of depression were stigma (OR=1.43, CI=1.22-1.69), bullying (OR=0.29, CI=0.13-0.63), poor perceived social support (OR=2.41, CI= 1.15-5.54), total quality of life (OR=0.94, CI=0.92-0.97), school functioning (OR=0.94, CI=0.91-0.97), emotional functioning (OR=0.96, CI=0.94-0.98). Correlates of anxiety include, viral load (OR=0.55, CI=0.33-0.93), stigma (OR=0.69, 0.55-0.85), anti-retroviral medication adherence (OR=0.59, CI=0.38-0.90), awareness of HIV/AIDS diagnosis (OR=0.23, CI=0.06-0.85), emotional functioning (OR=1.13, CI=1.07-1.18), physical functioning (OR=1.05, 1.02-1.08), social functioning (OR=1.23, CI= 1.21-1.26), total quality of life (OR=1.05, 1.02-1.08), age (OR=0.81, CI=0.66-0.89) and poor perceived social support (OR=1.23, CI=1.11-1.99).

### **Conclusion**

Depression and anxiety are common among HIV-positive adolescents, it is necessary to develop preventive strategies against these mental health problems among this group of individuals, and ensure good quality of life.

**Keywords:** Adolescent, Anxiety, Depression, HIV/AIDS, Quality of Life

### **INTRODUCTION**

Human immunodeficiency virus / Acquired immune deficiency syndrome (HIV/AIDS) has become one of the major public health challenges globally since the initial discovery of the disease in the 1980's [1]. Adolescents (persons between the ages of 10 years to 19 years) are the fastest-growing age group of people living with HIV/AIDS [2]. There are about 1.2 billion adolescents worldwide, and 2.1 million of them are living with HIV [3]. Out of this population of HIV-infected adolescents, 85% (1.8 million) of them reside in sub-Saharan Africa [2]. Nigeria is the country with the second largest HIV disease burden globally, with approximately 3.5 million people living with HIV/AIDS, including 400,000 HIV-positive children and adolescents [1].

Adolescence is a high-risk period for the acquisition and transmission of HIV, as this phase is associated with an upsurge in HIV high-risk behaviours such as, intravenous drug abuse, unprotected sexual intercourse, body piercing and tattooing [4]. Beyond this, adolescence is the age of onset of mental health morbidity such as depression and anxiety [5]. Anxiety and depression are the most common mental disorders among HIV-positive adolescents [6], and may result in dire consequences such as low self-esteem, poor academic achievement and impaired quality of life [7,8]. The co-morbidity of anxiety and depression with HIV/AIDS may compromise anti-retroviral treatment adherence and can increase the perception of stigma among HIV-positive adolescents [9]. Furthermore, research has shown that among HIV-positive adolescents, there are significant correlates of depression and anxiety such as; orphanhood, gender, age, anti-retroviral medication adherence, stigma, perceived social support, viral load, and quality of life [6,7,8,9,10]. These correlates need to be factored into the management of HIV-infected adolescents in order to achieve optimal treatment outcome.

Despite its adverse consequences, epidemiological data on depression and anxiety disorders among adolescents living with HIV in Nigeria is still limited. For example, studies on the psychological impact of HIV were conducted in the Northern [10,11,12] and South-Eastern parts of Nigeria [13,14], however; these studies included other age groups apart from adolescents. There are fewer studies concerning mental health problems specific to HIV-positive adolescents in South-Western Nigeria. Nigeria is a very large country with diverse culture and as such, epidemiological data have to be generated from different regions. Furthermore, previous studies sometimes include both adult and adolescent samples together [10], include only adolescents who are older than 15 years [14], or are limited to children who are younger than the adolescent age of 10 years. Other areas of gap include small sample size [13], and use of non-diagnostic assessment tools [10]. Additionally, within this environment, there is a paucity of studies that explore the correlates of depression and anxiety, and determine the relationship between anxiety/depression among HIV infected adolescents, adherence to anti-retroviral treatment, quality of life, and perception of stigma. Having such information provides a context for

understanding the likely public-health impact of anxiety/depression among Nigerian HIV-positive adolescents. This study explores the prevalence of depression and anxiety among HIV-positive adolescents. Additionally, the association between these mental disorders, quality of life, anti-retroviral treatment adherence, and the experience of stigma was also examined.

The relevance of this study may be explained as follows; although there are notable studies with respect to depression and anxiety in HIV-positive adolescents living in Nigeria, there is however inadequate information concerning the relationship between depression, anxiety, and variables such as, anti-retroviral medication adherence, perception of stigma, and the quality of life of Nigerian adolescents infected with HIV, as most documented studies are from the western world. It is hoped that the information derived from this study may result in improved mental health screening at follow-up appointments at pediatric HIV clinics. This will facilitate early detection and management of depression and anxiety, with potential positive impact on treatment outcome in HIV-positive adolescents. It is also expected that information derived from this project will be useful to governmental and non-governmental organizations in the creation of policies, and more advocacy and awareness programs to reduce stigma towards Nigerian adolescents living with HIV/AIDS.

## **MATERIALS AND METHODS**

### **Study Design and Sample**

This was a descriptive cross-sectional study conducted at the Pediatric HIV Out-Patient clinics of the Lagos State University Teaching Hospital, Nigeria from October, 2018 to May, 2019. The inclusion criteria were; adolescents (aged 10-18 years) who had commenced anti-retroviral treatment, gave assent, and whose guardians consented to their participation in the study. A total of 155 HIV-positive adolescents were selected using total sampling of those who met the inclusion criteria. Ethical approval for the study was obtained from the Ethics and Research Committee of the Lagos State University Teaching Hospital.

### **Study Instruments**

#### **Socio-demographic questionnaire**

This included information on the:

- 1) Demographic variables – Age, gender, religion, marital status, class at school, frequent change of school, history of class retention
- 2) Social variables – family monthly income, number of close friends, experience of bullying, orphanhood, marital status of parents, witness and experience of violence at home
- 3) Clinical variables – Awareness of diagnosis, route of HIV-infection, duration of treatment, latest CD4 count and viral load, history of psychoactive substance use, number of hospitalizations, presence of co-morbidities (such as Tuberculosis and Dermatitis), past personal history and family history of mental illness.

### **Oslo Social Support Scale**

The Oslo Social Support (OSS) scale is a 3-item scale which assesses perceived level of social support [15]. The total score ranges from 3 to 14, and the scores from each question can be summed up to indicate whether the perceived support is Poor (3-8), Moderate (9-11) or Strong (12-14). This scale has shown high acceptability with an internal consistency of 0.6 [16] and has been validated for use in Nigeria [17].

### **Morisky Medication Adherence Scale-4 item (MMAS-4)**

The MMAS-4 consists of 4-items with a scoring scheme of 'Yes'=1, and 'No'=0 [18]. This instrument was used to measure the level of adherence of the participants in the last one month. The items are summed to give a total range of scores from 0 to 4, where 0= High adherence, 1-2= Medium adherence, 3-4= Low adherence. The four questions included are: 1) Do you ever forget to take your medicine? 2) Do you ever have problems remembering to take your medication? 3) When you feel better, do you sometimes stop taking your medication? 4) Sometimes, when you feel worse do you stop taking your medications? This instrument has been good validity and an internal consistency greater than 0.70[19, 20, 21].

### **Paediatric Quality of Life Inventory (PedsQL) 4.0 Short Form-15 Generic Core Scales**

The Paediatric Quality of Life Inventory is used to demonstrate significant impairments in Health-Related Quality of Life (HRQOL) in children between ages 2 years and 18 years of age[22]. This inventory comes in the form of the Generic Core Scales, and some Disease-Specific scales. The Generic Core Scale [23] has two versions, the 23-item version and the Short Form-15 (SF-15) version; the SF-15 version was administered in this study. The PedsQL 4.0 SF15 has two-forms, a child-self report and parent-proxy-report, the former was used for this study. It encompasses 1) physical functioning (five items); 2) emotional functioning (four items); 3) social functioning (three items) and 4) school functioning (three items). The instructions ask how much of a problem each item has been during the past 1 month. A five-point response scale was utilized (0 = never a problem; 1 = almost never a problem; 2 = sometimes a problem; 3 = often a problem; 4 = almost always a problem). Items were reverse-scored so that higher scores indicated better HRQOL. For each subscale, the score is the sum of the items over the number of the items answered. The total is the sum of all the items over the number of items on all the sub-scales. This instrument has been validated for use in Nigeria, with an internal consistency greater than 0.70 for all the subscales [24].

### **Jacoby's Stigma Scale**

The Jacoby's stigma scale is a three-item scale used for assessing perceived stigma. This scale was used to measure the extent to which the participants perceive negative attitudes or behaviour of others because of their HIV/AIDS diagnosis. Item questions include: "Because of my illness; 1) I feel some people are uncomfortable with me, 2) I feel some people treat me like an inferior person, 3) I feel some people would prefer to avoid me. A response is selected from a 4-point hierarchy ranging from 1= not at all, 2 = a little, 3 = sometimes, and 4 = always. The overall score is the sum of all the responses and ranges from 3–12. A higher score is indicative of a high

level of perceived stigma. This scale has been used typically to measure perceived stigma in people with chronic health conditions, with an internal consistency greater than 0.70 in sub-Saharan Africa [25, 26] and especially in Nigeria [27, 28].

### **Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID)**

The MINI-KID is a brief structured diagnostic interview to assess for psychiatric disorders in children and adolescents, has good validity and reliability [29]. The MINI-KID is organised into 23 diagnostic sections and has two screening questions per disorder. The questionnaire also has a MINI-KID SCREEN attached, which comprises a set of screening questions in each module of the MINI KID. A negative response to the screening questions usually means it is unlikely the patient has the disorder. A positive response to questions in the MINI KID SCREEN suggests the presence of a psychopathology; necessitating further questioning using the standard MINI KID in order to make a definite diagnosis. The depression and anxiety modules (specifically for panic disorder, agoraphobia, social phobia, generalised anxiety disorder) of the MINI-KID version 7.0 were administered. This instrument has good validity, and the inter-rater and test-retest reliability values ranges from 0.64 to 1.00 for all the individual MINI-KID disorders [29].

### **Statistical Analysis**

Data was analysed using the Statistical Package for the Social Sciences version 22 (SPSS 22). Descriptive statistics were used to summarize the socio-demographic and clinical variables of the participants. Chi-square test, Independent samples T-test and Mann-Whitney U tests were used accordingly for univariate analysis, to determine the significance of study parameters among adolescents with, and without depression/anxiety. The association between socio-demographic variables, clinical variables and depression/anxiety were further investigated using logistic regression analyses (backward stepwise method). For all the statistical tests, level of significance was set at  $P < 0.05$ .

## **RESULTS**

A total of 155 adolescents met the inclusion criteria for the study. All of the adolescents and their guardians gave consent. The response rate was 100%, and there were no cases of missing questionnaires or data.

### **Socio-Demographic Characteristics**

The mean age of the respondents was  $14(\pm 2.4)$  years, and there were more boys than girls in the sample ( $n=84$ , 54.2%). Majority ( $n=120$ , 77.4%) were from Christian homes and in secondary school (89.7%). About 33.5% ( $n=52$ ) of them were orphans and more than half of the sample ( $n=85$ , 54.8%) reported a monthly family income of less than 50,000 naira (\$100). About two-third ( $n=94$ , 60.6%) had changed schools more than once, while about a third had repeated a grade in school ( $n=57$ , 36.8%) and experienced bullying ( $n=50$ , 32.3%). About a quarter ( $n=41$ , 26.5%) had witnessed domestic violence and was beaten at least twice a week by their caregivers. The mean score for social support was  $10.8(\pm 2.5)$ , while that for level of perception of stigma was  $4.6(\pm 2.3)$  (see Table 1A and 1B for more details).

**TABLE 1--- SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY POPULATION**

VARIABLE	FREQUENCY-N (%) N=155	MEAN(±S.D) MEDIAN(RANGE)
<b>Age</b>		
10-13years	68(43.9)	14(2.4)
14-18years	87(56.1)	14(10-18)
<b>Gender</b>		
Male	84 (54.2)	-----
Female	71 (45.8)	
<b>Religion</b>		
Islam	35 (22.6)	
Christianity	120 (77.4)	-----
<b>Level of Schooling</b>		
Primary	36 (23.2)	
Secondary	88 (56.8)	-----
Tertiary	15 (9.7)	
Secondary School Leaver	16 (10.3)	
<b>Change of School</b>		
Yes	61 (39.4)	1(1.6)
No	94 (60.6)	0(0-6)
<b>Class Retention</b>		
Yes	57(36.8)	-----
No	98(63.2)	
<b>Bullying</b>		
Yes	50 (32.3)	-----
No	105(67.7)	
<b>Level of perceived stigma</b>		
3-6	122(78.7)	
7-9	24(15.5)	1.3(0.6)
10-12	9(5.8)	1(3-12)
<b>Marital status of Parents</b>		
Married and Living Together	67 (43.2)	
Married and Living Apart	16 (10.3)	
Divorced	16 (10.3)	-----
Widow/Widower	56 (36.1)	
<b>Orphan</b>		
No	103 (66.5)	
Mother Dead	24(15.5)	
Father Dead	16(10.3)	-----
Both Parents Dead	12 (7.7)	

<b>Family Monthly income (Naira)</b>		
Less than 50,000 (<\$100)	85(54.8)	
50,000-100,000 (\$100-\$1000)	50 (32.3)	82,345(208,184)
Above 100,000 (>\$1000)	20 (12.9)	45,000(12,000-2.5million)
<b>Social Support</b>		
Poor	36 (23.2)	
Moderate	50 (32.3)	11(2.5)
Strong	69 (44.5)	11(5-14)
<b>Witness Violence Between Parents</b>		
Yes	41 (26.5)	
No	114(73.5)	
<b>Beaten by Parents</b>		
No	89(57.4)	
Yes, once a week	25(16.1)	
Yes, More than twice a week	41(26.5)	

**S.D (Standard Deviation)**

**Clinical characteristics**

Majority were aware that they had HIV/AIDS (n= 97, 62.6%). About half were perinatally infected (50.3%) and had been on anti-retroviral treatment for at least 10 years (n=75, 48.4%). Almost half of them (n=76, 49%) had a high level of anti-retroviral medication adherence and 47 (30.3%) of them have experienced hospitalisation. Twenty (12.9%) had co-morbidities (Tuberculosis 5.8%, Dermatitis, 7.1%) and seven (4.4%) adolescents had a history of psychoactive substance use. The mean duration of treatment was 9(±4.2)years, mean CD4 count 875(±360) cells/mm<sup>3</sup> and mean viral load was 6,077(±16,788) copies/ml. The mean score for total quality of life was 86(±14.2) (see Table 2 for more details).

**Mental Health Characteristics**

Thirty-seven (23.9%) adolescents had a depressive disorder, while Twenty (12.9%) had some form of anxiety disorder. Five (3.2%) of the participants had a previous history of mental illness, and twelve (7.7%) adolescents had a family history of mental disorder (see Table 2).

**Health-Related Quality of Life Profile of the Participants**

The mean total quality of life was 86(±14.2), of all the subscales, emotional functioning had the least mean score of 83 (±16.7), while physical functioning had the highest mean score of 89(±17.4) (see Table 3).



**TABLE 2-- CLINICAL CHARACTERISTICS OF THE STUDY POPULATION**

VARIABLE	FREQUENCY-N(%) N=155	MEAN( $\pm$ S.D) MEDIAN(RANGE)
<b>Awareness of Diagnosis</b>		
Yes	97 (62.6)	-----
No	58 (37.4)	
<b>Route of Infection</b>		
Perinatal	78 (50.3)	
Behavioural	35 (22.6)	-----
Unexplained	42 (27.1)	
<b>Duration of Treatment(years)</b>		
<10 years	80 (51.6)	9(4.2)
$\geq$ 10 years	75 (48.4)	10(1-18)
<b>Number of Hospitalisations</b>		
None	108 (69.7)	1(1.1)
Once	27 (17.4)	0(0-6)
More than Once	20 (12.9)	
<b>CD4 Count(Cells/mm3)</b>		
Less than 500	22 (14.2)	875(360)
500-1500	133 (85.8)	866(167-1500)
<b>Viral Load (Copies/ml)</b>		
Less than 50	51 (32.9)	
50-1000	22 (14.2)	6,077(16,788)
>1000	45 (29.0)	42(0-133,200)
Undetectable	37 (23.9)	
<b>Presence of Co-morbidities</b>		
None	135 (87.1)	
Tuberculosis	9 (5.8)	-----
Dermatitis	11 (7.1)	
<b>Level of Medication Adherence</b>		
High (zero)	76 (49.0)	
Medium (1-2)	62 (40.0)	1(1.1)
Low (3-4)	17 (11.0)	1(0-4)
<b>Psychoactive Substance Use</b>		
None	148 (95.5)	
Alcohol	3 (1.9)	-----
Cannabis	3 (1.9)	
Tramadol	1(0.6)	
<b>Anxiety</b>	20 (12.9)	
Panic disorder	5 (3.2)	
Generalised anxiety disorder	9 (5.8)	
Social phobia	6 (3.9)	-----
Agoraphobia	0 (0.0)	
<b>Depression</b>	37 (23.9)	-----
<b>Previous History of Mental Illness</b>		
Yes	5 (3.2)	-----
No	150(96.8)	
<b>Family History of Mental Illness</b>		
Yes	12 (7.7)	-----
No	143 (92.3)	

S.D (Standard Deviation)



**TABLE 3 –HEALTH RELATED QUALITY OF LIFE PROFILE OF THE SAMPLE**

<b>VARIABLE</b>	<b>MEAN(±SD)</b>	<b>MEDIAN</b>	<b>RANGE(POSSIBLE RANGE)</b>
<b>Physical Functioning</b>	89(17.4)	95	10-100 (0 -100)
<b>Social Functioning</b>	87(20.4)	100	16.7-100 (0 -100)
<b>Emotional Functioning</b>	83(16.7)	87.5	25 -100 (0 -100)
<b>School Functioning</b>	86(19.8)	100.	8.3-100 (0-100)
<b>Psychosocial Health Summary</b>	85(14.2)	87.5	32.5-100 (0-100)
<b>Total Quality of Life</b>	86(14.2)	90	30-100 (0-100)

S.D (Standard Deviation

**Correlates of Depression and Anxiety**

With regards to anxiety, with increasing age, viral load and perceived stigma, the higher the odds of being anxious. Conversely, with increasing anti-retroviral medication adherence, and perceived level of social support, the lower the odds of having anxiety. Awareness of HIV/AIDS diagnosis was also positively associated with anxiety. Bullying and stigma were linked to higher risk of depression. On the other hand, the higher the perceived level of social support, the less the chances of having depression. However, no association was observed between depression and antiretroviral medication adherence (see Table 4).

**Association between Depression, Anxiety and Health-Related Quality of Life**

Total quality of life, school functioning and emotional functioning had an inverse relationship with depression. For every increase in score for total quality of life, social functioning, physical functioning and emotional functioning, the higher the chances of having some form of anxiety disorder (see Table 4).

**TABLE 4- SOCIO-DEMOGRAPHIC AND CLINICAL VARIABLES INDEPENDENTLY ASSOCIATED WITH ANXIETY AND DEPRESSION**

Variable	B	S.E	Wald	Df	Sig	Exp B	95% confidence interval
<b>DEPRESSION</b>							
Stigma	0.36	0.09	18.85	1	<0.001	1.43	1.22 - 1.69
Level of perceived social support	-0.88	0.42	4.32	1	0.04	2.41	1.15–5.54
Bullying	-1.08	0.39	9.99	1	<0.001	0.29	0.13 - 0.63
Total Quality of Life	-0.06	0.02	15.97	1	<0.001	0.94	0.92 - 0.97
School Functioning	-0.02	0.01	4.61	1	0.03	0.94	0.91 - 0.97
Emotional Functioning	-0.04	0.01	11.7	1	<0.001	0.96	0.94 - 0.98
<b>ANXIETY</b>							
Viral load	0.59	0.27	5.05	1	0.03	0.55	0.33–0.93
Stigma	0.36	0.12	9.20	1	<0.001	0.69	0.55–0.85
Anti-Retroviral Medication Adherence	-0.53	0.22	5.89	1	0.02	0.59	0.38 – 0.90
Level of perceived social support	-0.21	0.10	4.34	1	0.04	1.23	1.11–1.99
Awareness of diagnosis	-1.49	0.67	4.89	1	0.03	0.23	0.06–0.85
Emotional Functioning	-0.12	0.02	23.7	1	<0.001	1.13	1.07–1.18
Physical Functioning	-0.05	0.02	11.7	1	<0.001	1.05	1.02–1.08
Social Functioning	-0.03	0.01	9.39	1	<0.001	1.23	1.21–1.26
Total Quality of Life	-0.05	0.02	9.66	1	<0.001	1.05	1.02–1.08
Age	0.21	0.11	3.89	1	0.04	0.81	0.66–0.89

**Variables in equation for Depression:** bullying, stigma, anti-retroviral medication adherence, social support, total quality of life, school functioning, emotional functioning, physical functioning, total quality of life, age, orphanhood, CD4 count

**Variables in equation for Anxiety:** Anti-retroviral medication adherence, family monthly income, duration of treatment, social support, viral load, stigma, age, being beaten by caregivers, total quality of life, awareness of diagnosis, school functioning, physical functioning, social functioning, emotional functioning, parental marital status

## DISCUSSION

### **Magnitude of Depression and Anxiety**

The prevalence of depression and anxiety among the participants were 23.9% and 12.9% respectively, this is in tandem with other studies which have documented a high rate of depression and anxiety among adolescents living with HIV/AIDS [30, 31]. The magnitude of depression in this study (23.9%) is in keeping with the rate of 20% - 55% reported in other Nigerian studies [13, 11, 10] and 18% - 45% in other African studies [32, 33, 34, 35]. With regards to anxiety, the 12.9% rate found in the present study is lower than 26% - 41% found in South Africa, Kenya and Uganda [36,37,32], and 24% - 40% in HIV-infected adolescents in Europe and America [38,39,7]. This disparity in prevalence may be due to methodological differences between the former studies and this research. There was however a paucity of studies regarding anxiety among Nigerian HIV-positive adolescents.

### **Correlates of Depression and Anxiety**

Age had a positive association with anxiety among the sample. This finding contributes to the growing body of evidence which suggests that older age is associated with increased vulnerability to anxiety among HIV-infected adolescents [40, 41, 42]. Among adolescents living with HIV, with advancing age comes better understanding of their diagnosis, the implications of having a chronic disease such as HIV/AIDS, and a better appreciation of the impact of the disease and its treatment [31]. Furthermore, older adolescents have a better ability to detect stigma and discrimination, making them more susceptible to feelings of inferiority and low self-esteem, and other mental health problems [43, 44, 45]. Therefore, HIV-positive older adolescents would benefit from regular mental health evaluation at follow-up clinic appointments.

Poor perceived level of social support was linked to anxiety and depression. This outcome emphasizes the relevance of social support in the evolution of depression and anxiety among HIV-positive adolescents as documented in other literature [46, 10, 47]. For instance, a hospital-based study of 328 HIV-infected adolescents between the ages of 15 to 17 years, found a negative relationship between social support, depression and anxiety [48]. Adjustment to having a diagnosis of HIV/AIDS and anti-retroviral treatment may be facilitated by social support, which may be financial, physical or emotional [49]. Strong social support helps to improve the lives of persons living with HIV/AIDS, thereby, reducing the risk of depression and anxiety [50]. The creation of adolescent friendly-clinics, encouragement of peer and family support, would help to mitigate the risk of depression and anxiety among HIV-infected adolescents.

High level of perceived stigma resulted in an increased risk of anxiety and depression. Research has shown a positive relationship between stigma, depression and anxiety among HIV-infected adolescents [51, 52, 53]. Similarly, Bygrave et al [54], Lyambai et al [55] and Ashaba et al [56] in cross-sectional hospital-based studies of HIV-infected adolescents found that the experience of stigma was significantly associated with anxiety. Lawan et al [11] and Odimegwu et al [57] reported that stigma was associated with depression and anxiety among Nigerian HIV-positive adolescents.

Among children and adolescents, in educational settings, stigma may comprise of bullying and teasing by peers, exclusion from collective activities, and expulsion from school [58]. Within the community, stigma may come in form of shunning and rejection [59], while at the individual level, HIV-infected adolescents may experience internalized stigma due to their fear of stigma [45]. The cumulative effect of these different forms of stigma may result in psychological disturbances such as, mood and anxiety problems [45]. The implication of this finding is that there is a need for more advocacy and awareness campaigns by the government, health personnel, non-governmental organisations and private individuals about the need to stop stigma and discrimination against people living with HIV, and most especially adolescents.

Experience of bullying was found to be significantly linked with depression. This further strengthens the present body of evidence which suggests that the experience of being bullied is a predictor of emotional problems among children and adolescents [60]. Similar studies have also portrayed a positive relationship between bullying and depression among adolescents on anti-retroviral treatment [44, 61, 56].

The experience of being bullied is a stressful life event which could have a deleterious impact on the mental health of affected adolescents [62]. For adolescents living with HIV/AIDS, and on anti-retroviral treatment, bullying may be regarded as a form of a behavioural manifestation of stigma, and as with all forms of HIV-stigma, there is increased vulnerability to psychiatric morbidity [52]. Adolescent victims of bullying usually suffer from low self-esteem and insecurity which further predisposes them to depression and anxiety [62]. Therefore, bullying prevention programs may need to be instituted in schools and communities to reduce the occurrence of this phenomenon. Furthermore, HIV-positive adolescents who have experienced bullying may require frequent psychotherapy and counseling in order to ameliorate the impact of bullying on their mental health and well-being.

This study found that high viral load (above 1000 copies/ml and above) was significantly associated with anxiety among HIV positive adolescents, this is in keeping with previous notable works [32, 64]. Similar studies by Sale et al [10] and Andrinopoulous et al [52] found a significant association between high viral load and anxiety among HIV-positive adolescents.

Research has demonstrated that high viral load may be reflective of further immunosuppression, poor treatment outcome, more physical and psychological manifestations of the disease, and consequently significant impairment of mental health and well-being [10, 7, 65]. It is pertinent that efforts are made to ensure prompt treatment of opportunistic infections and other physical co-morbidities to prevent abnormal levels of viral load among HIV-infected adolescents.

Poor anti-retroviral medication adherence was significantly associated with anxiety among HIV-positive adolescents. This finding corroborates observations from other studies [65, 66, 67, 11]. Anxiety may be associated with impaired judgment, and a reduced comprehension of the importance of treatment adherence [68]. Additionally, low anti-retroviral medication adherence in adolescents living with HIV/AIDS usually results in further immunosuppression, worsening of physical functioning, with resultant anxiety [66]. Therefore, adherence monitoring and

counseling should be regular, to ensure improved treatment outcome and reduced risk of anxiety among HIV-infected adolescents.

**Association between Depression, Anxiety and Health-Related Quality of Life**

This study found an association between low quality of life and depression and anxiety among adolescents living with HIV/AIDS. The co-existence of physical illnesses (such as HIV/AIDS) and mental disorder (like depression and anxiety) in adolescents, is usually associated with adverse impact on quality of life [69, 70]. This finding is consistent with other studies that have shown that HIV-positive adolescents with co-morbid depression and anxiety have a poor quality of life [71, 7, 72, 73].

HIV-related physical and psychological symptoms, and treatment-related factors, may have a significant negative impact on mental health, and subsequently, the quality of life of HIV-positive adolescents [74]. This implies that efforts should be made by the primary physicians to ensure the prompt treatment of depression and anxiety, to ensure improved well-being and quality of life among adolescents living with HIV/AIDS.

**CONCLUSION**

Depression and anxiety are a common co-morbidities experienced by HIV-positive adolescents, early identification and management of these disorders among affected adolescents will reduce the burden of the disease, and improve their health-related quality of life.

**ACKNOWLEDGEMENT**

I would like to appreciate all the study participants and their caregivers for their cooperation.

**FUNDING**

None

**CONFLICT OF INTEREST**

The authors and planners have disclosed no potential conflict of interest, financial or otherwise

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