Original Research Article

Determinants of Non-Adherence to Antiretroviral Therapy Among HIV Positive Adolescents in a Tertiary Hospital in North Central Nigeria

ABSTRACT

Aim: The aim of this present study was to determine the prevalence of non-adherence to ART and identify the determinants of non-adherence among HIV-positive adolescents attending a tertiary hospital in north central Nigeria. Non-adherence to antiretroviral therapy (ART) is a major problem in the care of HIV positive adolescents on antiretroviral treatment because it is thought to impact negatively on their treatment. The prevalence of non-adherence to antiretroviral therapy among adolescent in sub-Saharan Africa is between 40 and 50%. Nigeria has a prevalence of 58%.

Study Design: Using a facility-based cross-sectional study,

Place and Duration of the Study: At sexually transmitted infections clinic, Federal Medical Centre Makurdi, Benue State, Nigeria from January 2023 to October 2024.

Methodology: A total of 417 consenting HIV-positive adolescents aged 10-19 years, who had been on ART for at least six months, were recruited using convenience sampling. Data collection included socio-demographic characteristics, the eight-item Morisky medication adherence scale (8-mmas), and an eight-item self-developed scale to assess barriers to adherence. Data analysis was conducted using the statistical package for social sciences (SPSS) software (version 23.0). Socio-demographic characteristics, prevalence of non-adherence, and determinants of non-adherence were reported as percentages. Chi-square, fisher test, and logistic regression were employed to identify determinants of non-adherence, with a significance level set at $p < 0.05$.

Results: The prevalence of non-adherence to ART among the study participants was 77.7%. Non-adherence was significantly associated with age, education level, occupation, ethnicity, and fear of stigmatization.

Conclusion: Enhanced adherence counseling, targeted interventions for at-risk adolescents, and a comprehensive approach that includes adherence assessment for those fearing stigmatization and with unsuppressed viral loads are recommended. These strategies may improve long-term therapeutic success and facilitate the transition from pediatric to adult care in this population.

Keywords: *Non-adherence, Antiretroviral therapy (ART), HIV-positive adolescents, Determinants, Stigmatization*

1.0 INTRODUCTION

1.1 **Background of Study**

Adolescence, defined as the period between 10 and 19 years [Lawan *et al*., 2015], is a transitional phase marked by significant experimentation and risk-taking behaviors, including those that increase vulnerability to diseases such as human immunodeficiency virus (HIV) [Lawan *et al*., 2015, Reif etal.,2020]. HIV infection is a major public health issue globally, but it poses an especially severe challenge in Africa [Akahara *et al.,* 2017, Leslie *et al*., 2021]. In 2018, approximately 37.9 million people worldwide were living with HIV, including 1.7 million children under the age of 15 [UNADS, 2019]. As of 2015, an estimated 1.8 million adolescents aged 10 to 19 years were living with HIV, with the majority being girls [Badru *et a*l., 2020]. Alarmingly, about 29 adolescents acquire HIV every hour, leading to a continuous rise in HIV-related mortality among this group [Badru *et al*., 2020]. AIDS is currently the leading cause of death among African adolescents and the second leading cause globally.

In Nigeria, the HIV prevalence rate is 1.4%, translating to about 1.9 million individuals aged 15-49 years living with HIV [**Badru** *et a***l.,** 2020, RNHAS, 2019]. Among adolescents, the prevalence is about 8%, the highest in West and Central Africa [Aderemi-William *et a*l., 2021]. Several factors contribute to the high HIV prevalence among adolescents, including ignorance about the infection, engagement in risky behaviors such as unprotected sex and substance abuse, poverty, and cultural practices [Okonkwo, 2011. Udomkhamsuk *et al*.,2014]. Although there is no cure for HIV, antiretroviral therapy (ART) is critical in managing the disease, improving immune function, and enhancing the quality of life for those infected. Adherence to ART is essential for achieving viral suppression and preventing treatment failure. Adherence to ART is crucial to achieving complete viral suppression and preventing treatment failure, especially among adolescents [Okonkwo, 2011]. Effective adherence is linked to sustained viral suppression, delayed onset of drug resistance, and overall improved health and quality of life [Namoomba *et al*.,2019, Oluwasina *et a*l.,2019]. Despite these benefits, non-adherence to ART remains a significant challenge, often leading to treatment failure and the emergence of drug-resistant HIV strains [Amour *et al*.,2022 Kambale *et al*., 2013]. Non-adherence to ART among adolescents is influenced by various factors, including lack of drug knowledge, fear of disclosure, depression, low social support, stigma, and socioeconomic challenges. Studies across different regions have

identified factors such as forgetfulness, side effects, and socio-economic constraints as determinants of non-adherence. In Nigeria, studies have highlighted additional factors such as perceived impact on physical appearance, the burden of daily medication, lack of parental support, and fear of disclosure [Lawan *et al* 2015, Aderemi- William *et al*., 2021, Oluwasina *et a*l., 2019]. Given the increasing shift in HIV global burden towards adolescents, and the high HIV prevalence in Benue State as well as the significant challenges of ART adherence among adolescents, leading to severe health risks, including viral progression, opportunistic infections, and transmission to sexual partners. There is an urgent need for targeted interventions to improve adherence and health outcomes among adolescents, particularly in regions with high HIV prevalence like Benue State, Nigeria.

The aim of the study therefore, is to identify the prevalence and determinants of non-adherence to antiretroviral therapy among HIV-positive adolescents attending the HIV clinic at Federal Medical Centre, Makurdi, to provide data that will improve treatment outcomes.

2. MATERIAL AND METHODS

Methods

2.1 Study Area

The study was conducted at the Federal Medical Centre Makurdi, Benue State, Nigeria. Located in north central Nigeria, Benue, is bordered by several Nigerian states and shares an international boundary with Cameroon. As of the 2016 census, Benue State had a population of 5,741,800, with Makurdi housing 405,500 people. The primary occupations include farming, civil service, and small and medium scale businesses.

2.2 Study Site

The study was carried out at the sexually transmitted infections clinic (STIC), Federal Medical Centre. This clinic serves over 10,000 HIV positive patients, including adolescents on antiretroviral therapy (ART). The clinic operates four days a week, with adolescents seen on Wednesdays and Fridays.

2. 3 Study Design

The study is a cross-sectional study.

2.4 Study Population

The population includes all HIV-positive adolescents aged 10-19 years attending the STIC at the Federal Medical Centre, Makurdi.

2.4.1 Inclusion Criteria

- HIV-positive adolescents aged 10-19 years attending the HIV clinic for at least six months.

- Adolescents or their caregivers/parents who consent to participate.

2.4.2 Exclusion Criteria

- HIV-positive adolescents with multiple chronic co-morbidities affecting treatment response.

2.4 Sample Size Determination

The sample size was determined using the Leslie Kish formula for calculating proportions in large population (Singh and Masuku, 2014, Shabi and Omolayo, 2018, Egunjobi *et al*., 2018)

$$Sample\ Size\ (n) = \frac{Z^2pq}{\delta^2}$$

n = the desired minimal sample size when the population is more than 10,000.

z = is the standard normal deviation corresponding to the level of significance and is constant at 95% confidence interval (1.96). therefore $Z^2 = 1.96^2 = 3.842$.

p = Prevalence of the outcome of interest, which is non-adherence to antiretroviral medication among adolescents in Nigeria and was found to be 58% = 0.58.(Singh and Masuku, 2014)

q = 1-p the power of the study is 1 – 0.58 = 0.42.

δ= the expected precision is 5% = (p value of 0.05), therefore $\delta^2 = 0.05^2 = 0.0025$.

$$n = \frac{3.84(0.58 \times 0.42)}{0.0025}$$

n = 374.16

The population N, was 38 (number of adolescent patients that attended clinic per week) × 4 weeks × 3 months (the duration the study lasted) = 456. Therefore, N = 456.

nf = the desired sample size when the population is less than 10,000. For this study, the population was 456.

nf $= \frac{n}{1} + \frac{(n-1)}{(N)}$ [21,112-114]

nf $= \frac{374}{1} + \frac{(374-1)}{(456)}$

nf =374.8 (approx. 375)

allowance for non-respondents was given by multiplying the sample size (nf) by 100/(1-NR) where NR was the non-response rate and is 10%.[21,112-114]

nf× 100/(1-NR)

375×100/90

375×1.11=416.6 (approx. 417)

Hence, for this study 417 participants will be recruited.

2.6 Sampling Techniques

Convenience sampling was employed, recruiting participants who were available and willing to participate. The duration for recruitment was approximately 11 weeks.

2.7 Study Instruments

A semi-structured questionnaire was used, containing:

- **Section A:** Socio-demographic data.

- **Section B:** The 8-item Morisky Medication Adherence Scale (MMAS-8) to assess medication adherence.
- **Section C:** Self-developed questions to assess adherence barriers.

2.8 Data Collection Method

Data collection was conducted in two phases:

- **Pre-test Phase:** The questionnaire was pre-tested on ten HIV-positive adolescents to ensure clarity and reliability.
- **Main Data Collection:** The questionnaire was administered to 417 participants over approximately 11 weeks. Consent was obtained from all participants or their guardians.

2.9 Data Management

2.9.1 Measurement of Variables

The dependent variable is non-adherence to ART. Independent variables are the factors determining non-adherence.

2.9.2 Statistical Analyses

Data was processed using SPSS version 23.0. Statistical analyses included measures of central tendencies and chi-square tests, with significance set at $p < 0.05$. Results were presented in tables.

3. RESULTS AND DISCUSSION

3.1 Table 1: Socio-demographic characteristics among HIV positive adolescent.

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The mean age of this study was 16.31 years. Most of the participants for this study were within the age range of 15 to 19 years. This finding is in conformity with other similar studies as illustrated. In a study that was carried out in Abuja by Ekopeno to find out the determinants of antiretroviral therapy adherence among HIV infected adolescents attending a tertiary hospital, most of the study participants were within the age range of 14 to 19 years.(Eholie *et a*l., 2007) In yet another study by Oluwasina to determine factors influencing adherence to antiretroviral drugs among HIV positive young women and adolescent patients in north central Nigeria, most of the adolescents were within the age range of 15 to 19 years.(Kambale, 2013) In a systematic review by Hudelson, to determine the factors associated with adherence to antiretroviral therapy among adolescents living in low- and middle- income countries, majority of studies reported a mean or median age between 10 and 19 years, with three studies specifically studying adolescents ages 10 to 19 years. (Hudelson *et a*l.,2015) In south Africa, Van Wyk in their study on the challenges to HIV treatment adherence amongst adolescent in low socioeconomic setting, documented 10-19 years. (VanWyk and Davids, 2019) In Cameroon, Wandji et al documented a mean age of 16.8 years in their study (Martial *et a*l.,2021) The

finding in this present study may be a reflection that HIV is common among this age group due to their risk-taking behaviors. (Dzer et al.,2021)

Over half of the participants (51.8%) were females. The findings from this present study corroborates those by Tor-Anyiin who documented more female (89.9%) participants in his study. (Tor-Anyiin,2015) Leslie in Ondo, south west Nigeria, also reported that majority (86%) of the participants were females. (Leslie et al.,2021) In another study, Carl Hudelson reported that 59% of participants were females. (Hudelson et al.,2015) In south Africa, Van Wyk and Davids, 2019 reported more (53%) females in their study. In Cameroon, Wandji et al in their study documented that 56.9% of females were participants. (Martial et al., 2021) The findings from this study may be explained that, generally, females lack support, especially among blacks. (Kagee,2017) Furthermore, in the African context, they lack the power to negotiate sex (Remien and Mellins 2007). Another reason is that, females themselves are less aware that consistent condom use prevents HIV infection (Kisito,2022). On the contrary, in another study conducted in Makurdi, Benue state, Dzer found out that males formed majority (67.5%) of the participants. (Dzer et al.,2021) HIV is tending towards the key population such as men who have sex with men (MSM) and people who inject drugs, which is becoming bothersome in our society, and may just be the explanation

A vast majority of the participants (95.4%) were single. The finding in this present study is similar to that reported by Aderemi-williams et al, in which, 91.2% of the participants were single. (Aderemi-William ,2021) In another study conducted by Lawan et al, in northwest Nigeria, 95.3% of the participants were single. (Lawan et al.,2015) On the contrary, Tor-Anyiin in his study, documented more married (37.3%) participants as compared to those that were single (34.8%).[17] This may be because, his study population were more of the elderly adolescents and young adults aged 15 to 24 years.

Over two-third (68.1%) of the participants had secondary education. Other studies have documented similar results. One of such studies is that conducted in Benue by Tor-Anyiin, who also reported that most (36.3%) of the participants in his study had secondary education. (Tor-Anyiin,2018) Similarly, in Abuja, north central Nigeria, Ekopeno and colleagues reported that 61.48% of the participants had completed secondary education (Ekopeno *et a*l., 2020). Leslie *et al*. 2021 in their study reported that most of the respondents, 44.9% had at least secondary education. In Lusaka. Zambia, Harrison et al

reported that participants who had at least secondary education were 52.6%. (Namoomba et al.,2017) This may be that patients who are educated are more informed of the benefits of seeking care.

Concerning occupation, above two-third (70.7%) of the participants were students. Similarly, a study conducted by Aderemi-Williams et al in southern Nigeria, documented that 82.4% of the study participants were students (Aderemi-William,2021) This may not be unusual especially that these studies were conducted in urban and semi-urban areas. However, a similar study conducted by Abu et al. 2020 in Ukum, a rural area in Benue state documented that most of the participants (67.5%) were farmers. Most (95.7%) of the participants were Christians. The finding in this study is corroborated by other studies. In a similar study carried out in Makurdi, by Dzer, it was documented that most of the participants (56%) were Christians.[22] Furthermore, another study in Abuja, north central Nigeria, by Ekopeno *et a*l. 2020 documented 75.56%. In southern Nigeria, a study documented 79.4% of the study participants as Christians. (Aderemi-William,2021) In yet another study conducted in the same region, Leslie et al. et al 2021also reported 91.6%.[3] While in south east Okpara et al.2022 also reported 87.5%. In Zambia, Harrison et al. 2015 reported that all the participants (100%) were Christians.[12] The explanation could be that the places where these studies were carried out have Christianity as a major religion.

Majority (68.6%) of the participants were Tiv. This finding is similar to those of studies conducted by Tor-Anyiin, Dzer and Abu in Benue state (Dzer et al.,2021, Abu et al.,2010, Tor-Anyiin,2018). The explanation is simply because Tiv people form the major ethic group in Benue state. The mean duration on antiretroviral therapy (ART) was 9.95±4.61 years with over half (52.0%) of the participants on ART for equal or greater than ten years. In a similar study, Tor-Anyiin reported the duration on ART as (SD = 3.92); the duration on ART among the study population showed that those less than 2 years were 244 (37.2%), those between 2.01 and 4.00 years were 163 (24.8%), those between the ages 4 to 6 years were 229 (34.9%) while those who have been on ART between 6.01 and 8.00 years were 15 (2.3%).(Tor-Anyiin,2018) However, in a prospective study carried out in southwest Ethiopia by Amberbir et al, to determine the predictors of adherence to antiretroviral therapy among HIV-infected persons, in which 400 participants were recruited and followed up for three months, it was documented that, the study subjects, at inclusion, were on HAART for a median duration of 8 months (3 to 67 month). And that most 384 (96%) of them had monthly regular follow up visit for their drug refill. (Amberbir et al.,2008) The differences could be attributed to the different study designs.

3.2 Figure 1: Bar chart showing prevalence of non-adherence to antiretroviral therapy among HIV positive adolescent.

The prevalence of non-adherence to antiretroviral therapy (ART) among HIV-positive adolescents in this study was 77.7%, aligning with the global prevalence of 64%. Usman *et al*. 2019 documented a 58% non-adherence rate in Kano, Nigeria, while Wandji et al **[**Martial *et al.,* 2021**]**. reported a 41% non-adherence rate among older adolescents in Cameroon. Namoomba *et al*. 2019 found a lower non-adherence rate of 43.9% in Zambia, likely due to strong family support. In California, Sayles et al.2009 reported a 42.5% non-adherence rate, potentially influenced by socioeconomic factors. A significant proportion of participants (62.1%) identified side effects as a determinant for non-adherence. Murray et al. 2009.

3.3 Table 2: The Determinants of non- adherence to antiretroviral therapy among HIV positive adolescents on antiretroviral therapy in Federal Medical Center

In Zambia, Mills *et al*.2006 in a systematic review, and Eholie *et al*. 2007 in Côte d'Ivoire all found that side effects were a major barrier to adherence. Religious beliefs also played a role, with 73.6% of participants citing it as a factor, similar to findings by Zou *et al*. 2009. In Tanzania, traveling away from home affected adherence for 50.6% of participants. Mills *et al*. 2006 and other studies have shown that travel can lead to missed doses. Transportation problems were less significant, with only 13% of participants in a multi-country study by Hardon *et a*l. 2006 reporting it as a barrier. Stigmatization was a major issue, with 58.8% of participants affected. This is supported by studies in Zambia, a systematic review by Mills *et al*.2006 and other African studies. Depression also impacted adherence, with 65.0% of participants affected, consistent with Mills *et al*. 2006 systematic review, although lower rates were found in studies in Botswana, Tanzania, and Uganda. A substantial proportion of participants (72.2%) believed that ART was toxic, affecting adherence. Similar beliefs were reported in Zambia and a systematic review by Mills *et al*. 2006 Doubts about ART efficacy were reported by 74.3% of participants, supported by findings in a systematic review.

3.4 Table 4: Bivariate analysis of determinants of non-adherence and non-adherence to antiretroviral therapy among HIV positive adolescents on antiretroviral therapy.

Bivariate analysis identified several significant factors associated with non-adherence, including age, education, occupation, fear of stigmatization, depression, belief in ART toxicity, and doubts about ART efficacy.

3.5 Table 5: Multivariate logistic regression of independent variables predicting non-adherence to antiretroviral therapy among HIV positive adolescents on antiretroviral therapy.

Multivariate logistic regression confirmed age, education, occupation, ethnicity, and stigmatization as independent predictors of non-adherence.

Adolescents aged 15-19 years were 2.16 times more likely to be non-adherent, consistent with other studies. Education level also influenced adherence, with those having secondary and post-secondary education more likely to be non-adherent. Occupation was a significant factor, with farmers being less likely to be non-adherent. Ethnicity and fear of stigmatization were also significant determinants.

These findings highlight the multifaceted nature of ART adherence among adolescents and underscore the need for targeted interventions addressing side effects, religious beliefs, travel, stigmatization, depression, and misconceptions about ART.

4. CONCLUSION

This study provides a unique insight into the prevalence and determinants of non-adherence to antiretroviral therapy among adolescents on antiretroviral therapy in Federal Medical Centre, Makurdi. The study revealed the high prevalence of non-adherence, and also found that, age, educational level, occupation, ethnicity and stigmatization were independently associated with non-adherence.

RECOMMENDATIONS

1.There should be provision of strategies for enhanced adherence counselling for older adolescents.

2.There should be prioritization of interventions for adolescents that specifically targets those that default antiretroviral therapy.

3. Importantly, a combination method that involves identifying those who fear stigmatization, are non-adherent to antiretroviral therapy, and have unsuppressed viral load, for adherence assessment would be more productive in resource-limited settings. Such approach might contribute to long-term therapeutic success and smooth transition from pediatrics, through adolescent to adult care in this specific population.

Table 1: Socio-demographic characteristics of participants.

Table 2: The Determinants of non- adherence to antiretroviral therapy among HIV positive adolescents on antiretroviral therapy in Federal Medical Center

Table 3: Bi-variate analysis of socio-demographic characteristics and non-adherence to antiretroviral therapy among HIV positive adolescents on antiretroviral therapy in Federal Medical Centre, Makurdi

Table 4: Bivariate analysis of determinants of non-adherence and non-adherence to antiretroviral therapy among HIV positive adolescents on antiretroviral therapy in Federal Medical Centre Makurdi

Table 5: Multivariate logistic regression of independent variables predicting non-adherence to antiretroviral therapy among HIV positive adolescents on antiretroviral therapy in Federal Medical Centre Makurdi

Figure 1: Bar chart showing prevalence of non-adherence to antiretroviral therapy among HIV positive adolescent in Federal Medical Centre, Makurdi

Consent

All authors declare that a 'written informed consent was obtained from all the patient;

Ethical approval.

The ethical approval was sought and obtained from the Research and Ethics committee board of Federal Medical Center Makurdi, Benue State with reference number: FMH/HREC/108/VOL.1 Informed consent was obtained, and confidentiality was maintained throughout the study. Data collected was used solely for research purposes.

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Table 1: Socio-demographic characteristics of HIV positive adolescents on antiretroviral therapy in Federal Medical Centre, Makurdi (n=417)

Variables	Frequency	Percentage
Age (in years)		
10-14	102	24.5
15-19	315	75.5
Mean=16.31±2.61		
Sex		
Male	201	48.2
Female	216	51.8
Marital Status		
Single	398	95.4
Married	15	3.6
Separated	4	1.0
Educational level		
Informal education	18	4.3
Primary education	44	10.6
Secondary education	284	68.1
Post-secondary education	71	17.0
Occupation		
Civil Servant	6	1.4
Trader	44	10.6
Farmer	28	6.7
Artisan	33	7.9
Student	295	70.7
Others	11	2.6
Religion		
Christianity	399	95.7
Islam	18	4.3
Ethnicity		
Tiv	286	68.6
Idoma	66	15.8
Igede	44	10.6
Others**	21	5.0

Duration on ART		
<10 years	200	48.0
≥10 Years	217	52.0
Mean=9.95±4.61		

**= Yoruba, Igb

Table 2: Determinants of non-adherence to antiretroviral therapy among HIV positive adolescents on antiretroviral therapy in Federal Medical Centre, Makurdi (n=417)

Variables	Frequency	Percentage
Want to avoid side effect		
No	158	37.9
Yes	259	62.1
Religion beliefs		
No	110	26.4
Yes	307	73.6
Travelled away from home		
No	206	49.4
Yes	211	50.6
Transportation problem		
No	213	51.1
Yes	204	48.9
Fear of stigmatization or discrimination		
No	172	41.2
Yes	245	58.8
Felt depressed or overwhelmed		
No	146	35.0
Yes	271	65.0
Felt that anti-HIV medication was toxic or harmful		
No	116	27.8
Yes	301	72.2
Think medication wouldn't really work		
No	107	25.7

Yes	310	74.3

Table 3: Bi-variate analysis of socio-demographic characteristics and non-adherence to antiretroviral therapy among HIV positive adolescents on antiretroviral therapy in Federal Medical Centre, Makurdi

Variables	Adherence		Test statistics	df	P-value
			χ^2		
	Non-adherence	Adherence			
	n=324	n=93			
	n(%)	n(%)			
Age (in years)			χ^2=9.48	1	0.002*
10-14	68(66.7)	34(33.3)			
15-19	256(81.3)	59(18.7)			
Sex			χ^2=0.00	1	0.968
Male	156(77.6)	45(22.4)			
Female	168(77.8)	48(22.2)			
Marital Status			Fisher's exact=0.29		1.000
Single	309(77.6)	89(22.4)			
Married	12(80.0)	3(20.0)			
Separated	3(75.0)	1(25.0)			
Educational level			Fisher's exact=11.48		0.008*
Informal education	9(50.0)	9(50.0)			
Primary education	30(68.2)	14(31.8)			
Secondary education	225(79.2)	59(20.8)			
Post-secondary education	60(84.5)	11(15.5)			
Occupation			Fisher's exact=14.62		0.009*
Civil Servant	5(83.3)	1(16.7)			
Trader	39(88.6)	5(11.4)			
Farmer	14(50.0)	14(50.0)			
Artisan	24(72.7)	9(27.3)			
Student	233(79.0)	62(21.0)			
Others	9(81.8)	2(18.2)			
Religion			χ^2=0.32	1	0.568
Christianity	311(77.9)	88(22.1)			
Islam	13(72.2)	5(27.8)			
Ethnicity			Fisher's exact=16.38		0.001*
Tiv	236(82.5)	50(17.5)			

Idoma	47(71.2)	19(28.8)			
Igede	31(70.5)	13(29.5)			
Others	10(47.6)	11(52.4)			
Duration on ART			χ^2=1.17	1	0.278
<10 years	160(80.0)	40(20.0)			
≥10 Years	164(75.6)	53(24.4)			

*=Statistically significant

Table 4: Bivariate analysis of determinants of non-adherence and non-adherence to antiretroviral therapy among HIV positive adolescents on antiretroviral therapy in Federal Medical Centre Makurdi

Variables	Adherence		Test statistics χ^2	df	P-value
	Non-adherence n=324 n(%)	Adherence n=93 n(%)			
Want to avoid side effect			χ^2=0.61	1	0.432
No	126(79.7)	32(20.3)			
Yes	198(76.4)	61(23.6)			
Religion beliefs			χ^2=1.46	1	0.226
No	90(81.8)	20(18.2)			
Yes	234(76.2)	73(23.8)			
Travelled away from home			χ^2=0.51	1	0.472
No	157(76.2)	49(23.8)			
Yes	167(79.1)	44(20.9)			
Transportation problem			χ^2=3.99	1	0.046*
No	157(73.7)	56(26.3)			
Yes	167(81.9)	37(18.1)			
Fear of stigmatization or discrimination			χ^2=24.32	1	0.000*
No	113(65.7)	59(34.3)			
Yes	211(86.1)	34(13.9)			
Felt depressed or overwhelmed			χ^2=9.41	1	0.002*
No	101(69.2)	45(30.8)			
Yes	223(82.3)	48(17.7)			

Felt that anti-HIV medication was toxic or harmful			χ^2=15.77	1	0.000*
No	75(64.7)	41(35.3)			
Yes	249(82.7)	52(17.3)			
Think medication wouldn't really work			χ^2=10.68	1	0.001*
No	71(66.4)	36(33.6)			
Yes	253(81.6)	57(18.4)			

*=Statistically significant

Table 5: Multivariate logistic regression of independent variables predicting non-adherence to antiretroviral therapy among HIV positive adolescents on antiretroviral therapy in Federal Medical Centre Makurdi

Variables	**Adjusted odds ratio (aOR)**	**95% confidential interval (CI)**		**p-value**
		Lower	**Upper**	
Age (in years)				
10-14	Reference			
15-19	2.16	1.160	4.045	0.015*
Educational level				
Informal education	Reference			
Primary education	3.03	0.770	11.920	0.113
Secondary education	3.56	1.105	11.513	0.033*
Post-secondary education	5.20	1.396	19.415	0.014*
Occupation				
Civil Servant	0.35	0.016	7.814	0.511
Trader	0.50	0.054	4.686	0.547
Farmer	0.09	0.012	0.817	0.032*
Artisan	0.29	0.033	2.598	0.271
Student	0.24	0.032	1.794	0.164
Others	Reference			
Ethnicity				
Tiv	4.20	1.463	12.086	0.008*
Idoma	2.56	0.800	8.246	0.133
Igede	2.11	0.6010	7.419	0.244
Others	Reference			
Transportation problem				
No	Reference			
Yes	1.035	0.591	1.810	0.905
Fear of stigmatization or discrimination				
No	Reference			
Yes	2.00	1.094	3.669	0.024*
Felt depressed or overwhelmed				
No	Reference			

Yes	1.37	0.725	2.602	0.330
Felt that anti-HIV medication was toxic or harmful				
No	Reference			
Yes	1.65	0.846	3.251	0.141
Think medication wouldn't really work				
No	Reference			
Yes	1.33	0.649	2.732	0.435

Note: *=Statistically significant, Omnibus test: Chi-square= 68.50, df=17, p=0.000; Hosmer-Lemeshow goodness of fit test: χ^2 =11.67, df = 8, p =0.166, Nagelkerke R^2=0.232

Figure 1: Showed the prevalence of non-adherence to antiretroviral therapy (77.7%).