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ADHERENCE TO ANTIRETROVIRAL THERAPY AMONG HUMAN IMMUNODEFICIENCY VIRUS INFECTED PATIENTS AT THE UNIVERSITY OF ILORIN TEACHING HOSPITAL, ILORIN. NIGERIA.

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KEY WORDS: Adherence, , Human Immunodeficiency Virus, People Living with HIV/AIDS, Highly Active Antiretroviral therapy University of Ilorin Teaching Hospital.

SUMMARY

Background: When people living with HIV/AIDS (PLHAs) are able to meet its challenging adherence requirements, highly active antiretroviral therapy (HAART) can be a nearly miraculous drug regimen that drastically reduces viral replication and damage to the immune system, restores daily functioning and well being.

Objectives: The study sought to determine the rate and sociodemographic factors affecting adherence to antiretroviral therapy. Also to find associations between adherence and some clinical parameters among HIV infected patients attending lentiviral clinic at the University of Ilorin Teaching Hospital, Ilorin, Nigeria.

Methods: The study was a descriptive cross-sectional survey of a randomly selected 250 HIV infected adult patients who were on antiretroviral therapy for a minimum of three months under the Federal Government of Nigeria's free drugs programme. Self-reported adherence and other data were collected using an interviewer-administered questionnaire.

Results: Adherence rate to antiretroviral therapy among HIV-infected patients was 90%. Knowledge of respondents about adherence and the increase in CD4 counts were significantly associated with adherence level. An assessment of the relationship between rate of adherence and socio-demographic factors revealed that there were no statistically significant associations.

Conclusion: The high rate of adherence was largely attributed to free drugs provided by the clinic, free CD4 counts and other investigations, regular health talk and adherence counseling provided by a high level man-power.

INTRODUCTION

HIV/AIDS is the biggest challenge our health system currently faces.[1] It is estimated that about 40.3 million people live with HIV/AIDS and 3.1million died from AIDS at the end of 2005 worldwide.[2-3] In Sub-Saharan Africa, an estimated 25.8million people live with HIV; and an estimated 2.4 million people died from AIDS at the end of 2005 .[1] HIV/AIDS is the single highest cause of death in Sub-Saharan Africa.[1] The epidemic has left behind some 12 million orphaned African children.[1,4,5]

Reports in contemporary literature have confirmed the efficacy of antiretroviral (ARV) drugs in the clinical management of patients infected with HIV.[6-8] Treatment with a combination of 2 Nucleoside Reverse Transcriptase Inhibitors ($NRTI_S$) and a more potent Non Nucleoside Reverse Transcriptase Inhibitors ($NNRTI_S$) or a Protease Inhibitor (PI) constitutes the Highly Active Antiretroviral Therapy (HAART) regimen, which is presently being adopted as the gold standard in the clinical management of HIV infections.[9,10] Indeed it has been documented that HAART has remarkably sustained both the suppression of viral replication and the enhancement of immune restoration in infected patient.[11-14] It has been reported that within 6 months of treatment, an effective HAART, achieves a significant suppression of viral replication and progressive reconstitution of immune system of the patient[9-11]

However, achieving this potential often requires careful adherence to regimens that may be complex and/or cause unpleasant side effects.[15] Non adherence to ARV therapy may result not only in reduced treatment efficacy but also in the emergence of drug-resistant HIV strains.[12,13]

Adherence describes both clinician and patient working together to achieve a treatment concept acceptable for both and includes all factors that influence staying on a regimen in terms of "acceptability".[14] Medication adherence may also be defined as the extent to which a patient takes a medication in the way intended by a health care provider,[15] and it is expressed quantitatively as the percentage of doses that have been taken by the patient.[14] Non adherence to

medication in general, is very common.[16-19] Non adherence to Antiretroviral Therapy (ART) likewise, is common in all groups of treated individuals. The average rate of adherence varies by the method used to assess it and the group studied, but appears to be approximately seventy percent (70%).[19] However, the exact level of adherence that is necessary to prevent emergence of drug-resistant virus or to delay disease progression and death is unknown, nevertheless, near-perfect adherence (> 90-95%) remains the goal for all HIV-infected patients.[13-17]

For HAART, adherence of less than 95% has been linked with treatment failure.[17-21] Lower adherence rates foster development of virus mutations and the risk of developing resistance have been found to be highest with adherence in the range of 80 to 90%.[18-22]

In 2002 the Nigerian government started an ambitious antiretroviral program which aimed to supply 10,000 adults and 5,000 children with antiretroviral drugs within one year. The program was announced as "Africa's largest antiretroviral treatment program".[22-24]

Lack of strict adherence to highly active antiretroviral therapy (HAART) is considered to be one of the key challenges to AIDS care worldwide.[25] Estimates of average adherence rates of many different social and cultural settings, and the risks associated with non adherence are extensive at both individual and societal levels.[26,27] Treatment adherence has been closely correlated with viral suppression,[28,29] while non adherence has contributed to progression to AIDS,[15] the development of multidrug resistance, and death.[30-34] Even non adherence for as short as one week may result in rapid rebound of plasma viraemia, leading to treatment failure.[34-35]

There have been concerns that African patients, many of whom live in poverty, and lack formal education, will have suboptimal adherence for ART, which could lead to the development and spread of drug resistance.[33-36] Little or no information is available about adherence of patients to ART in Kwara State, Nigeria. Therefore this study is to contribute to the existing body of literature in Nigeria as a whole and Kwara State in particular.

AIM AND OBJECTIVES.

The aim of this study is to assess the degree of adherence, and characteristics of adherence to Antiretroviral Therapy, among the Human Immunodeficiency Virus infected patients who attend the lentiviral clinic of the Department of Family Medicine at the University of Ilorin Teaching Hospital, Ilorin.

The Specific Objectives Include:

1. To determine the rate of adherence to antiretroviral therapy at the University of Ilorin Teaching Hospital.
2. To assess the relationship between sociodemographic factors and adherence to Anti Retroviral Therapy.
3. To determine the association between Adherence and CD4 count, Body Weight and Body Mass Index (BMI).

MATERIALS AND METHODS

The study was carried out in the lentiviral clinic of the department of family medicine, University of Ilorin Teaching Hospital Ilorin. The lentiviral clinic of the department of family medicine is one of such clinics that are being facilitated by the Institute of Human Virology Nigeria (IHVN).

This study was a cross-sectional study carried out between December 2008 and May 2009. The study population consisted of adult HIV positive patients who attended the Family Medicine department lentiviral clinic of the University of Ilorin Teaching Hospital and also satisfied the inclusion criteria.

Inclusion criteria include all adult HIV positive patients (18 years and above) on antiretroviral therapy at the family medicine lentiviral clinic of the University of Ilorin Teaching Hospital, for at least 3 months who were willing to participate in the study and were eligible for inclusion.

Exclusion criteria are

1. Patients with co morbidity e.g. Tuberculosis, because of additional immune depression and pill burden.
2. Patients with severe opportunistic infections and complications, due to severe ill health that may require patient's admission.
3. Patients who did not give consent.

SAMPLE SIZE DETERMINATION

The required sample size was determined using Leslie and Kish's statistical formula for estimating minimum sample size in health studies.[35-36]

$$n = \frac{Z^2pq}{d^2}$$

Where n = desired sample size. Z = standard normal deviation, usually set at 1.96 which corresponds to 95% confidence level. p = proportion in the target population estimated to have a particular characteristics. An adherence rate of 80% from a previous study[37] will be used. Therefore, p = 0.8 q = 1- p. d = degree of accuracy desired usually set at 0.05. Therefore the sample size for this study will be:

$$n = \frac{(1.96)^2 (0.8) (0.2)}{(0.05)^2} \qquad n = 245.76$$

An approximate sample size of 250 is therefore proposed for the study.

SAMPLING TECHNIQUE:

The systematic random sampling technique was used to select the sample from the study population. Weekly average attendance of patients at the lentiviral clinic was 60 obtained from the Records Department. About 12 patients per clinic day per week were interviewed to obtain the total sample size of 250 in 6 months. The sampling interval was, therefore, 60/12=5.

ETHICAL CONSIDERATION

Clearance to undertake the study was obtained from the Ethical Committee of the University of Ilorin Teaching Hospital. The subjects were adequately informed about the nature of the study before consent was obtained. They were told about the purpose of the study and that some of the questions would be personal in nature, but were assured that strict confidentiality would be maintained at all times throughout the duration of the study. They were also informed before recruitment that blood samples would be taken from them with minimal discomfort; but that they would in no way be exposed to any health hazard whatsoever during the collection of blood.

Universal basic precautions were employed at all times during the collection of blood samples and also in the handling of the samples and sharp instruments. A new disposable syringe was used for each patient and properly disposed of immediately after use. Subjects were not made to pay for the cost of materials and investigations as they were borne by the researcher.

Finally, respondents identified to have problems with adherence were properly counseled and also referred appropriately to the adherence counselors.

The questionnaire was pre-tested in the Haematology HIV clinic in order to test its logical sequence. All necessary amendments were made before using it for the main study. The research team was gender balanced, comprising two male junior residents and two female nurses as research assistants to help in data collection. The data collectors were trained in the various methodologies of data collection and also on critical ethical issues. As part of the training, the data collectors participated in pre-testing the instruments with the guidance of the principal investigator. Fortnightly meetings were held with the research assistants to review the study and to ensure that consistency was maintained in the administration of the questionnaires.

DATA COLLECTION

A semi-structured mostly closed ended questionnaire was used to collect data. It was serially numbered and interviewer administered. The researcher administered the questionnaire personally assisted by well trained research assistants. Administration of questionnaire was done during normal clinic hours after normal consultation and informed consent from the participants. The questions were grouped into different sections as follows:

Section A: This section was on socio-demographic data and included such data as the subjects' age, sex, religious ethnicity, marital status, occupation, and level of education. Respondents were grouped into different occupational classes using Oyedeji's classification[38] Occupational groups 1 and 2 comprise senior public servants, professionals managers, contractors, intermediate grade public servants, nurses and secretaries. Occupational groups 3 and 4 comprise the junior school teachers, typist, drivers, artisans, traders, labourers, messengers and similar grades.

Section B: This section was about subjects' knowledge of HIV/AIDS. It sought to know if subjects understood the difference between HIV and AIDS, if they knew the risk factors of HIV transmission and whether they understood the meaning of CD4 count, adherence and viral resistance.

Section C: This section obtained information about respondent's expenses with regards to clinic visit, registration at the clinic, and cost of other HIV related treatment, if any, apart from the ARVs which are given out to patients free of charge courtesy of IHVN and the Federal Government of Nigeria. The aim was to find out how difficult it was for participants to access their drugs in the clinic.

Section D: This section obtained information about psychosocial issues. Subjects were asked about friends and family support. Family members were people living together in the same household. They were also asked about alcohol consumption and whether or not they had confidence in the antiretroviral drugs.

Section E: This section obtained information about respondent's treatment and adherence behavior. This included duration of treatment, dosing frequency and regularity at follow-up

clinics. Patients were asked to identify the antiretroviral medications they were presently taking (from samples obtained from the hospital pharmacy). They were also asked to recall the number of times per day they were supposed to take each medication and the number of pills per dose (this was compared with the doctor's prescription). Respondents were then asked the number of doses they had missed within the seven-day period preceding the interview. Each day was taken one after the order, beginning from the day before the interview and backwards to a week before the interview. Both information were used in calculating the percentage adherence. If the respondent reported skipping a dose, reasons for non-compliance were demanded. Multiple responses were allowed in this section.

Section F: This section was for anthropometric and laboratory parameters of respondents, including weight, height, BMI. Approximately 5mls of venous blood is collected into clean heparinized bottles for CD4 count determination in the Haematology laboratory. All sample bottles were serially numbered for proper identification. The baseline CD4 counts of respondents were obtained from the folders to calculate the difference in CD4 counts.

DATA ANALYSIS

Completed questionnaires and measurements were entered into a computerized database. The data was analyzed using the epidemiological information (Epi-info) 2005 software package. The 2 by 2 contingency tables were used to carry out chi-square test and to find out the level of significance. Values less than 0.05 were regarded as statistically significant. Data presentation formats like pie charts, and bar charts were drawn using Excel 2003 software package**.**

RESULTS

TABLE 1: SOCIODEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS (N=250)

VARIABLES	FREQUENCY	PROPORTION (%)
AGE		
18 – 27	16	6.4
28 – 37	86	34.4
38 – 47	85	34.0
48 – 57	45	18.0
≥ 58	18	7.2
SEX		
Male	101	40.4
Female	149	59.6
RELIGION		
Christianity	111	44.4
Islam	139	55.6
EDUCATION		
No Formal Education	37	14.8
Primary	75	30.0
Secondary	72	28.8
Tertiary	66	26.4
MARITAL STATUS		
Married	160	64.0
Single	27	10.8
Separated	17	6.8
Divorced	17	6.8
Widowed	29	11.6
OCCUPATION		
GROUP 1	1	0.4
GROUP 2	52	20.8
GROUP 3	110	44.0
GROUP 4	68	27.2
GROUP 5	19	7.6
ETHNICITY		
Hausa	5	2.0
Igbo	11	4.4
Nupe	7	2.8

Yoruba	199	79.6
Others	28	11.2

A total of 250 respondents aged 19 years and above were recruited for the study. Age range 28 – 37 years had the highest number of respondents (34.4%). It was closely followed by the age range 38-47years with (34%), while there was a lower representation at the upper and lower extremes of the age ranges at (6.4%) and (7.2) respectively. The mean age was 40.98 ± 10.23years. Most patients 187 (74.8%) were below 48years of age, and 63 (25.2%) were 48years and above.

Of the 250 respondents, 101 (40.4%) were males and 149 (59.6%) were females, giving a male: female ratio 1:1.5. Most of the respondents 139 (55.6%) were Muslims, while the remaining 111(44.4%) belonged to the Christian faith.

The majority of the respondents (58.8%) either had primary (30%) or secondary education (28.8%). Sixty-six respondents (26.4%) had tertiary education and the remaining 37 (14.8) had no formal education. One hundred and sixty (64%) of the respondents were married, 29 (11.6%) were widowed, while 27 (10.8%) were single. The rest of them 34 (13.6%) were either divorced (6.8%), or separated (6.8%). Using Oyedeji's[73] classification, respondents were classified into 5 occupational groups (1 – 5). The majority of respondents 178 (67.2%) were in occupational group 3 and 4 with 110 (44%) and (27.2%) respectively. Respondents in occupational group 2 were 52 (20.8%), while those in occupational group 5 were19 (7.6%). Only 1 (0.4%) of the respondents was in occupational group 1.

The Yorubas had the highest representation of 199 (79.6%) among the respondents. There were 11(4.4%) respondents of Igbo tribe, while 5 (2.0%) of the respondents were Hausas. The Nupes and minority tribes formed the remaining 35 (14%) of the respondents.

Most of the respondents (60.4%) understood that HIV and AIDS are somewhat different. However, the majority of them (64.4%) did not know the meaning and importance of CD4 Counts.

Ninety three percent of the respondents knew some of the risk factors for HIV transmission, and most of them (98.0%) have also had some explanations about adherence to the antiretroviral (ARV) drugs.

Very few respondents (8.8%) actually have no knowledge of viral resistance. The majority of the respondents, 288 (91.2%) have been educated about viral resistance. Most of the respondents (69.6%) revealed their statuses to their family members while the majority of the respondents (64.4%) disclosed their statuses to their spouses. Most of them (81.6%) did not disclose their statuses to their friends. Eighty-six percent of respondents had support from family and friends. Fewer respondents, (13.2%) were engaged in alcohol ingestion but almost all of the respondents (98.4%) have confidence in HAART.

TABLE 2: COST CONSIDERATION OF TREATMENT

VARIABLES (N = 250)	YES n_1 (%)	NO n_2 (%)
Transport fares as a burden	90 (36.0)	160 (64.0)
Cost of Registration as a burden	20 (8.0)	230 (92.0)
Loss of income due to clinic appointments	78 (31.2)	172 (68.8)
Payment for other drugs	80 (32.0)	170 (68.0)

Most of the respondents (64.0%) did not consider their transport fares as a burden. Also, the majority of them (92.0%) did not feel the registration fee as a burden. About (69.0%) of respondents indicated, they did not lose income by coming to clinic for appointments. Only 32% of all respondents actually paid for other drugs apart from ARVs. The majority of the respondents (70.4%; n=) spent between 0 – 999 Naira on transportation followed by those who spent between 1,000 and 1,999 Naira on transportation (12.4%; n=). About 7% of respondents, spent 2,000 – 2,999 Naira (n=) while 6.0% of respondents spent between 3,000 and 3,999 Naira (n=). Others spent between 4,000 and 4,999 Naira (1.2%; n=) and not less than 5,000 Naira (3.2%). The mean cost of transportation was 897 Naira ±1,255 Naira, 67 kobo.

Twenty eight percent of respondents (n=70) had been on antiretroviral drugs for between 3 – 9 months while 23.6% of the respondents (n=59) had been on medications for about 10 months to 16 months. Those who had been on antiretroviral drugs for 17 – 23 months constituted 13.2% of respondents (n=33) while other analysis showed 14.8% for 24 – 30 months (n=37); 10.8% for 31 – 37 months (n=27); e.t.c The majority of respondents, 64.8% have been on antiretroviral medications for less than 24 months (2 years) while the rest 35.2% have been on treatment for less than 24 months. The mean duration of treatment was 20 months ± 14.75 months.

The majority of respondents were on two pills per day (52.4%; n=131) followed by 15.2% who were on three pills per day (n=38). Other respondents were on four pills per day (12.0%; n=30), five pills per day (4.4%; n=11), six pills per day (14.4%; n=36), seven pills per day (0.4%;

n=1), and, eight pills per day (1.2%; n=3) respectively. The mean number of pills per day was 3.9 ±1.56.

TABLE 3: REASONS FOR MISSING DOSES OF ARVs

VARIABLES (REASONS) (N = 250)	FREQUENCY n	PROPORTION % $\frac{n}{N} \times 100$
Simply forgot	63	25.3
Missed clinic appointments	27	10.8
Being away From Home	24	9.6
Running Out of Pills	14	5.6
Too Busy With Other Things	14	5.6
Distance to the clinic	7	2.8
Hiding drugs from others around	6	2.4
Change of Schedule	6	2.4
Drug side effects	6	2.4
Feeling Sick or Depressed	2	0.8
Absence of Symptoms	2	0.8

Table 3 shows that 68.4% of respondents missed their drugs at a point in time for various reasons. The commonest reason was forgetfulness (36.8%) others included: missed clinic appointments (15.8%), followed by being away from home (14.0%) and running out of drugs (9.9%), being too busy with other things (9.99%), long distance from clinic (4.1%), hiding drugs from others around (3.5%), change of schedule (3.5%),side effect of drugs (3.5%), absence of symptoms and feeling sick or depressed (1.4%).

Ninety two percent (n=231) of respondents recorded an increase from baseline in their CD4 counts while 8.0% (n=19) recorded a decrease in CD4 counts on the course of treatment with HAART. The mean CD4 gain was 236.4 cell/µl ± 198.2. The majority of respondents (88.4%; n=221) recorded a gain in weight. Close to 3% (n=7) had no change in their weight while 8.8% (n=22) recorded some weight loss. The mean weight gain was 7.4kg ± 7.7kg. As defined by the study protocol and regarding the adherence of respondents to ARV, most of them (90%; n=225) were actually adherent while others (10%; n=25) were not.

TABLE 4: ASSOCIATION BETWEEN ADHERENCE LEVEL AND SOCIODEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

VARIABLES VALUE (N = 250)	ADHERENT n_1 (%)	NON-ADHERENT n_2 (%)	χ^2	p
AGE			**1.280**	**0.865**
18 – 27	15 (6.7)	1 (4.0)		
28 – 37	78 (34.7)	8 (32.0)		
38 – 47	76 (33.8)	9 (36.0)		
48 – 57	39 (17.3)	6 (24.0)		
≥ 58	17 (7.6)	1 (4.0)		
SEX			**0.666**	**0.414**
Male	89 (39.6)	12 (48.0)		
Female	136 (60.4)	13 (52.0)		
RELIGION			**0.650**	**0.420**
Christianity	98 (43.6)	13 (52.0)		
Islam	127 (56.4)	12 (48.0)		
EDUCATION			**6.230**	**0.101**
No Formal Education	36 (16.0)	1 (4.0)		
Primary	67 (29.8)	8 (32.0)		
Secondary	67 (29.8)	5 (20.0)		
Tertiary	55 (24.4)	11 (44.0)		
MARITAL STATUS			**5.703**	**0.127**
Married	143 (63.6)	17 (68.0)		
Single	25 (11.1)	2 (8.0)		
Separated	14 (6.2)	3 (12.0)		
Divorced	14 (6.2)	3 (12.0)		
Widowed	29 (12.8)	0 (0.0)		
OCCUPATION			**8.539**	**0.074**
GROUP 1	1 (0.4)	0 (0.0)		
GROUP 2	43 (19.1)	9 (36.0)		
GROUP 3	101 (44.9)	9 (36.0)		
GROUP 4	65 (28.9)	3 (12.0)		
GROUP 5	15 (6.7)	4 (16.0)		
ETHNICITY	**2.831**	**0.587**		

Hausa	5 (2.2)	0 (0.0)
Igbo	10 (4.4)	1 (4.0)
Nupe	6 (2.7)	1 (4.0)
Yoruba	181 (80.4)	18 (72.0)
Others	23 (10.2)	5 (20.0)

χ^2 = Chi squared; p = Level of significance;

Table 4 shows the association between adherence level and the socio-demographic characteristics of respondents.About thirty five percent (34.7%) of those who were adherent to their treatment fell within in the age group of 28 – 37. They were closely followed by respondents in the age group 38 – 47 (33.8%). This same age group (38 – 47) also had the highest rate of non-adherence (36.0%). However, the association between the age groups and adherence level was not statistically significant ($p > 0.05$).

In terms of gender, majority of those who were adherent to their treatment were females (60.4%) while the males constituted 39.6% of those who were adherent. This finding was not statistically significant ($p > 0.05$). The same trend was found for non-adherence i.e 52% for females and 48% for males. Majority of those who were adherent were Muslims (56.4%) while the Christians constituted the majority of those that were non-adherent (52.0%). The association between adherence level and religion was not statistically significant. ($p > 0.05$).

Respondents with primary education and those with secondary education both constituted 29.8% of respondents who adhered to their treatment respectively. They are closely followed by those with tertiary education (24.4%). However, most of the respondents who were non-adherent to their treatment had tertiary education (44.0%) followed by those with primary education (32.0%). This relationship was however not statistically significant ($p > 0.05$).

About 64% of those who were adherent were currently married, this is also the same for non-adherent respondents as 68% of them were currently married. All widowed respondents were adherent to their drugs. No statistical significance was observed. ($p > 0.05$)

Respondents in Oyedeji's occupational group 3 constituted majority of those who adhered to treatment (44.9%) while groups 2 and 4 constituted 19.1% and 28.9% respectively. For non-

adherence however, respondents in groups 2 and 3 constituted 36.0% each while groups 3 and 4 constituted 12% and 16% respectively. This finding was not statistically significant. ($p > 0.05$).

In terms of ethnicity, majority of the respondents who adhered to treatment were of the Yoruba race (80.4%). This is also true of those who were non-adherent in which case the Yorubas constituted 72%.In this study, the association between respondents' ethnicity and adherence level was not statistically significant. ($p > 0.05$).

TABLE 5: ASSOCIATION BETWEEN ADHERENCE LEVEL AND RESPONDNTS' KNOWLEDGE OF HIV AND AIDS

VARIABLES (N = 250)	ADHERENT n_1 (%)	NON-ADHERENT n_2 (%)	χ^2	P
Difference between HIV & AIDS			**0.151**	**0.698**
YES	135 (60.0)	16 (64.0)		
NO	90 (40.0)	9 (36.0)		
About CD4 count			**0.670**	**0.403**
YES	82 (36.4)	7(28.0)		
NO	143 (63.6)	18(72.0)		
Risk of HIV transmission			**1.899**	**0.168**
YES	209 (92.9)	25 (100.0)		
NO	16 (7.1)	0 (0.0)		
About Adherence			**5.102**	**0.024**
YES	222 (98.7)	23 (92.0)		
NO	3 (1.3)	2 (8.0)		
About Viral Resistance			**0.354**	**0.552**
YES	206 (91.6)	22 (88.0)		
NO	19 (8.4)	3 (12.0)		

χ^2 = Chi squared;
p = Level of significance;

Table 5 shows the association between adherence level of respondents and their knowledge about HIV and AIDS. Sixty percent of those who were adherent actually knew the difference between HIV and AIDS while others (40%) did not know. A similar trend was found in respondents who were non-adherent (64% and 36% respectively). However, the association between adherence level of respondents and their knowledge about the difference between HIV and AIDS is not statistically significant ($p > 0.05$). Close to 64% of adherent respondents did not know about CD4 counts. Others (36.4%) actually knew. Almost three

quarters (72.0%) of non-adherent respondents also did not know about CD4 counts. This association is not statistically significant. ($p > 0.05$).

About 93% of respondents who were adherent to treatment had knowledge about the risk factors of HIV transmission while all the non-adherent respondents knew about risk factors. This finding was not statistically significant ($p > 0.05$). Almost Ninety nine percent (98.7%) of respondents who were adherent to their therapy had knowledge about adherence, likewise 92.0% of non-adherent respondents. 1.3% of the five respondents who did not have knowledge about adherence were adherent to their therapy while 8.0% were not. Respondents' knowledge about adherence was statistically significant ($p < 0.05$).

When related to adherence level, respondents who had knowledge about viral resistance constituted 91.6% of those who adhered to their therapy but also 88.0% of those who were non-adherent. On the other hand, respondents who had no knowledge about resistance constituted 8.4% of those who were adherent and 12.0% of those who were non-adherent to therapy. The result was not statistically significant ($p > 0.05$).

TABLE 6: ASSOCIATION BETWEEN ADHERENCE LEVEL AND PSYCHOSOCIAL ISSUES ABOUT HIV/AIDS

VARIABLES (N = 250)	ADHERENT n_1 (%)	NON-ADHERENT n_2 (%)	χ^2	P
Disclosure of status to Family Members			**0.076**	**0.783**
YES	156 (69.3)	18 (72.0)		
NO	69 (30.7)	7 (28.0)		
Disclosure of status to Spouse			**0.235**	**0.628**
YES				
NO	146 (64.9)	15 (60.0)		
	79 (35.1)	10 (40.0)		
Disclosure of status to Friends			**0.758**	**0.384**
YES				
NO	43 (19.1)	3 (12.0)		
	182 (80.9)	22 (88.0)		
Overall support from Family/Friends			**0.092**	**0.761**
YES	194 (86.2)	21 (84.4)		
NO	31 (13.8)	4 (16.0)		
History of Alcohol intake			**0.190**	**0.663**
YES	29 (12.9)	4 (16.0)		
NO	196 (87.1)	21 (84.0)		
Confidence in HAART			**0.452**	**0.502**
YES	221 (98.2)	25 (100.0)		
NO	4 (1.8)	0 (0.0)		

χ^2 = Chi squared

p = Level of significance

Out of 225 respondents who were adherent, 69.3% of them disclosed their status to members of their families while 30.7% of them did not disclose their status to members of their families. In the same vein, 72% of the non-adherent respondents actually disclosed their

HIV status to family members while others (28.0%) did not. This association was not statistically significant ($p > 0.05$) (Table 6)

The respondents who disclosed their status to their spouses constituted 64.9% of those who were adherent and 60.0% of those who were non-adherent to treatment. Respondents who did not disclose their status to their spouse formed 35.1% of those who were adherent to treatment and 40.0% of those who were non-adherent. The association between respondents' level of adherence and disclosure of HIV status to spouse did not show statistical significance ($p > 0.05$).

Some of the respondents who disclosed their HIV status to their friends constituted 19.1% of those who were adherent while others formed 12.0% of those who were non-adherent to treatment. However, the majority of those who were non-adherent (88%) did not disclose their status to their friends while 80.9% of the adherent respondents also did not disclose their HIV status to friends. This relationship however did not show statistical significance. ($p > 0.05$)

Two hundred and forty two respondents (98.2%) who were adherent to their therapy said they had confidence in HAART while all of those that were non-adherent (100%) also said they had confidence in HAART. However, the remaining 4 respondents who did not have confidence in HAART were adherent to their therapy. The association between respondents' level of adherence and confidence in HAART did not show statistical significance ($p > 0.05$)

TABLE 7: ASSOCIATION BETWEEN ADHERENCE LEVEL AND COST CONSIDERATION OF TREATMENT

VARIABLES (N = 250)	ADHERENT n_1 (%)	NON-ADHERENT n_2 (%)	χ^2	P
Transport fares as a burden			**4.823**	**0.028**
YES	76 (33.8)	14 (56.0)		
NO	149 (66.2)	11 (44.0)		
Cost of Registration as a burden			**0.604**	**0.437**
YES	19 (18.4)	1 (4.0)		
NO	206 (91.6)	24 (96.0)		
Loss of income due to clinic appointments			**0.298**	**0.585**
YES	69 (30.7)	9 (36.0)		
NO	156 (69.3)	16 (64.0)		
Payments of other drugs			**0.204**	**0.651**
YES	73 (32.4)	7 (28.0)		
NO	152 (67.6)	18 (72.0)		

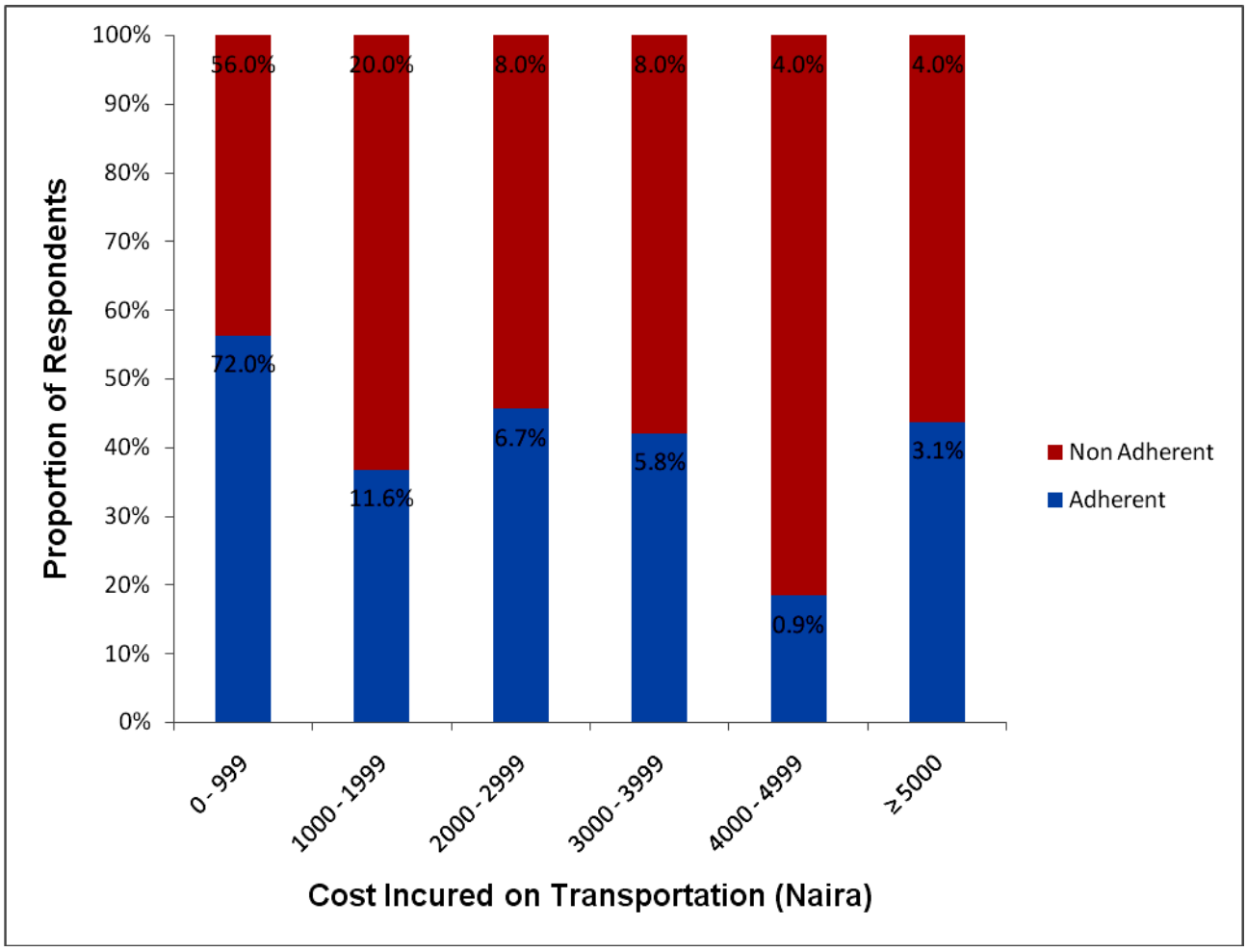
χ^2 = *Chi squared*

p = Level of significance

About 34% of respondents who were adherent to their treatment reported that transport fares to clinic was a burden while others (66.2%) reported otherwise. This finding is statistically significant ($p < 0.05$).

Ninety six percent of those who were non-adherent felt that cost of registration to HAART program was not a burden while others (4%) felt it as a burden. This finding is similar to the adherent group, that is, 91.6% of them did not feel cost of registration as a burden while 18.4% felt so. This relationship was however not statistically significant (Table 7).

FIGURE 1: ASSOCIATION BETWEEN ADHERENCE LEVEL AND COST INCURRED ON TRANSPORTATION BY RESPONDENTS



N = 250; χ^2 = 4.227 p = 0.517

χ^2 = Chi squared

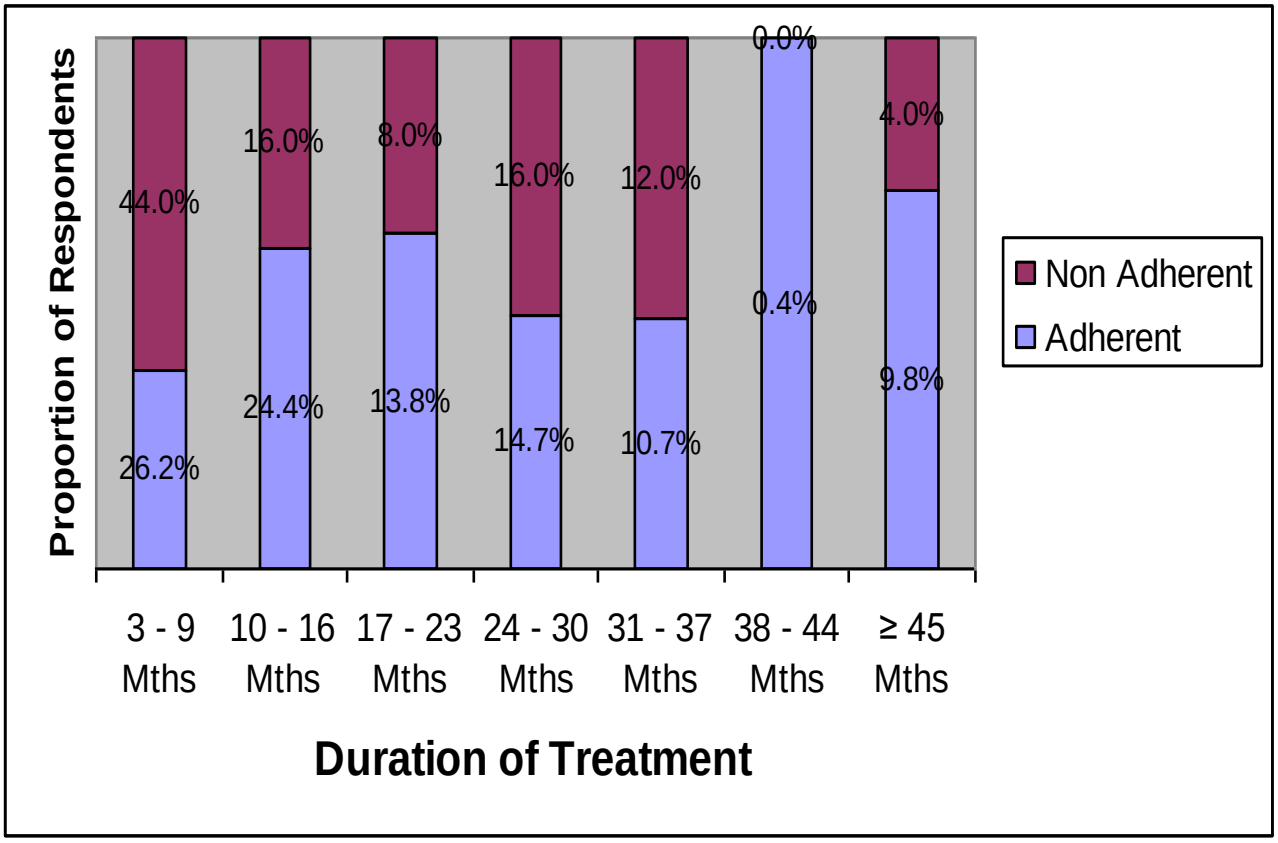
N = Total number of respondents;

p = Level of significance

Seventy two percent (n=162) of adherent respondents spent between 0 and 999 Naira on transportation while 11.6% spent between 1,000 and 1,999 Naira (n=26); 6.7% (n=15) spent between 2,000 – 2,999 Naira and 5.8% (n=13) spent between 3,000 and 3,999 Naira. On the other hand, 56% of the non-adherent respondents (n=14) spent between 0 and 999 Naira on transportation. 20% spent between 1,000 and 1,999 Naira (n=5), while 8% of them spent between 2,000 and 2,999 Naira (n=2). Another 8% of them spent between 3,000 and 3,999

Naira (n=2) while 4% spent between 4,000 and 4,999 Naira (n=1) and the remaining 4% (n=1) spent 5,000 Naira and above on transportation to clinic. The association between adherence level and cost incurred by respondents on transportation, however, was not statistically significant. ($p > 0.05$).

FIGURE 2: ASSOCIATION BETWEEN ADHERENCE LEVEL AND DURATION OF TREATMENT OF RESPONDENTS



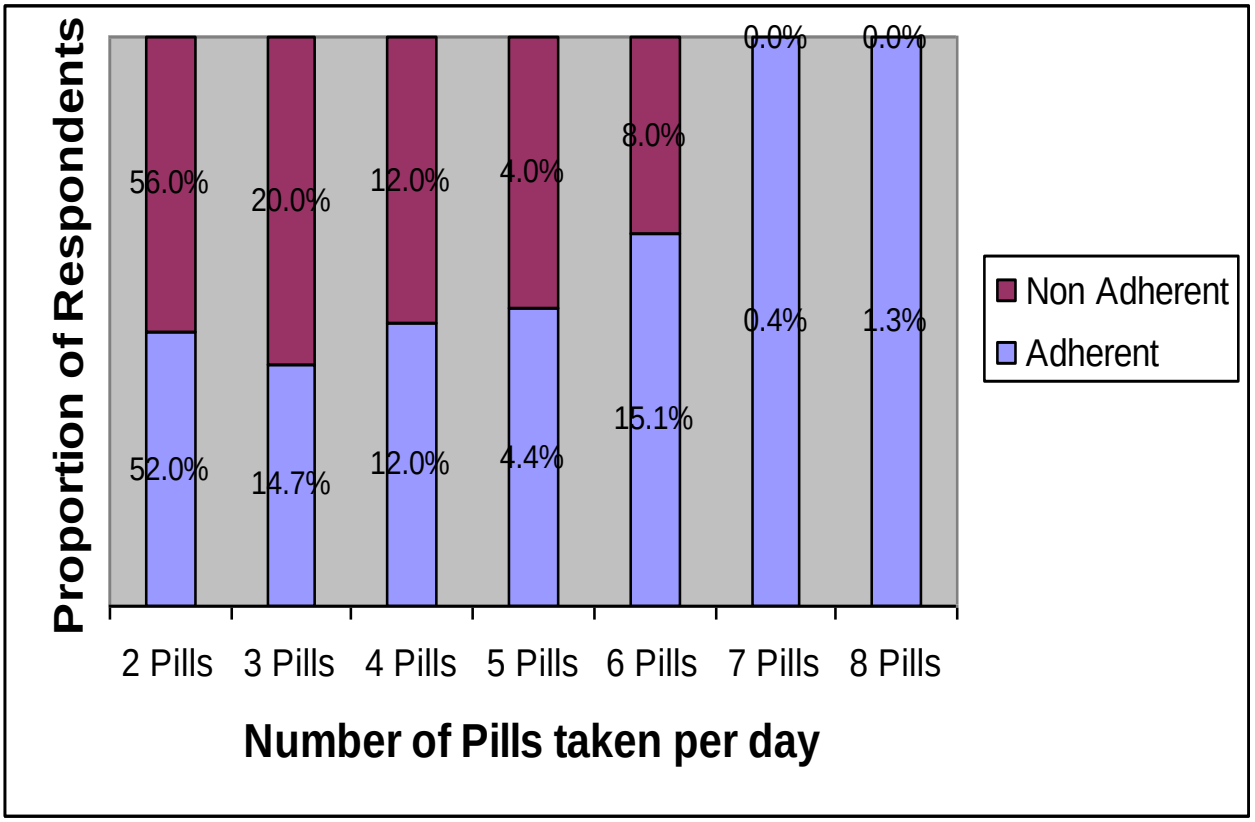
χ^2 = 4.780 **p = 0.572** **N = 250**

χ^2 = Chi squared ***N = Total number of respondents;*** ***p = Level of significance***

The majority (26.2%; n=59) of the adherent respondents have been on treatment for between 3 – 9 months; 24.4% (n=55) of them for between 10 – 16 months, while 13.8%

(n=31) of them have been on treatment for between 17 – 23 months. 14.7% (n=33) of the adherent respondents were on treatment for between 24 – 30 months and 10.7% (n=24) have been taking antiretroviral treatment for between 31 – 37 months; while 0.4% (n=1) of them have had treatment for between 38 – 44 months. The remaining 9.8% (n=22) have been on treatment for 45 months or more but the association between adherence level and duration of treatment in this study was not statistically significant. ($p > 0.05$) (Figure 2).

FIGURE 3: ASSOCIATION BETWEEN ADHERENCE LEVEL AND NUMBER OF PILLS TAKEN PER DAY BY RESPONDENTS



$\chi^2 = 1.734$ p = 0.942 N = 250

χ^2 = Chi squared N = Total number of respondents p = Level of significance

Most of the adherent respondents (52%; n=117) were on 2 pills per day followed by those on 6 pills per day (15.1%; n=34), then those on 3 pills per day (14.7%; n=33). 12.0% (n=27) of them were taking 4 pills per day while 4.4% (n=10) were on 5 pills per day and 1.3% (n=3) were on 8 pills per day. Only 0.4% (n=1) was on 7 pills per day. Similarly, the majority of the non-adherent respondents (56.0%; n=14) were on 2 pills per day, but those on 3 pills per day followed with 20.0% (n=5) while those on 4 pills per day came next with 12.0% (n=3). 8.0% of the non-adherent respondents were on 6 pills per day (n=2), 4.0% of them were on 5 pills per day (n=1) while none of them was on neither 7 nor 8 pills (n=0 each). However, the association between adherence level and number of pills taken per day was not statistically significant ($p > 0.05$) (Figure 3).

TABLE 8: ASSOCIATION BETWEEN ADHERENCE LEVEL AND CHANGE IN CD4 COUNTS OF RESPONDENTS

VARIABLES (N = 250)	**ADHERENT n_1 (%)**	**NON-ADHERENT n_2 (%)**
CD4 COUNT INCREASED	212 (94.2)	19 (76.0)
CD4 COUNT DECREASED	13 (5.8)	6 (24.0)

$\chi^2 = 10.639$ **$p = 0.001$**

χ^2 = Chi squared

p = Level of significance

Out of 225 respondents who were adherent to their medication, 94.2% recorded an increase in their CD4 counts while 5.8% had a decrease in their CD4 counts. Of the 25 respondents who were non-adherent to treatment, 76.0% recorded an increase in CD4 counts while 24.0% recorded a loss in CD4 counts. The association between adherence level and change in CD4 counts was statistically significant ($p < 0.05$).

TABLE 9: ASSOCIATION BETWEEN ADHERENCE LEVEL AND WEIGHT STATUS OF RESPONDENTS

VARIABLES (N = 250)	ADHERENT n_1 (%)	NON-ADHERENT n_2 (%)
GAINED WEIGHT	199 (88.4)	22 (88.0)
NO CHANGE IN WEIGHT	6 (2.6)	1 (4.0)
LOST WEIGHT	20 (9.0)	2 (8.0)

$\chi^2 = 0.162$ p = 0.922

χ^2 = Chi squared p = Level of significance

Of the 225 respondents who were adherent to treatment, 88.4% recorded a gain in weight, 2.6% had no change in weight while 9% recorded a loss in weight. However, out of the 25 respondents who were non-adherent to treatment, 88.0% recorded a gain in weight, 4.0% had no change in weight while 8.0% recorded a loss in weight. The association between level of adherence and weight status of respondents was not statistically significant ($p > 0.05$).

DISCUSSION

In this study, the adherence rate to antiretroviral therapy among Human Immunodeficiency Virus infected patients was ninety percent (90%). This represented those respondents who ingested 95% or more of their drugs in the one week preceding the interview. This rate of adherence is comparable to those found in Abuja (95.5%),[39] Lagos (92% at 3/12 and 88% at 18/12),[39] Senegal (91%)[40] and South Africa (87%).[41] However, it is much higher than those observed by Ilyasu et al in Kano (54%),[37] while Erhabor and Akani reported 49.2% in Port Harcourt.[42]

The high adherence rate in this study may be attributable to the fact that antiretroviral drugs were accessed free of charge and also other supportive care and investigations were free in this center, courtesy of Federal Government of Nigeria and its collaborating partners like IHVN.

Therefore, reasons cited in previous similar studies[37,39] like non availability of drugs and lack of funds have been totally eliminated or drastically reduced. It may also be due to different socio-cultural factors and different geographical locations. Another reason may be the counseling sessions given to subjects in this center; however a separate study may be needed to confirm this conclusion.

In developed countries, the rates of patient reported adherence ranged from 40 to 70%.[43-45] The high adherence rate in this study as in others in Nigeria and some African countries, shows that patients in developing countries can achieve good adherence despite limited resources. Orrell et al[41] also found that low socioeconomic status was not a predictor of adherence for patients with fully subsidized therapy and concluded that adherence in developing countries had been found to be at least as good as adherence in developed countries. It is therefore expected that the supply of free drugs and investigations will be sustained by the government.

Many studies reported conflicting evidence about the association between socio-demographic factors and adherence behavior.[33,34] While some factors like younger age, ethnicity, lower income, lower literacy and unstable housing are associated with non adherence in developed countries; others like gender, educational level and insurance status were not associated.[17]

The sociodemographic profile of the two hundred and fifty respondents in this study showed a preponderance of women over men (59.5% vs 40.6%). The high proportion of females in this study was probably because of high health seeking behavior among the females than the males in this environment. This also supports other findings that HIV infection is more common in women than men.[79] Socio-cultural and economic factors that put women at a disadvantage are responsible for this difference.[79] However the difference in this study may also be attributable to the free handout of antiretroviral drugs, therefore minimizing the economic advantage of the men over the women. Also, the fact that polygamy is common among the dominant Muslim population in Ilorin and it's environ could be a reason for the high number of women in this

study. This finding is contrary to that of Ilyasu et al[56] in Kano where men were predominant in their study and they attributed it to the economic advantage of the men over the women. Ilyasu's observation may be due to the fact that men in Kano may actually not be giving permission to their wives to come forward for voluntary screening and consequently the burden of HIV/AIDS in Northern Nigeria may really have been under estimated.

In this study, females appeared to be more adherent (60.4%) than men (39.6%). Though not statistically significant, this difference may be probably because of the fear in women not wanting to leave their children as orphans. Furthermore, some of them are full house wives while others are engaged in businesses or jobs which keep them around their houses or in the town where their drugs are often within reach. Difference between sexes continues to be controversial; with one large study finding similar adherence between women and men.[43] However, Ilyasu and colleagues reported that gender and sex did not influence adherence.[37]

With regards to age groups, respondents in age group (28 – 47) years were more predominant in this study constituting about 68%. Similar observations were made in Kano[37] (25 – 45) years and Makurdi[44] (30 – 39) years. This is consistent with findings of surveys that identified people of this age group most vulnerable to HIV/AIDS because they belong to the sexually active, reproductive age group.[45,46] This finding highlights the need to intensify HIV/AIDS prevention campaign and voluntary counseling and testing (VCT), to reduce the incidence and prevalence of the scourge to the barest minimum.

The age group (28 – 47) years appeared to have the highest level of adherence (68.5%).Though not statistically significant, this may be probably because many of them have younger children whom they have affection for, and would not want them orphaned so early in life. The lowest adherence level was recorded in the age group (18 – 27) years. Perhaps, most of them are not married and therefore may lack the necessary social support, which would have enhanced adherence, from spouses and children. Also, there may be the tendency for them to hide their

status or drugs from other people. As Family Physicians there is the need to target this group for special adherence counseling.

High proportion of Muslims (55.6%) seen in this study may be because Islam is the predominant religion of the inhabitants of Ilorin. In the same vein, the preponderance of the Yoruba tribe in this study is predicated on the fact that majority of the inhabitants of Ilorin and Kwara State in general are Yorubas. The surrounding states as well, are mostly Yoruba speaking. In this study, no statistically significant difference was found between adherence and religion. ($p > 0.05$). However, involvement of spiritual leaders in adherence counseling may help to improve adherence because they are supposed to be role models to their congregations.

The majority of the respondents (64.0%) were married and living with their spouses. 25% of the respondents were separated, divorced or widowed, while 11.1% were single. This distribution of marital status becomes relevant, considering the fact that heterosexual transmission accounts for 80% of HIV infection in developing countries.[46,47] The 25% of separated, divorced or widowed respondents may be assumed to highlight the devastating effect of HIV infection on the family structure. However, further study may be required to confirm this. Odumosu et al[48] reported that HIV/AIDS epidemic had devastated families in Nigeria emotionally, socially and financially. In addition to the expenses that infected individuals incurred, each affected family bore the psychic costs associated with the death and illness of family member, the breakdown in family structure, and the stigma associated with HIV.[48]

Most of the respondents were in the occupational groups 3 and 4. The reason for this may probably be because they have the highest rate of HIV and AIDS infections due to their risky sexual practices.[46]

In terms of adherence, occupational groups 1 and 2 had a lower adherence to therapy than those in groups 3 and 4. Though not statistically significant, this was probably because they have no time; and also, they may not appreciate the treatment being given free. This finding is similar to

that of Shaahu[49] in Makurdi who also found that higher occupational groups were less adherent to therapy probably because they were more likely to forget to take their drugs as a result of their busier schedule.

Lack of patients' understanding of HIV illness, importance of adherence, and the specifics of the HAART regimen were some of the factors that could stand in the way of high adherence[24, 50] It was discovered in this study that majority of the respondents had knowledge about difference between HIV and AIDS (60%), risk of HIV transmission (92.9%), knowledge about viral resistance (91.6%), and knowledge about adherence (98.7%). The regular counseling and health talk given to patients on clinic days may have contributed to this high knowledge. However, their knowledge about CD4 counts was low (36.4%). The lack of adequate knowledge about CD4 counts may be due to its technical nature and the lack of appropriate word to explain it to patients in the local languages. It is therefore important to intensify education of patients about the various aspects of HIV and AIDS. During the early phases of therapy, the patient should be informed of treatment success as seen by reduction in viral load and the rise in CD4 counts.[18] About 98% respondents actually had knowledge about adherence. Also 98.7% of adherent respondents, had knowledge about adherence. The association between respondents' knowledge about adherence and adherence level was found to be statistically significant in this study ($p < 0.05$). This further emphasizes the need to for care givers to establish the baseline knowledge of patients about adherence even before initiation of therapy. In cases where the patient knowledge is found to be inadequate, adherence counseling should be offered repeatedly until patient has sufficient knowledge before commencement of therapy.

This study found an association between adherence and psycho-social issues about HIV and AIDS, though not statistically significant. The high level of family support and confidence in HAART and other psycho-social parameters found among respondents support the overall high adherence rate of 90% obtained in this study. Two studies[48,51] reported similar findings that the

majority of patients receiving HAART in certain African countries have disclosed their status to families. Patients with a good family support system that include family, friends, other patients who are role models and members of the health care team may be more motivated to adhere to treatment.[46]

However it is important to note that 30% of respondents did not disclose their status to family members, 35% did not disclose to spouses while 81% did not disclose to friends in this study. This is similar to the report by Health Reform Foundation of Nigeria (HERFON)[52] that 36% of people living with HIV/AIDS (PLHAs) still have problems disclosing their status to their partners. This seems to show that a significant number of subjects in this study were still grappling with the problems of stigmatization. With the introduction of the free drugs program, it is hoped that HIV/AIDS would be seen like other chronic diseases such as systemic hypertension and diabetes mellitus, which despite their potential complications, including death, sufferers are not stigmatized.

The treatment of HIV and AIDS is associated with high economic burden. Even though drugs are given free of charge in this center, other costs like transportation, cost of clinic registration, payment for other non ARV drugs and loss of income due to clinic appointments, are borne by the patients. This study suggests that 36% of the respondents have problems with transportation and about 32% considered payment for other drugs as a burden. Majority of the respondents (70.4%) spent ≤1,000 Naira per clinic visit with a mean of 897 ± 1,255 Naira on transport. Considering that most of the subjects are in the low socio-economic group, they might have been making a great sacrifice to keep their clinic appointments and to access their drugs. In a nationwide study by HERFON[52] in 2007, they found that half of the people living with HIV and AIDS (PLHAS), had problems not having enough money to eat, a place to live in, or for transportation. They also found that patients spent a mean of 5,000 Naira on buying other drugs and on transportation.

The difference in mean cost may be methodological. This study is hospital based while HERFON's was community based and nationwide. This study found no statistically significant association between adherence and cost incurred on transportation. This could be because many of the respondents are usually given their drugs for between 2 – 3 months before coming for refill, and some of the subjects collected drugs for their spouses while they attended clinics in turns to minimize cost of transportation. The government may need to help in this regard and the family physicians being an advocate for their patients should help them by way of advising government on the need to provide transport subsidy to patients, or provide home-based care programmes in collaboration with non-governmental organizations (NGOs) as it is being done in some African countries like Uganda by The Aids Support Organization (TASO).[53]

In this study, it was found that the majority of the respondents (64.8%) had been on ARVs for less than 2 years while the rest of them had been on treatment for more than 2 years. The mean duration of treatment was 20 months ± 14.75 months. This may be attributable to the fact that IHVN started to support this center with free ARVs about 2 years ago. HERFON[52] reported that 69.9% of patients started accessing ARVs in the last 3 years nationwide. Studies have shown that side effect of drugs (e.g lypodystrophy from stavudine) are dependent on treatment duration;[18] also that patients tend to have "drug fatigue" the longer they are on treatment and this reduces adherence to therapy.[54] It is therefore important to monitor patients closely for side effect of drugs including treatment failures and intensify adherence counseling the longer they are getting on their treatments.

Though the association between adherence level and duration of treatment was not statistically significant in this study ($p > 0.05$), it is similar to findings by Shaahu et al in Makurdi.[49] The high adherence in the respondents who were less than 2 years on treatment may be probably because they were anxious to see the clinical benefit of the drugs and also are yet to experience "drug fatigue". Other studies, however, have not shown any association between adherence and length of time on HAART.[55,56]

Lower number of pills taken had been shown to enhance adherence.[19] In this study, similar association between number of pills and adherence were established though this did not reach a significant level ($p > 0.05$). However, some studies[33, 56] found no association between dose frequency or pill burden and adherence level. Care givers should endeavor to limit drugs to only those that are essential, so that unnecessary pill burden is not placed on the patient which might compromise adherence.

Ninety two percent of respondents in this study recorded an increase in their CD4 counts from baseline, while 8.0% recorded a decrease in their CD4 counts in the course of treatment with ARVs. The mean CD4 gain was 236.4 cells / µl ± 198.2 cells / µl. This mean rise in CD4 counts is similar to (100 – 200 cells/ µl) found by Idigbe et al[31] in Lagos and 159 – 179 cells/µl in similar studies.[17,33] Adherence has been associated with CD4 in a number of settings.[17,33] The association between CD4 counts and adherence level was statistically significant in this study ($p < 0.05$).

Similar to the CD4 counts increase, 88.4% of adherent respondents recorded an increase in weight. 8.8% recorded a loss in weight while 2.8% had no change in weight. Those with no weight change or loss in weight may have been experiencing treatment failures, viral resistance or nutritional problems. Further studies may, however, be required to confirm this. The association between weight status and adherence level were not statistically significant in this study. ($p > 0.05$)

Though not statistically significant, the gain in weight by respondents, as well as that of increase in CD4 counts reported above is not surprising in view of the high adherence level of 90% obtained in this study. The free handout of ARV drugs, free CD4 counts and other investigations, regular health talk and adherence counseling as well as the professional approach by the care givers led by the Family Physicians in this center might have all contributed to this high adherence level of 90% obtained in this study. It is hoped that the Federal Government and collaborating partners will continue to support this center to sustain the gain.

Reasons proffered for missing doses by respondents in this study included in order of frequency, forgetfulness, missed clinic appointments and being away from home. Others are, running out of pills, and being too busy with other things. In his study, Ilyasu[37] found that non availability of drugs, lack of funds, exhaustion of drugs; forgetfulness and busy schedule were responsible for missing doses in Kano. The result from this study is similar to Gifford et al[57] who found that organizational difficulties such as too busy, simply forgot, away from home, and change in routine were most common reasons given for missed doses in their study. The difference in finding between this study and that of Ilyasu could be due to difference in periods of both studies. While this study was done at a period when the Federal government and its collaborating partners were supplying free antiretroviral drug to PLHAs, patients were buying their drugs in the other study.

Another reason for missing doses may be because of the difference in location and also different socio-cultural background of the subjects. This study has, however, shown that subjects have diverse reasons for failing to adhere to their antiretroviral regimens. This might require the offering of adherence-enhancing interventions according to the identified needs of individuals. Patients who are experiencing adverse effects are less likely to adhere than those who are tolerating the medications.[33] Side effects of treatment were mentioned in this study as a reason for missing doses but appeared not to be very important. Only 2.4% of respondents stated side effects as a reason for missing their drugs. This may probably be because majority of respondents either did not experience any adverse reactions, or might have adjusted to the adverse effects of the ARV drugs with time. This may have had a good implication for adherence to therapy.

CONCLUSION

The rate of adherence to antiretroviral therapy among Human Immunodeficiency Virus – infected patients at the University of Ilorin Teaching Hospital, was 90%. This rate is considered high and adequate compared to earlier reported studies. It is suggested that the free handout of

ARV drugs, free CD4 counts and other investigations, regular health talk and adherence counseling as well as the professional approach by the care givers led by the Family Physicians in this center might have all contributed to this impressive rate. An assessment of the relationship between rate of adherence and socio-demographic factors revealed that many were associated but none was statistically significant. Since the relationship between adherence and many of these socio-demographic factors have been reported to be controversial in other studies too, a study with a larger population size may be required to establish the true relationship between adherence and socio-demographic characteristics.

That significant association was established between patients' CD4 and adherence coupled with overall gain in weight and BMI in the majority of respondents again supports the high rate of adherence in this study.

STRENGHS AND LIMITATIONS TO THE STUDY

The strength of this study was in its ability to measure the variables that were set out to be investigated with strong statistical power. Another was the fact that respondents were very willing to participate in the study after they had been assured about confidentiality of information obtained from them. No drop-outs were recorded since the questionnaires were interviewer administered.

One limitation was that self-report is a less sensitive method to assess adherence because it can over estimate adherence, but it is a simple and efficient method of assessing adherence in clinical practice and has been correlated with viral load and CD4 counts in some studies.[40,47] However efforts were made to limit the problem of recall to one week preceding the study. Also respondents were made to identify their drugs from samples obtained from the pharmacy.

Another limitation was the inability to corroborate respondents' self-reports of adherence with viral load because of the exorbitant costs and its non availability in this center, however, the CD4 counts of respondents were used.

RECOMMENDATIONS

- Based on the high rate of adherence largely attributed to free drugs provided by the clinic, it is recommended that HIV clinics should be established and run on the basis of free drug policy.
- The UITH HIV clinic has a complement of high caliber health care workers. These include a consultant Family Physician, senior residents in family medicine, senior nurses, counselors and social workers supported by laboratories and pharmacy. This factor also contributed to the high adherence rate. It is recommended that HIV clinics should be well supplied not only with drugs but also with high level man-power.
- Based on the problem of transportation that affected a reasonable number of patients in this study and its relationship to adherence, it is recommended that Governments and NGOs should go beyond free drugs and establish zonal treatment centers as well home base care.
- In view of the significant relationship found between respondents' adherence and CD4 counts, it is recommended that Governments and their implementing partners should endeavor to provide and maintain all equipments necessary for monitoring patients on ARVs including that for viral load measurements.
- Many, if not all practicing Family Physicians will have to deal with HIV/AIDS issues frequently, although they may not be administering drugs. It is recommended that Family Physicians should be using patient self- report to help patients with adherence to their therapy at every clinic contact.
- By experience gained in this research, it is recommended that more Family Physicians should be encouraged to be involved in various aspects of HIV/AIDS research including adherence to therapy which is described as the "Achilles heel".
- All Community Health Centers should be made counseling and drug handout centers.

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