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Medication adherence and social support in people living with HIV/AIDS (PLWH) in Kogi State, Nigeria

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Human immunodeficiency syndrome ranks among the global worrisome health indices. This study was aimed at determining the effect of social support on medication adherence among people living with HIV/AIDS attending the general out-patient clinic of Kogi State Specialist Hospital (KSSH), Kogi State. A 20-item perceived social support-family scale (PSS-Fa) was used to assess patient's levels of perceived social support. The number of pills missed were counted and used to calculate their adherence percentage after 4 weeks of medication use. A Morisky medication adherence scale (MMAS-4) was used to strengthen measurement of adherence by pill counting. An association was sought between the mean scores and they were tested for statistical significance. A total of 153 patients were analysed. The largest number of participants was aged between 28 and 37 years. There was a statistically significant association between respondents perceived support and medication adherence ($p<0.001$). A statistically significant association was recorded between respondents' social class and perceived social support ($p<0.05$). However, there was no statistically significant association between other socio-demographic characteristics (age, gender, level of education, religion, place of domicile and ethnic groups) and perceived social support of respondents ($p<0.05$). There was no statistically significant difference association between family dynamics (marital status, type of marriage, family size and family income) and medication adherence of respondents ($p<0.05$). There was also no statistically significant association between respondents, family dynamics and perceived social support ($p<0.05$). A statistically significant association was found between respondents perceived social support and medication adherence. Social class was the predictor of perceived social support among respondents.

Key words: HIV/AIDS, social support, CD4 count, antiretroviral, body mass index.

INTRODUCTION

Human immunodeficiency syndrome (HIV) is an overwhelming global challenge which ranks fifth as a cause of permanent life disability (Wilkins, 2016). Its complications could alter the life of affected individual for the rest of his/her life (Ortblad et al., 2017). Acquired immunodeficiency syndrome (AIDS) was first recognized in 1981, HIV was not identified as the aetiologic agent until 1983 (Wilkins, 2016).

It remains the second leading cause of disease burden world-wide and the leading cause of death in Africa

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(Wilkins, 2016; Ortblad et al., 2017). Sub-Saharan Africa (SSA) has the most serious HIV and AIDS epidemic in the world. In 2012, about 25 million people in SSA were living with HIV, accounting for nearly 70% of the global burden (AVERT, 2014). Risk factors for HIV includes present or past high-risk behavior (e.g., multiple sexual partners), loss of a spouse or partner from HIV disease, having sexually transmitted infections, especially Herpes simplex virus type 2, being an uncircumcised man and being in an HIV-discordant sexual relationship or marriage (AVERT, 2014). The populations at risk are drug users, commercial sex workers, homosexuals, long distance drivers, migrants and refugees. In 2012, there were an estimated 1.6 million new HIV infections and 1.2 million AIDS-related deaths (AVERT, 2014). In the same year, Swaziland had the highest HIV prevalence rate than any country in the world (26.5%) (AVERT, 2014). South Africa has the largest HIV epidemic of any country with 6.1 million people living with HIV- a prevalence of 17.9%. West Africa has only been moderately affected by HIV and AIDS. For example, in Senegal, HIV prevalence is as low as 0.5% (AVERT, 2014). Nigeria reported her first HIV/AIDS case in 1986 and estimates put Nigeria's HIV/AIDS prevalence at 3.6% in 2007 and 2.8% in 2010 (Ejiji et al., 2016). HIV prevalence in East Africa is second behind Southern Africa. However, general prevalence has declined in the past two decades. In absolute numbers, about 3 million people live with HIV/AIDS in Nigeria and have the highest prevalence rate in West African sub-region and the third highest prevalence of any country in the world after India and South Africa (Monjok et al., 2017). Thus, Nigeria has the second highest number of PLWH in Africa after South Africa (Wilkins, 2016; AVERT, 2014). Male to female ratio of people living with HIV in Nigeria was put at 1.2 and 1.7, respectively while number of new infections was put at 323,000 adults and 57,000 children (UN, 2014). Kogi State HIV infection prevalence rate was put at 5.8%.9 HIV infection sero-prevalence in some Nigerian states includes Zamfara (0.4%), Ekiti (1.4%), Yobe (2.1%), Plateau (7.7%), Anambra (8.7%), Akwa-Ibom (10.9%), Benue (12.7%), and Rivers (15.2%) (AVERT, 2014). Although a total of 74 treatment sites in Nigeria was in the ART program as at the end of 2006, only about 5% of PLWHA had access to treatment (Monjok et al., 2017). The rollout of antiretroviral therapy (ART) significantly reduced HIV-related morbidity and mortality, but good clinical outcomes depend on access and adherence to treatment. Botswana and Rwanda are two sub-Saharan African countries that have achieved universal access target which accounted for treatment coverage of 80% or more of patients in need at the end of 2009 (AVERT, 2014; Ndiaye et al., 2014). Maintaining optimal adherence to antiretroviral drugs is therefore essential for HIV infection management. Adherence to a medication regimen is defined as the extent to which patients take medications as prescribed by their health care providers.

It involves a partnership between the patient and the health care team. A high level of adherence (>95%) is required for antiretroviral therapy to be effective (Afolabi et al., 2015). Poor adherence to antiretroviral treatment regimens has serious consequences for HIV-infected patients, including failure to prevent viral replication and an increased risk of developing viral resistance. Physician-patient relationships and communication quality have been shown to be related to medication adherence in HIV care (Monjok et al., 2017). There are various methods of measuring adherence to ART, this includes the direct and indirect methods (Monjok et al., 2017; Bello, 2016). Factors influencing adherence to ART in Nigeria include structural, socio-cultural, and economic problems. Other factors identified include stigmatization, low levels of education and awareness, adverse side effect of medication and distance to heath care facility (Monjok et al., 2017; Bello, 2016; Ushie and Jegede, 2018). Treatment adherence can be measured by use of a variety of methods, including patients' self-reports, pharmacy-based approaches, pill counts, and electronic monitoring (Monjok et al., 2017; Scheurer et al., 2016). However, these measures of adherence have different strengths and weaknesses with regard to practical application and identifying deficient adherence. Several methods of improving adherence have been proffered (Monjok et al., 2017; Scheurer et al., 2016).

Social support is a concept recognising that people exist to varying degrees in networks through which they can receive and give aid and in which they engage in interactions (Danielle et al., 2018; Cortes, 2015). Most social support includes both tangible components, such as financial and physical aid, and intangible components, such as encouragement and guidance (Danielle et al., 2018; Cummings, 2015). Different types of social support including structural, instrumental, and emotional can be obtained from family, friends, co-workers, spiritual leaders, healthcare personnel or members of one's community or neighbourhood (Monjok et al., 2017; Cortes, 2015). HIV/AIDS is a highly stigmatizing disease with PLWHA experiencing rejection even by their families; however with availability of treatment, HIV/AIDS is now a chronic manageable illness (Monjok et al., 2017).

Nigeria is a low-resource country with 65% of her population living below poverty level and HIV affects 3.4% of this population (WHO, 2016). Studies have shown that morbidity and mortality due to HIV infection and its complications is still a major concern among Nigerians (AVERT, 2014; Chu and Selwyn, 2017). This has been attributed to factors promoting non-adherence to ART. Low levels of social support have been shown to negatively influence medication adherence in HIV/AIDS patients (Monjok et al., 2017). Non-adherence in the management of retroviral disease is a pervasive clinical challenge which often is a consequence of one or more behavioral, structural and psychosocial barriers (Scheurer et al., 2016). The rationale behind this study, partly, is the need to justify the resources invested into the ART

program with a view to achieving the objectives set for it. The most important factor to realizing this is to ensure complete adherence to antiretroviral therapy (Scheurer et al., 2016). The HIV/AIDS burden within our community had progressively led to the poor quality of life of PLWHA (Monjok et al., 2017; UN, 2014; Scheurer et al., 2016). The increasing incidence and prevalence of PLWHA (UN, 2014; Scheurer et al., 2016), had also constituted a burden of care on healthcare providers including doctors, nurses, pharmacists, HIV counsellors and allied staff (UNPF, 2014; Khamarko and Myers, 2015; WHO, 2016). This study is therefore aimed at determining the medication adherence and social support in HIV/AIDS diseases patients in Kogi State Specialist Hospital, Lokoja, Kogi State.

MATERIALS AND METHODS

Study design

It was a descriptive, cross-sectional, and hospital-based study, designed to explore the research questions: What is the level of medication adherence among adult HIV/AIDS patients in Kogi State Specialist Hospital, Nigeria? What is the level of perceived social support among adult HIV/AIDS patients in Kogi State Specialist Hospital, Nigeria?

Ethical consideration

Participation in the study was voluntary, and a written informed consent was obtained from the participants. Ethical approval was also obtained from the hospital ethical review and research committee. The information collected from each respondent was treated confidentially; no names or addresses appeared on the questionnaires, only numbers were used as identifiers. Standard information that was beneficial to respondents such as ART adherence percentage and level of perceived social support was disclosed to them. They were informed about their right to withdraw voluntarily from the study at any point if they so wish.

Sample

The sample consisted of English, Hausa, Kakanda, Kupa, Nupe, Oworo, Igala, Yoruba (Okun), Ebira, Bassa, and Igbo speaking (n=153). A total of 153 patients with a diagnosis of HIV/AIDS aged 18 and above, and all receiving medications at least for the last 3 months prior to the study. The patients agreed to participate and complete questionnaires. The setting of the study was at Kogi State Specialist Hospital, Kogi State, Nigeria. Participants were interviewed by trained residential doctors who recruited the patients after a semi-structured questionnaire.

Procedure and instrument translation

Patients were recruited after consenting as they attend their routine clinic. The questionnaire was pretested on twenty patients at another centre (Federal Medical Centre, Lokoja) within two weeks, and the time taken to complete the questionnaire was established.

There were no findings that opposed the validity of the questionnaire. Inclusion criteria include adult HIV patients aged 18 years and above; all patients on medications for at least three months before the commencement of the study. All retroviral patients were informed about the study on every clinic day in order to create awareness from four weeks to the commencement day of the study. They were also told to come along with all their medications at every visit. The researcher was introduced to respondents, details on the study benefits were explained to them, and voluntary participation was emphasized. Respondents were also reassured of strict confidentiality. The reason(s) for the screening was explained to them for proper clarity and consenting respondents were requested to provide correct responses to all questions asked which were verified by the researcher and his trained resident doctor assistants. The quality control of all completed questionnaires was done by the researcher; this was to ensure appropriate filling and completion of the questionnaire. The socio-demographic characteristics, family dynamics, perceived social support and adherence to the medication of respondents were determined using the completed questionnaire.

Instruments

The following instruments were completed by the participants' questionnaire enquired information regarding patient socio-demographics and clinical characteristics. Patients were asked about details of their prescribed medication regimen; the number of prescribed antiretroviral drugs; frequency per day, duration of intake in months, and time of intake of the drug(s) (morning, afternoon, and evening). Information was also extracted from patients' case notes on these and their remaining pills were counted to determine the adherence percentage. Perceived social support is the degree to which one perceives how his or her needs for support are fulfilled by family. The respondents provided a "yes", "no", or "don't know" response, with each "yes" answer scoring +1. Any other response was scored zero. Summated scores were used to arrive at a perceived social support score. The possible range of scores is from 0 to 20. Higher scores indicate a higher level of perceived social support (Scores equal to or greater than 11 points suggest strong social support, scores below 10 points suggest weak social support). The Perceived Social Support-Family Scale has been found to have good reliability and validity (Afolabi et al., 2017). The original Perceived Social Support Scale has an alpha coefficient of 0.90 indicating that the scale has excellent internal consistency. The alpha coefficient for the PSS-Fa ranged from 0.88 to 0.91 (Afolabi et al., 2017). The scale particularly saves cost and time expenditure. The original version (MMAS-4) has a scoring scheme of "Yes" =1 and "No"=0. The items are summed to give a range of scores from low adherence to high adherence. The possible range of scores is 0 to 4 (Score of 0 suggests high adherence, scores of 1 to 2 suggest medium adherence while scores of 3 to 4 suggest low adherence). More recently, an eight-item scale was developed but did not show any added advantage over the four-item scale (Morisky et al., 2018).

Measurement of adherence by pill counting - Adherence percentage was determined using the

Formula11: No. of pills prescribed – No. of pills missed* / No. of pills prescribed × 100

where *Number of pills prescribed/missed was calculated for four weeks of medication use. A score of 95% and above represents good adherence and less than 95% was rated as poor adherence.

Data analysis

Package for Social Sciences (SPSS) for windows software version 16.0. Frequency tables, graphs and charts were generated for relevant variables. Pearson's Chi-Square was used to test for association between categorical variables. Chi square was used to determine statistical significance of observed differences in cross-

tabulated variables. Logistic regression of the variables was also done where applicable. The student t-test was used to compare the mean values of continuous variables. P-value of equal or less than 0.05 was taken to be statistically significant.

RESULTS AND DISCUSSION

Socio-demographic characteristics of respondents

From Table 1, the largest number of respondents (42.5%) was between 28 and 37 years. Forty-one males (26.8%) and 112 females (73.2%) participated in the study. The largest number of respondents (37.9%) had secondary education while 51 (33.3%) of them were in social class l. Majority (72.6%) of respondents lived within Lokoja town where the hospital is located. Thirty-nine (25.5%) respondents were Igala speaking and 103 (67.3%) were Christians.

Family dynamics of respondents

In Table 2, family dynamics of respondents showed that 103 (67.3%) of the respondents were married and were still with their husband, 24 (15.7%) respondents were single and 9 (5.9%) of the respondents each were either widows or separated from their spouse. Ninety-five (74.2%) of the respondents were in monogamous marriage, while 33 (25.8%) were polygamous. Majority, 112 (73.2%) of respondents had 2 to 6 members in the family and the 8 single respondents (5.2%) were counted as one-member family. A significant number, 46 (30.0%) of the respondents have a family income less than #5,000 per month.

Medication adherence of respondents

Medication adherence by pill counting

Figure 1 shows respondents' medication adherence by pill counting. Majority, 122 (79.7%), of the respondents were adherent to their medications.

Morisky medication adherence scale (mmas-4)

Table 3 shows respondents' Morisky medication adherence scale (MMAS-4). Majority of respondents, 122 (79.7%) had good adherence to medications. The remaining thirty-one (20.3%) respondents were non-adherent.

Perceived social support-family scale (Pss-Fa)

Table 4 shows the perceived social support of respondents. The largest number of respondents, 95(62.1%) had strong social support while 58 (37.9%) of them had weak social support.

Relationship between perceived social support and medication adherence

Table 5 shows the relationship between perceived social support and medication adherence of respondents. Majority of the respondents (ninety-five) who had strong social support also had good medication adherence (80.0%). There was no significant association between respondent's perceived social support and medication adherence (0.917).

Logistic regression of perceived social support on medication adherence of respondents

Table 6 shows a statistically significant association between respondents perceived social support and medication adherence (p=0.001).

Relationship between socio-demographic characteristics and medication adherence of respondents

Table 7 shows that the age, gender, level of education, social class, religion, place of domicile and ethnic groups of respondents were not significantly associated with their medication adherence (p>0.05).

Relationship between socio-demographic characteristics and perceived social support of respondents

Table 8 shows that the age, gender, educational level, ethnic group, religion, and place of domicile of respondents were not significantly associated with their perceived social support (p>0.05). However, Table 9 (logistic regression) shows that the social class of respondents was significantly associated with perceived social support (p=0.005).

Relationship between family dynamics and medication adherence of respondents

Table 10 shows the relationship between family dynamics and medication adherence of respondents. The marital status, type of marriage, family size, and family income of respondents were not significantly associated with the level of medication adherence (p>0.05).

Relationship between family dynamics and perceived social support of respondents

Table 11 shows the relationship between family dynamics

Table 1. Socio-demographic characteristics of respondents.

Characteristics	Number	Percentage
Age group (years)		
18-27	29	19.0
28-37	65	42.5
38-47	37	24.2
48-57	16	10.4
58-67	6	3.9
	153	**100**
Gender		
Male	41	26.8
Female	112	73.2
	153	**100**
Education		
Tertiary	51	33.3
Secondary	58	37.9
Primary	36	23.5
No education	8	5.3
	153	**100**
Social class*		
Class I	51	33.3
Class II	50	32.7
Class III	9	5.9
Class IV	34	22.2
Class V	9	5.9
	153	**100**
Place of domicile		
Urban	111	72.6
Rural	42	27.4
	153	**100**
Ethnic group		
Igala	39	25.5
Yoruba	24	15.7
Ebira	21	13.8
Bassange	19	12.4
Hausa	12	7.8
Igbo	10	6.5
Others	28	18.3
	153	**100**
Religion		
Christianity	103	67.3
Islam	50	32.7
Others	0	0
	153	**100**

Source: Authors

Table 2. Family dynamics of respondents.

Characteristics	Number	Percentage
Marital status		
Single	24	15.7
Married	103	67.3
Unmarried cohabitation	1	0.65
Separated	9	5.9
Divorced	6	3.9
Widowed	9	5.9
Widower	1	0.65
	153	**100**
Type of marriage*		
Monogamy	95	74.2
Polygamy	33	25.8
	128	**100**
Family size		
One member	8	5.2
2 - 6 members	112	73.2
≥ 7 members	33	21.6
	153	**100**
Total family income/month		
< 5,000	46	30.0
5,000 - 10,000	28	18.3
10,000 - 20,000	33	21.6
20,000 - 40,000	32	20.9
>40,000	14	9.2
No response	0	0
	153	**100**

*N=128, singles and the unmarried cohabitation were excluded.
Source: Authors

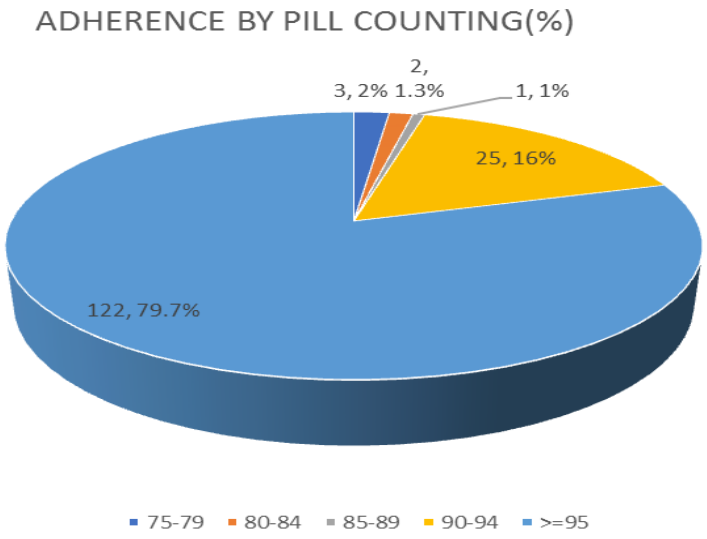

Figure 1. Respondents' medication adherence by pill counting.
Source: Authors

Table 3. Respondents' Morisky medication adherence scale (MMAS-4).

Total score (MMAS-4)	Adherence	Number	Percentage
0	High (GOOD)	122	79.7
1-2	Medium	0	0
3-4	Low (POOR)	31	20.3

Source: Authors

Table 4. Perceived social support-family scale (PSS-Fa) rating of respondents.

PSS-Fa score	Number	Percentage
Weak social support (0-10)	58	37.9
Strong social support (>11)	95	62.1
Total	153	100

Source: Authors

Table 3. Relationship between perceived social support (PSS) and medication adherence.

PSS	Number	Percentage	Medication adherence (%)		P-value
			Good	Poor	
Strong	95	100.0	76 (80.0)	19 (20.0)	0.917
Weak	58	100.0	46 (79.3)	12 (20.7)	

Source: Authors

Table 4. Logistic regression of perceived social support on medication adherence.

Variable	p-value	Odd ratio	Upper confidence limit	Lower confidence limit
PSS-Fa*	0.001	0.932	0.910	0.955

*PSS-Fa: Perceived social support-family scale.
Source: Authors

and the perceived social support of respondents. The marital status, type of marriage, family, size and family income of respondents were not significantly associated with the level of perceived social support ($p>0.05$).

Socio-demographic characteristics of respondents

The stress and socioeconomic implications of treating HIV/AIDS is enormous on the family. Most of the complications these patients have arisen as a result of poor adherence to antiretroviral therapy. In order to improve on this, this study assessed the level of medication adherence among HIV/AIDS patients and their level of perceived social support. The study also determined the relationship between clinical parameters and adherence to antiretroviral therapy and the relationship between the level of medication adherence and perceived social support among the HIV/AIDS patients.

Age distribution

The mean age of the patients in this study was 36.23±13.85 years. The mean age in this study was ranked lower than the mean age of 40.80±9.90 years obtained in the study on adherence by Afolabi et al. (2015) carried out among adult HIV/AIDS patients attending antiretroviral clinic of Ladoke Akintola University Teaching Hospital, Osogbo, Nigeria. This could have been as a result of the high distribution of middle-aged retroviral patients attending the ART clinic at their study site. The mean age in this study is, however, similar to the age of 36.63±8.56 years reported in the study on adherence by Onyeonoro et al. (2018) carried out among PLWHA attending antiretroviral clinic of Nnamdi Azikwe University Teaching Hospital, Nnewi, Nigeria. Their result was probably due to the location of the study in a tertiary institution comprising of young students. It was noted from the age distribution of the

Table 5. Relationship between socio-demographic characteristics and medication adherence.

Characteristics	Number	Percentage	Medication adherence (%)		X^2	P value
			Good	Poor		
Age group (years)						
18-27	29	100.0	24 (82.8)	5 (17.2)	9.112	0.058
28-37	65	100.0	46 (70.8)	19 (29.2)		
38-47	37	100.0	35 (94.6)	2 (5.4)		
48-57	16	100.0	13 (81.3)	3 (18.8)		
58-67	6	100.0	4 (66.7)	2 (33.3)		
Gender						
Male	41	100.0	33 (80.5)	8 (19.5)	0.019	0.889
Female	112	100.0	89 (79.5)	23 (20.5)		
Level of education						
Tertiary	51	100.0	43 (84.3)	8 (15.7)	2.224	0.527
Secondary	58	100.0	46 (79.3)	12 (20.7)		
Primary	36	100.0	28 (77.8)	8 (22.2)		
No education	8	100.0	5 (62.5)	3 (37.5)		
Social class						
Class I	51	100.0	39 (76.5)	12 (23.5)	2.667	0.453
Class II	50	100.0	38 (76.0)	12 (24.0)		
Class III	9	100.0	8 (88.9)	1 (11.1)		
Class IV	34	100.0	28 (82.4)	6 (17.6)		
Class V	9	100.0	9 (100.0)	0 (0.0)		
Religion						
Christianity	103	100.0	81 (78.6)	22 (21.4)	0.235	0.628
Islam	50	100.0	41 (82.0)	9 (18.0)		
Place of domicile						
Urban	111	100.0	91 (82.0)	20 (18.0)	1.260	0.262
Rural	42	100.0	31 (73.8)	11 (26.2)		
Ethnic group						
Igala	39	100.0	36 (92.3)	3 (7.7)	6.603	0.359
Yoruba	24	100.0	19 (79.9)	5 (20.8)		
Ebira	21	100.0	16 (76.2)	5 (23.8)		
Bassange	19	100.0	15 (78.9)	4 (21.1)		
Hausa	12	100.0	9 (75.5)	3 (25.0)		
Igbo	10	100.0	8 (80.0)	2 (20.0)		
Others	28	100.0	19 (67.9)	9 (32.1)		

Source: Authors

present study that 42.5 and 24.2% of the respondents are between 28 and 47 years, respectively and they constituted the predominant age groups.

From the aforementioned, the majority of the patients were in their youthful age group irrespective of their locality. The study location had about four tertiary institutions; hence the finding may be attributed to the high student population within the study area. The present study finding was also similar to the studies by Pennap et al. (2015) in Keffi, Nigeria and Uzochukwu et al. (2019) in Enugu, Nigeria.

Pennap et al. (2015) conducted their study in a STD clinic attended mostly by young people prone to STI due to their explorative lifestyle practice while Uzochukwu et al. (2019) conducted their study on predominantly young businessmen and women. Olowookere et al. (2016) on

Table 6. Relationship between socio-demographic characteristics and perceived social support of respondents.

Variable	Number	Percentage	PSS-Fa* (%)		X^2	P value
			Weak	Strong		
Age groups (years)						
≤ 27	29	100.0	12 (41.4)	17 (58.6)	5.367	0.252
28 - 37	65	100.0	31 (47.7)	34 (52.3)		
38 - 47	37	100.0	12 (32.4)	25 (67.6)		
48 - 57	16	100.0	4 (25.00	12 (75.0)		
≥ 58	6	100.0	1 (16.7)	5 (83.3)		
Gender						
Male	41	100.0	12 (29.3)	29 (70.7)	2.325	0.127
Female	112	100.0	48 (42.9)	64 (57.1)		
Educational level						
Tertiary	51	100.0	17 (33.3)	34 (66.7)	2.963	0.397
Secondary	58	100.0	27 (46.6)	31 (53.4)		
Primary	36	100.0	12 (33.3)	24 (66.7)		
No education	8	100.0	4 (50.0)	4 (50.0)		
Social class						
Class 1	51	100.0	28 (54.9)	23 (45.1)	9.965	**0.041**
Class 2	50	100.0	18 (36.0)	32 (64.0)		
Class 3	9	100.0	3 (33.3)	6 (66.7)		
Class 4	34	100.0	10 (29.4)	24 (70.6)		
Class 5	9	100.0	1 (11.1)	8 (88.9)		
Place of domicile						
Urban	111	100.0	44 (39.6)	67 (60.4)	0.030	0.862
Rural	42	100.0	16 (38.1)	26 (61.9)		
Religion						
Christianity	103	100.0	38 (36.9)	65 (63.1)	0.713	0.398
Islam	50	100.0	22 (44.0)	28 (56.0)		
Ethnic group						
Igala	39	100.0	10 (25.6)	29 (74.4)	8.617	0.196
Yoruba	24	100.0	8 (33.3)	16 (66.7)		
Ebira	21	100.0	8 (38.1)	13 (61.9)		
Bassange	19	100.0	12 (63.2)	7 (36.8)		
Hausa	12	100.0	5 (41.7)	7 (58.3)		
Igbo	10	100.0	5 (50.0)	5 (50.0)		
Others	28	100.0	12 (42.9)	16 (57.1)		

*PSS-Fa: Perceived social support-family scale.
Source: Authors

age group within the study area.

Sex distribution

In many populations, there is a higher prevalence of HIV/AIDS in females than in males (Potcho et al., 2017; Peltzer and Pengpid, 2017). This was corroborated by a female predominance in this study (male: female= 1:2.7). The effect of biological differences between both genders and gross impoverishment may have contributed to the higher female prevalence. The rate of prostitution in the

Table 7. Predictor of perceived social support among respondents.

Variable	p-value	Odd ratio	Confidence interval	
			Lower	Upper
Social class	0.005	1.490	1.131	1.962

Source: Authors

Table 8. Relationship between family dynamics and medication adherence of respondents.

Family dynamics	Number	Percentage	Medication Adherence (%)		X2	P-value
			Good	Poor		
Marital status						
Single	24	100.0	17 (70.8)	7 (29.2)	2.583	0.764
Married	103	100.0	85 (82.5)	18 (17.5)		
Unmarried cohabitation	1	100.0	0 (0.0)	1 (100.0)		
Separated	9	100.0	7 (77.8)	2 (22.2)		
Divorced	6	100.0	5 (83.3)	1 (16.7)		
Widowed	9	100.0	5 (55.6)	4 (44.4)		
Widower	1	100.0	1 (100.0)	0 (0.0)		
Type of marriage*						
Monogamy	95	100.0	77 (81.1)	18 (18.9)	0.009	0.923
Polygamy	33	100.0	27 (81.8)	6 (18.2)		
Family size						
One member	8	100.0	7 (87.5)	1 (12.5)	0.649	0.723
2-6 members	112	100.0	90 (80.40	22 (19.6)		
≥7 members	33	100.0	25 (75.8)	8 (24.2)		
Family income						
<5,000	46	100.0	36 (78.3)	10 (21.7)	1.614	0.806
5000-10,000	28	100.0	22 (78.6)	6 (21.4)		
10,000-20,000	33	100.0	25 (75.8)	8 (24.2)		
20,000-40,000	32	100.0	28 (87.5)	4 (12.5)		
>40,000	14	100.0	11 (78.6)	3 (21.4)		
No response	0	0.0	0 (0.0)	0 (0.0)		

*N=128, singles and the unmarried cohabitation were excluded.
Source: Authors

study area even among undergraduate students is alarming; lack of economic security may have accounted for this trend especially with less contraceptive use including barrier contraception.

Other studies found violence against women, barriers of access to services and poor education as reasons attributable to female predominance (Uzochukwu et al., 2019; Potcho et al., 2017). These showed the level of gender inequality existent within the study area. However, Peltzer and Pengpid (2017) reported a study where a male preponderance was attributed to their economic advantage over women.

Level of education

Most of the participants (71.2%) had either secondary education (37.9%) or tertiary education (33.3%). This finding may be attributed to the high number of secondary and tertiary institutions densely distributed around the study area and is similar to the study of Afolabi et al. (2017) and Pennap et al. (2015) revealed 70% of their participants had at least elementary education.

However, Anyebe et al. (2019) found secondary education as the highest educational qualification due to

Table 9. Relationship between family dynamics and perceived social support.

Variable	Number	Percentage	PSS-Fa* (%)		X2	P value
			Weak	Strong		
Marital status						
Single	24	100.0	11 (45.8)	13 (54.2)	3.456	0.630
Married	103	100.0	39 (37.9)	64 (62.1)		
Unmarried cohabitation	1	100.0	1 (100)	0 (0.0)		
Separated	9	100.0	2 (22.2)	7 (77.8)		
Divorced	6	100.0	3 (50.0)	3 (50.0)		
Widowed	9	100.0	4 (44.4)	5 (55.6)		
Widower	1	100.0	0 (0.0)	1 (100)		
Type of marriage*						
Monogamy	95	100.0	34 (35.8)	61 (64.2)	0.460	0.498
Polygamy	33	100.0	14 (42.4)	19 (57.6)		
Family size						
1	8	100.0	4 (50.0)	4 (50.0)	0.503	0.778
2 – 6	112	100.0	44 (39.3)	68 (60.7)		
≥ 7	33	100.0	12 (36.4)	21 (63.6)		
Family income						
< 5000	46	100.0	26 (56.5)	20 (43.5)	9.196	0.056
5000 - 10000	28	100.0	11 (39.3)	17 (60.7)		
10001 - 20000	33	100.0	10 (30.3)	23 (69.7)		
20001 - 40000	32	100.0	9 (28.1)	23 (71.9)		
> 40000	14	100.0	4 (28.6)	10 (71.4)		

N=128, singles and the unmarried cohabitation were excluded. *PSS-Fa: Perceived social support-family scale
Source: Authors

their high engagement in farming activities. They reported predominantly female participants with no formal education. Uzochukwu et al. (2019) reported participants that were mostly business men and women, only a few of them had formal education; a similar finding was also reported by Shittu et al. (2016), Adebayo et al. (2017) reported an increasing HIV prevalence with higher educational attainment. Therefore, a high level of educational status may not necessarily suggest a low HIV prevalence as shown in the present study.

Social class

The largest number of the respondents was in social class 1 (33.3%). This may be due to the urban location of the tertiary health institution, Kogi State Specialist Hospital, Lokoja where the study was carried out. This was similar to the studies of Afolabi et al. (2015) and Oku et al. (2016), where most of their participants completed secondary school, lived and worked in urban centers with many skilled workers amongst them.

The current study was at variance with predominant elderly rural dwellers with low level of education reported by Olowookere et al. (2016) and predominant young farmers found by Anyebe et al. (2019). This finding may be due to lack of formal education of respondents in the two studies when compared with this study. HIV infection can thus be found predominantly among the high social class population as demonstrated in the present study.

Religion

Most of the respondents were Christians (67.3%), Kogi State comprised of a mixed faith population from diverse ethnic groups living within and outside Lokoja, the Kogi state capital. Most of those who were students and in higher socioeconomic class were Christians. The prevailing ethno-cultural and socio-demographic factors in the study location may have determined the predominant religion in the present study. Afolabi et al. (2017) found a mixed population of Christian and Muslim respondents in a study conducted at a tertiary institution in South-Western Nigeria. This finding may probably be because the study site was a public institution located in the state capital.

Anyebe et al. (2019) and Tessema et al. (2017) both

reported predominantly Christian participants in their studies. These findings were attributed to the predominantly Christian communities where the studies were conducted. Shittu et al. (2016) found Islam as being the predominant religion in contrast to the present study. Islam was the most popular religion in their study area; this may have influenced their finding. Therefore, prevalence of HIV may not necessarily have any religious inclination.

Place of domicile

The majority of respondents (72.6%) lived within Lokoja metropolis. The proximity to point of care may have influenced this large number of respondents accessing care at our healthcare facility. Pennap et al. (2015) revealed how distance to treatment sites in urban centres was a barrier to many enrolled patients. Many rural dwellers enrolled in urban centres in order to avoid stigmatization/discrimination. This is a cause of missed appointments. It may also be because of lack of healthcare facilities in their areas. The distance of place of residence of patients to health facilities for treatment access has been shown to promote antiretroviral adherence, particularly with close proximity (Afolabi et al., 2015; Olowookere et al., 2016; Onyeonoro et al., 2018).

Marital status

Almost two-third of respondents was married (67.3%), and most married respondents were in monogamous relationships. Many of the female respondents were married with or without children; similar results were reported in some local studies (Afolabi et al., 2015; Anyebe et al., 2019; Adebayo et al., 2017). Extramarital relationship was a norm among many married ethno-cultural groups in the study area. Moreover, many men were found to have infected their wives without disclosure of their status to avoid being stigmatized. Studies (Xu et al., 2017; Takada et al., 2015) have also corroborated this finding. However, a study reported a higher HIV incidence among formerly married women (divorced, separated or widowed); it was more than double that of those who were currently married or cohabiting with a sexual partner; and more than three times those that were never married (Takada et al., 2015). This was attributed to lack of economic independence, formal education and low knowledge about HIV transmission and prevention which could result to inability to negotiate safe sex.

Socio-cultural factors may have also contributed to the high incidence of HIV infection among married women. As an ancient traditional practice in some settings, married women have been used as objects of sexual entertainment for male visitors (Anyebe et al., 2019). In contrast to the current study; Shittu et al. (2016) found most of their participants were separated or divorced. Socioeconomic factor was proffered as the reason for this finding. The finding by Shittu et al. (2016) was similar to that of Adebayo et al. (2017). Complex socioeconomic and cultural factors including prostitution may have engendered many women in the study area to having HIV infection.

Family income

Almost a quarter of respondents (30%) earn less than N5,000 per month in the present study. This was in consonance with some local studies (Folasire et al., 2015; Salami et al., 2015). In spite of a larger number of respondents in higher social class and educational level, the overall family income level of respondents in the study area was low. This finding reflected the dwindling economy in the study area as well as the sliding economic indices such as the gross domestic product (Araoye, 2014).

Many of the respondents in the civil service reported gross irregularities in payment of salaries with concomitant effect on other members of the society such as the elderly and student population. Shittu et al. (2016) reported that most of their participants earn less than twenty thousand naira monthly. This was attributed to the low socio-economic status of most of the participants. This finding was similar to the current study and some local studies (Folasire et al., 2015; Anyebe et al., 2019). The overall effect of low-income level on the health of retroviral patients includes the inability to meet their basic daily needs including health needs, laboratory investigations, transportation and other necessities.

Level of medication adherence

The current study showed that 79.7% of the respondents were adherent to HAART. The advent of HAART had brought about improvement in quality of life of patients especially when ARV adherence was greater than 95% (Silva and Tavares, 2015; Rivera-Rivera et al., 2017).

The HAART adherence rate found in this study can be improved upon when other facilitators of adherence are put in place. A higher level of adherence was found in this study because of easy access to healthcare services including ARV drugs, peer supporters and follow-up of treatment defaulters using phone reminder and text messages.

Non-governmental organizations have also contributed to maintenance of a high adherence level through assistance with beneficial items such as insecticide-treated bed nets, grains and buckets. They also provided transport fares to those who have financial difficulty with transportation to healthcare facility.

Olowookere et al. (2016) in a study on ART adherence among PLWHA in Ibadan, Nigeria reported an adherence of 62.9% while Afolabi et al. (2017) in another study among PLWHA in Ife-Ijesa zone of Osun State, Nigeria reported 44%. Reports from Northern Nigeria and South-Eastern Nigeria quoted adherence rates of 54.5 and 49.2%, respectively (Omonaiye et al., 2017). These are lower adherence rates compared to the present study. Reasons attributed for this trend include increasing rate of determinants of non-adherence such as side effects of ART, forgetfulness, living far away from the treatment site, HIV status non-disclosure, pill burden and tiredness.

However, the adherence rate in this study corroborated the adherence rates of Salami et al. (2015) 140 in Ilorin, North-Central Nigeria (70.8%),(Shittu et al., 2013), South-South Nigeria (73.4%), and Uzochukwu et al. (2019) in South-East Nigeria (75%). These adherence rates from different location may be due to diverse reasons such as true differences, or the fact that different standards in the measurement of this parameter were applied. For instance, different studies used different recall period to determine adherence and some set the adherence level of 90% or more as optimum as against 95% and above in this study. Afolabi et al. (2017) at Osogbo, South-West Nigeria, found a high level of adherence (95.5%). The adherence level was attributed to free supplies of medications and laboratory investigations, the nature and quality of support received from the care institution, and the psychosocial counselling services offered at the study site.

A high level of adherence (96.2%) reported by Chineke et al. (2015) at Orlu, South-East Nigeria, was attributed to the high level of formal education of the participants in their study. Lower adherence rates were found in many African countries such as Kenya with an adherence rate of 43.2% (Sia et al., 2015). Potcho et al. (2017) found an adherence rate of 62.62% in a study in Togo, West Africa. However, Tessema et al. (2017) found an adherence rate of 82.8% among PLWHA in North-West Ethiopia. These studies attributed different reasons for their respective findings; these include the facilitators of ART adherence earlier discussed.

Most studies (Afolabi et al., 2015; Olowookere et al., 2016; Pennap et al., 2015) also used self-report as the method for measurement of adherence rates. This is partly because of its convenience and relative ease of administration but it has also been associated with recall bias. However, the index study utilized the pill counting method as well as the Morisky Medication Adherence Scale (MMAS-4). Interestingly, similar value for adherence rate was recorded using both methods which demonstrated a reproducibility of the validated scale.

Level of perceived social support

A large percentage of the respondents 95 (62.1%) in the current study had a strong social support. This finding reflected the influence of the family and friends, and more importantly, the role of healthcare providers in strengthening the adherence to ART of the PLWHA in the study area.

A greater degree of practical support was most consistently associated with greater adherence to medication (Danielle et al., 2018; Cummings, 2015). Interventions that use existing contacts (friends or family) to engage patients in the practical aspects of medication administration may be an effective approach to provide better medication adherence. Strong social support was found in many studies (Afolabi et al., 2017; Khamarko and Myers, 2015; Olowookere et al., 2016). They attributed the role of the caregivers as major stakeholders in patient management as the reason for strong social support in their studies. They also emphasized the importance of the family in providing support for patient's care.

Folasire et al. (2015) in a study found poorest perception from respondents' family. Lack of employment was the most important factor identified as being responsible for this negative disposition. However, the current study ART adherence rate can be improved upon by scaling up the social support network among the respondents for maximal benefits.

Conclusions

This research reported that the majority of respondents studied, 122 (79.7%), had good adherence to HAART. Also, it was revealed that a large chunk of respondents, 95 (62.1%) had a strong social support, while 58 (37.9%) had a weak social support. In addition, a good number of respondents (95) who had strong social support also had good medication adherence, 76 (80.0%). There was a statistically significant association between perceived social support and medication adherence of respondents ($p=0.001$). There was no statistically significant association between respondents' socio-demographic characteristics (age, gender, level of education, social class, religion, place of domicile and ethnic groups) and medication adherence ($p>0.05$). The social class of respondents was significantly associated with perceived social support ($p=0.005$). Social class was the predictor of perceived social support among respondents. However, there was no statistically significant association found between other socio-demographic characteristics (age, gender, level of education, religion, place of domicile and ethnic groups) and perceived social support of respondents ($p>0.05$). There was no statistically significant association between respondents' family dynamics (marital status, type of marriage, family size and family income) and level of medication adherence ($p>0.05$). The following recommendations are made according to this study and they are as follows: Family

Physicians need to be involved in the interview, education, and counseling of retroviral patients with a view of identifying their source of perceived social support, family Physicians should engage government and non-governmental organizations (NGOs) in order to advocate and improve on the provision of transport fare for patients domiciled at remote distances to their treatment centres, use of treatment supporters should be introduced and intensified where one already exists, family physicians are encouraged to utilize pill counting as a method of measuring adherence to antiretroviral therapy due to its relative ease of administration and effectiveness, more training and re-training of HIV counsellors on enhanced adherence counselling and other aspects of HIV counselling is advocated.

Also, further research is also needed in the following areas of this study: Multi-center studies on the effect of perceived social support on adherence to antiretroviral therapy is required to determine their relationship. The relationship between respondents' social class and perceived social support should be explored further in a new study to see how it could be harnessed to improve social support and antiretroviral adherence. Family Physicians should conduct studies to determine factors influencing adherence to antiretroviral therapy in their health facilities with a view to improving adherence among their retroviral patients.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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REFERENCES

Adebayo SB, Olukolade RI, Idogho O, Anyanti J, Ankomah A (2017). Marital status and HIV prevalence in Nigeria: Implications for effective prevention programmes for women. Advances in Infectious Diseases 2(3):210-218.

Afolabi BA, Afolabi MO, Afolabi AA, Odewale MA, Olowookere SA (2015). Roles of family dynamics on adherence to highly active antiretroviral therapy among people living with HIV/AIDS at a tertiary hospital in Osogbo, South-west Nigeria. African Health Science 13(4):920-926.

Afolabi MO, Ijadunola KT, Fatusi AO, Olasode OA (2017). Determinants of adherence to antiretroviral drugs among people living with HIV/AIDS in the Ife-Ijesa of Osun State, Nigeria. African Journal of Primary Health Care and Family Medicine 1(1):1-6.

Anyebe EE, Hellandendu JM, Gyong JE (2019). Socio-demographic profile of people living with HIV/AIDS in Idoma land, Benue, North-Central Nigeria: Implications for HIV/AIDS control. International Journal of Sociology and Anthropology 5(5):153-162.

Araoye MO (2014). Sample Size Determination. In: Research Methodology with Statistics for Health and Social Sciences. Ilorin: Nathadex Publishers 115(9):25-120.

AVERT (2014). Africa Human Immunodeficiency Virus and Acquired Immune-deficiency Syndrome Statistics. Averting HIV and AIDS. Available from:www.avert.org/Africa-hiv-aids-statistics.htm(Accessed on 29/10/14).

Bello SI (2016). HIV/AIDS patients' adherence to antiretroviral therapy in Sobi Specialist Hospital, Ilorin, Nigeria. Global Journal of Medical Research 11(2):16-25.

Chineke HN, Adogu PO, Uwakwe KA, Enuzie MU (2015). Assessment of level of adherence to antiretroviral therapy among HIV/AIDS patients at Imo State University Teaching Hospital, Orlu, Nigeria. The Nigerian Journal of General Practice 13(1):21.

Chu C, Selwyn PA (2017). Complications of HIV infection: A system-based approach. American Family Physician 83(4):395-406.

Cortes A (2015). Development of the scale of perceived social support in HIV. AIDS Behaviour 18(12):2274-2284.

Cummings B (2015). The role of Social support among people living with HIV in rural Mozambique. AIDS Patient Care STDS 28(11):602-612.

Danielle S, Niteesh C, Kellie AS, Olga M, Will S (2018). Association between different types of social support and medication adherence. The American Journal of Managed Care 18(12):e461-7.

Ejiji SI, Daniyam CA, Iroezindu M (2016). A decade of Anti-Retroviral Therapy in Nigeria: Efficacy of First Line Regimens in Treatment-Naïve HIV/AIDS Patients. The Nigerian Health Journal 11(3):75-78.

Folasire OF, Akinyemi O, Owoaje E (2015). Perceived social support among HIV positive and HIV negative people in Ibadan, Nigeria. World Journal of AIDS 4:15-26.

Khamarko K, Myers JJ (2015). The influence of social support on the lives of HIV-infected individuals in low- and middle- income countries, WHO/HIV 51:1-40.

Monjok E, Smesny A, Okokon IB, Mgbere O, Essien EJ (2017). Adherence to ART in Nigeria: an overview of research studies and implications for policy and practice HIV/AIDS(Auckl) 2:69-76.

Morisky DE, Ang A, Krousel-Wood M, Ward HJ (2018). Predictive validity of A Medication Adherence Measure in an Outpatient Setting. American Journal of Hypertension (Greenwich) 10(5):348-354.

Ndiaye M, Nyasulu P, Nguyen H, Lowenthal ED, Gross R, Mills EJ (2014). Risk factors for suboptimal antiretroviral therapy adherence in HIV-infected adolescents in Gaborone, Botswana: a pilot cross-sectional study. Patient Preference and Adherence pp. 891-895.

Oku AO, Owoaje ET, Ige OK, Oyo-ita A (2016). Prevalence and determinants of adherence to HAART amongst people living with HIV in a tertiary health facility in South-South Nigeria. BMC Infectious Diseases 13:401.

Olowookere SA, Fatiregun AA, Ladipo MA, Abioye-Kuteyi EA, Adewole IF (2016). Effects of adherence to antiretroviral therapy on body mass index, immunological and virological status of Nigerians living with HIV/AIDS. Alexandria Journal of Medicine 52(1):51-54.

Omonaiye O, Agu KA, Oqua D, Sani T, Isah MA, Olayemi S (2017). Medication adherence and cluster of differentiation 4 (CD4) cells response in patients receiving antiretroviral therapy. Academic Journals 5(5):163-169.

Onyeonoro UU, Ebenebe UE, Ibeh CC, Nwamoh UN, Ukegbu AU, Emelumadu OF (2018). Adherence to antiretroviral therapy among people living with HIV/AIDS in a tertiary health facility in South-Eastern Nigeria. Journal of HIV Human Reproduction (Serial online) 1:58-63.

Ortblad KF, Lozano R, Murray CL (2017). The burden of HIV: Insights from the global burden of disease study 2010. AIDS 27(13):2003-2017.

Peltzer K, Pengpid S (2017). Socioeconomic factors in adherence to HIV therapy in low- and middle-income countries. Journal of Health Population Nutrition 31(2):150-170.

Pennap GR, Abdullahi U, Bako IA (2015). Adherence to highly active antiretroviral therapy and its challenges in people living with HIV infection in Keffi, Nigeria. Journal of AIDS and HIV Research 5(2):52-58.

Potcho Y, Tchamdja K, Bologou A, Pitche VP, Guissou IP, Kassang EK

(2017). Knowledge and adherence to antiretroviral therapy among adult people living with HIV/AIDS treated in the healthcare centres of the association “Espoir vie Togo” in Togo, West Africa. BMC Clinical Pharmacology 10:11.
Rivera-Rivera JN, Madera SLR, Varas-Diaz N, Pacheco RY (2017). The Role of Social Support on Health-Related Practices of HIV-Discordant Heterosexual Couples. Revista Puertorriquena de Psicologia 24(2):1-18.
Salami AK, Fadeyi A, Ogunmodede JA, Desalu O (2015). Factors influencing adherence to antiretroviral medication in Ilorin, Nigeria. Journal of the International Association of Physicians in AIDS Care 9(3):191-195.
Scheurer D, Choudhry N, Swanton KA. Matlin O, Shrank W (2016). Association between different types of social support and medication adherence. American Journal of Managed Care 18(12):461-467.
Shittu RO, Issa BA, Olanrewaju GT, Odeigah LO, Sule AG, Musa AS (2013). Adherence to HAART in depressed people living with HIV/AIDS in Nigeria, West Africa Journal of Antiretroviral 6(1):006-012.
Sia D, Onadja Y, Nandi A, Foro A, Brewer T (2015). What lies behind gender inequalities in HIV/AIDS in sub-Saharan African countries: evidence from Kenya, Lesotho and Tanzania. Health Policy Plan 29(7):938-949.
Silva LS, Tavares JC (2015). The family’s role as a support network for people living with HIV/AIDS: a review of Brazilian research into the theme. Ciência & Saúde Coletiva 20:1109-1118.
Takada S, Weiser SD, Kumbakumba E, Muzoora C, Martin JN, Hunt PW (2015). The dynamic relationship between social support and HIV-related stigma in rural Uganda. Annals of Behavioral Medicine 48(1):26-37.
Tessema B, Biadglegne F, Mulu A, Getachew A, Emmrich F, Sack U (2017). Magnitude and determinants of non-adherence and non-readiness to highly active antiretroviral therapy among people living with HIV/AIDS in Northwest Ethiopia: a cross-sectional study. AIDS Research and Therapy 7(1):1-8.
United Nations Population Fund (UNPF)(2014). Nigeria Human Immunodeficiency Virus and Acquired Immune-deficiency Syndrome. http://www.unfpa.org/nigeria.htm (Accessed on 17/11/14)
Ushie BA, Jegede AS (2018). The Paradox of family support: concerns of tuberculosis-infected HIV patients about involving family and friends in their treatment. AIDS Patient Care STDS 26(11):674-680.
Uzochukwu BSC, Onwujekwe OE, Onoka AC, Okoli C, Uguru NP, Chukwuogo OI (2019). Determinants of non-adherence to subsidized antiretroviral treatment in Southeast Nigeria. Health Policy and Plan 24(3):189-196.
Wilkins EGL (2016). Human Immunodeficiency Virus Infection and Acquired Immune-deficiency Syndrome. In: Colledge NR, Walker BR, Ralston SH (eds.) Davidson’s Principles and Practice of Medicine. 21st ed. Edinburgh: Churchill Livingstone Elsevier pp. 384-408.
World Health Organization (2016). Health worker shortages and the response to AIDS. Published online at: www.who.int/,,/TTR2_eng.pdf(Accessed on 23/01/15).
World Health Organization. HIV /AIDS .www.int features/qa/71/en/ updated November 2016 (Accessed 15/12/2016).
Xu J, Ming Z, Zhang Y, Wang P, Jing J, Cheng F (2017). Family Support, discrimination, and quality of life among ART-treated HIV-infected patients: a two year study in China. Infectious Diseases of Poverty 6:152.