Journal of Advances in Virology Research
Volume 2 | Issue 1

Research Article Open Access

Level of Adherence to Antiretroviral Therapy Among People Living with HIV/AIDS in Ekiti State

Aduloju T[1*], Oluwadare CT[2], Aduloju OP[3]

[1]Centre for Gender and Development Studies, Ekiti State University, Ado Ekiti, Nigeria
[2]Department of Sociology, Ekiti State University, Ado Ekiti, Nigeria
[3]Department of Obstetrics and Gynaecology, Ekiti State University, Ado Ekiti, Nigeria

[*]**Corresponding author:** Aduloju T, Centre for Gender and Development Studies, Ekiti State University, Ado Ekiti, Nigeria. Tel: +2348037254033, E-mail: aduloju.tolu75@gmail.com

Citation: Aduloju T, Oluwadare CT, Aduloju OP (2022) Level of Adherence to Antiretroviral Therapy Among People Living with HIV/AIDS in Ekiti State. J Adv Virol Res 2(1): 103

Abstract

Introduction: The use of anti-retroviral drugs slows down disease progression in Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) and this has improved the quality of life and life expectancy of Persons Living with HIV/AIDS (PLWHA). However, optimum use of antiretroviral drugs (adherence) by PLWHA is the key to achieving viral load suppression and preventing drug resistance in them.

Objective: This study determined the level of adherence to Anti-Retroviral Therapy (ART) among PLWHA in Ekiti State.

Methodology: A cross-sectional study was conducted on 320 PLWHA in Ekiti State University Teaching Hospital, Ado-Ekiti and 300 PLWHA in Federal Teaching Hospital, Ido-Ekiti aged 18 years and above using ARV for at least six months prior to the study. Quantitative data were collected from the participants using a structured questionnaire while sixteen in-depth interviews were conducted among purposively selected PLWHA in both study centres to further elicit qualitative information on determinants of adherence. Quantitative data were analyzed with SPSS 22 using descriptive statistics while content analysis was used for qualitative data. Regression analysis was done to identify determinants of adherence at p value < 0.05.

Results: About 60% of the PLWHA had high level of ART adherence while 18.9% had low adherence. Most of the respondents were female (66.0%), married (76.1%) and Christians (89.4%) and had post-secondary education (43.4%). Respondents' age (X^2=32.483), educational status (X^2=2.473), marital status (X^2=40.083), occupation (X^2=57.951) and distance from the clinic (X^2=13.181) significantly influenced the level of adherence. Patient factors such as forget timing of the medication, pill burden and feeling better, psychosocial factors like stigmatization, non-disclosure of status and depression; and healthcare factors such as long clinic waiting time and absence of support are some of the barriers to optimum ART adherence.

Conclusion: Counseling on drug adherence and psycho-social support to PLWHA will further improve their level of adherence to medication.

Keywords: Adherence, Antiretroviral Therapy, People Living with HIV/AIDS, Psychosocial Factors

Introduction

Human immunodeficiency virus/ acquired immunodeficiency syndrome (HIV/AIDS) remains a public health disease especially in sub-Saharan Africa including Nigeria [1]. The prevalence of HIV/AIDS in Nigeria based on the recent Nigeria HIV/AIDS Indicator and Impact Survey is 1.4% [2] and is higher in female than male across the age groups [3]. The HIV prevalence in Nigeria appears to be reducing, with a relative stability in the HIV trends in the past few years till date. Adherence to Antiretroviral therapy (ART) is the mile stone of a successful therapy and this is achieved by sustaining optimal adherence of at least 95%. Successful ART provision thus required not just medical attention alone but also long term social and psychological support, including encouraging and monitoring adherence [4].

Adherence is a major predictor of the survival of individual living with HIV/AIDS and poor adherence to treatment is a major obstacle in the fight against HIV/AIDS [4]. However, there is need to also keep the morbidity and mortality associated with HIV/AIDS low by improving the adherence to antiretroviral therapy (ART) among People living with HIV/AIDS (PLWHA) [3]. Patient failure to follow ART regimen can lead to the development of treatment resistant strains and poorer health outcomes [5, 6].

Adherence to ART has been rated differently by different researchers using terms like low adherence, medium adherence and high adherence [7-10] while others rated adherence of PLWHA to ART medication as poor (missed more than 3 doses), fair (missed more than 2 doses), and good (missed less than 2 doses). There are several factors that have been reported from previous studies responsible for low adherence to ART. These factors include fear, stigmatization, distance from the clinics, missed clinic appointments, drugs side effects, poverty, intimate partner violence etc. [11, 12].

Several studies done in Nigeria have examined adherence to ART among HIV positive patients [8, 13, 14] with very few studies coming from Ekiti State and most of these studies used either quantitative or qualitative method. Therefore, this study was conducted to determine the level of adherence to ART and the determinant factors among People living with HIV/AIDS in Ekiti State using quantitative and qualitative methods. Findings from this study will identify peculiar factors contributing to ART adherence in Ekiti State and thereby help in designing of strategic interventions in the care of PLWHA in Ekiti Sate which will further strengthen HIV/AIDS services and treatment, thereby reducing the prevalence of the disease in Ekiti State. Also, the findings in this study will help to integrate the medical social services into the holistic HIV care and treatment of PLWHA in Ekiti State.

Materials and Methods

This was a multicenter cross-sectional study carried out in the Anti-retroviral Clinics of Ekiti State University Teaching Hospital (EKSUTH), Ado-Ekiti and Federal Teaching Ido-Ekiti (FETHI), Ekiti State between 1st February 2020 and 31st July 2022. Ekiti State is one of the Southwestern states of Nigeria with a projected population of 3.4 million people who are mostly into farming and the much educated in civil service employment. It is bounded by Osun, Ondo, Kogi and Kwara States. EKSUTH and FETHI are two public tertiary hospitals in Ekiti State that serve as referral centres for primary and secondary healthcare facilities in Ekiti State. Both centres have dedicated HIV clinic that runs on Tuesdays, Wednesdays and Thursdays and managed by a team of trained medical personnel.

Using the Yamane (1967) proportional sample size computation based on the population of PLWHA in both centres and 10% non-response rate, a sample size of 330 and 317 PLWHA were calculated for EKSUTH and FETHI respectively with a total sample size of 647 PLWHA for this study. The participants were selected using systematic random sampling with the clinic register as the sampling frame on each clinic day and every fourth person on the register was selected until the required sample size was attained.

The study population was people living with HIV/AIDS attending dedicated HIV clinic of EKSUTH and FETHI. The inclusion criteria were PLWHA aged 18 years and above, being on ART for a minimum of six months prior to this study and who gave their consent to participate in the study. PLWHA on ART for less than six months and did not consent to participate were excluded from the study. Information was collected from the respondents using both quantitative data (questionnaire) and qualitative data (in-depth interview).

The questionnaire for the quantitative data was adapted from similar studies on adherence and comprised four sections. Section A inquired information about socio-demographic characteristics of PLWHA such as age; sex; educational level; marital status and access to health facility among others, Section B examined the prevalence of Adherence using the Simplified Medication Adherence Questionnaire (SMAQ), Section C focused on determining the client's level of adherence based on self-report and keeping hospital appointment and this was determined using Morisky Medication Adherence Scale-8 (MMAS-8) while Section D determined the factors associated with adherence or non-adherence such as social support; socio-economic factors; stigmatization and level of alcohol use. The SMAQ scale contains six questions with a dichotomous response stem. It was rated 1 for "Yes" and 0 for No answers and these were applicable to questions 1 to 4 while questions 5 & 6 were rated 0 for "Never" and 1 for any other responses while the MMAS-8 consists of seven dichotomized responses of "Yes" and "No" scored 1 and 0 respectively while the eighth question assesses how often the client has difficulty remembering to take the medication with a five-point Likert scale graded as (a) never, (b) once in a while, (c) sometimes, (d) usually and (e) all the time and a is scored 0 while b-e is scored 1. Adherence is determined using the total scores obtained from the eight questions and rated as high adherence with a total score of 0 and 1, medium adherence with a score of 2 and low adherence with a score greater than 2.

The pretested interviewer administered questionnaire was filled by the respondents with the guidance of trained research assistants.

Eight in-depth interviews each were conducted among the women in EKSUTH and FETHI with an interview tool containing a list of open-ended questions which were used to explore the respondents' knowledge about the ART, prevalence of adherence to ART, how rural and urban differentials affect adherence and assessing the clients' view on factors contributing to adherence to antiretroviral therapy. The study participants were selected through purposive sampling method. One person was assigned for taking note and tape recording while the principal investigator facilitated the interview. Interviewer guide was used to facilitate the in-depth interview.

Data collected were entered into and analyzed using the IBM SPSS Statistics for Windows, version 22 (IBM Corp., Armonk, N.Y., USA). Categorical variables were presented in frequency and percentages while continuous variables were expressed in mean and standard deviation. Chi square was used in testing for significance for categorical variables and student t test for continuous variables. P value < 0.05 was considered statistically significant. Multivariate logistic regression analysis was done to identify factors determining ART adherence.

The recorded tape from in-depth interview was transcribed verbatim as it was recorded from the clients. This was later translated to English text by the researcher and analyzed using thematic content analysis. The results of the themes were presented in narration.

Ethical approval was obtained from the Ethics and Research Committees of Ekiti State University Teaching Hospital (EKSUTH/A67/2020/01/002), Ado-Ekiti, Office of Research and Development, Ekiti State University, Ado-Ekiti (ORD/AD/EAC/19/0052) and Human Research and Ethics Committee, Federal Teaching Hospital, Ido-Ekiti (ERC/2020/27/330A).

Results

A total of 620 questionnaires that were completely filled and returned were analyzed with a response rate of 95.8%.

The figure 1 shows that about three-fifths (59.5%) of the PLWHA in Ekiti State had high level of adherence to ART, 21.6% had medium adherence while 18.9% had low adherence to their ART medication.

The mean age of the respondents was 44.60 ± 12.50years. About two-thirds (66%) of the respondents were female while three-quarters (76.1%) of them were married. Most (89.4%) of the respondents were Christians, 84% of them had post-primary education while 64.7% of them were traders. Also, about two-thirds (66.5%) of the respondents come from a distance of less than one hour to

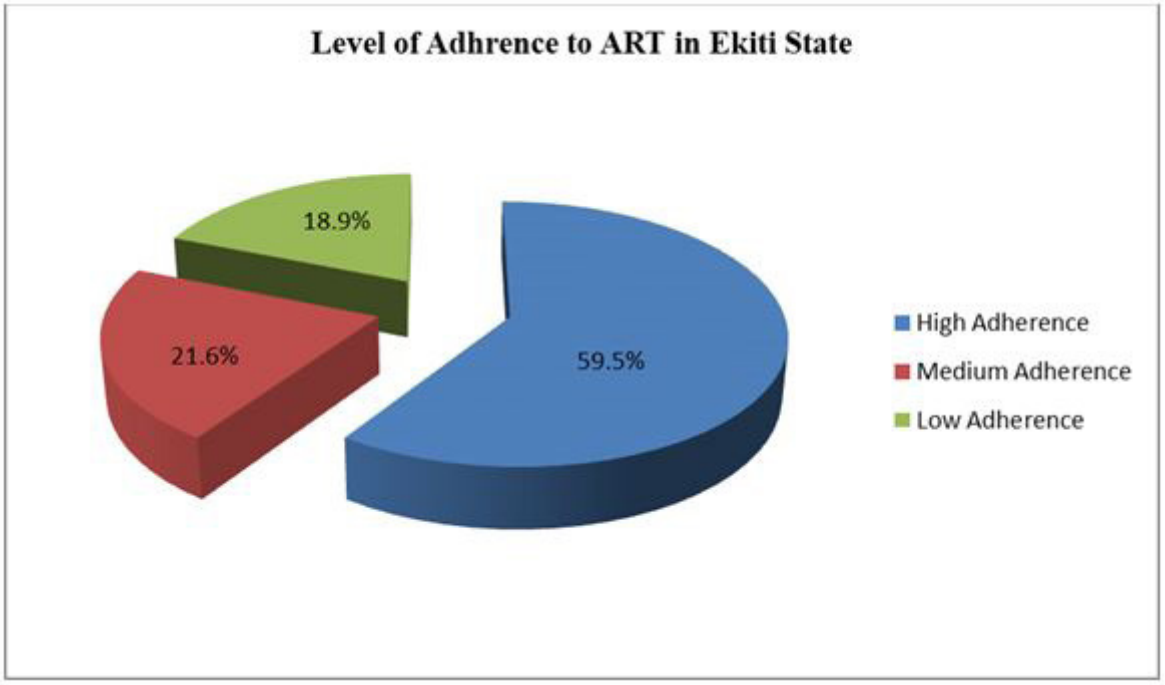

Figure 1: Level of Adherence of Respondents to ART in Ekiti State

the clinic with three-fifths (61.1%) of them spending about five hundred naira as transport fare. Most (86.5%) of the respondents come to the clinic using commercial transportation and about 91.1% of them do not take alcohol. Most (90.3%) of the respondents are on once daily medication dosage and 68.1% of them are on one pill per day. Other socio-demographic characteristics of the respondents are as shown in table one. The socio-demographic variables such as the age, marital status, religion, education and occupation of the respondents, alcohol intake, number of pills per day, duration on ART, distance from the clinic and average transport fare significantly ($p<0.05$) influence ART adherence among the respondents as shown in Table 1.

Variables	Frequency N (%)	Level of Adherence			Chi Square	p value
		High N=369 (%)	Medium N=117 (%)	Low N=134 (%)		
Age (years)						
18-39	171 (27.0)	58 (15.7)	44 (37.6)	69 (51.5)	71.347	0.000*
40-59	366 (59.0)	254 (68.8)	62 (53.0)	50 (37.3)		
60 & above	83 (13.4)	57 (15.4)	11 (9.4)	15 (11.2)		
Mean ±SD	44.60 ± 12.50 years					
Marital Status						
Married	472 (76.1)	290 (78.6)	83 (70.9)	99 (73.9)	40.083	0.000*
Single	71 (11.3)	26 (7.0)	27 (23.1)	18 (13.4)		
Co-habiting	12 (1.9)	9 (2.4)	2 (1.7)	1 (0.7)		
Divorced	8 (1.3)	1 (0.3)	3 (2.6)	4 (3.0)		
Separated	7 (1.1)	5 (1.4)	0 (0)	2 (1.5)		
Widowed	50 (8.1)	38 (10.3)	2 (1.7)	10 (7.5)		
Religion						
Christianity	554 (89.4)	332 (90.0)	111 (94.9)	111 (82.8)	11.189	0.025*
Islam	61 (9.8)	33 (8.9)	6 (5.1)	22 (16.4)		
Traditionalist	5 (0.8)	4 (1.1)	0 (0.0)	1 (0.7)		
Education level						
No education	30 (1.8)	29 (7.9)	1 (0.9)	0 (0.0)	31.576	0.000*
Primary	69 (11.1)	50 (13.6)	10 (8.5)	9 (6.7)		

Secondary	252 (40.6)	139 (37.7)	43 (36.8)	70 (52.2)		
Tertiary	269 (43.4)	151 (40.9)	63 (53.8)	55 (41.0)		
Occupation						
Unemployed	41 (66.0)	22 (6.0)	18 (15.4)	1 (0.7)	57.951	0.000*
Employed	72 (11.6)	41 (11.1)	9 (7.7)	22 (16.4)		
Retired	65 (10.5)	44 (11.9)	2 (1.7)	19 (14.2)		
Student	41 (6.6)	12 (29.3)	18 (43.9)	11 (26.8)		
Trading	401 (64.7)	250 (67.8)	70 (59.8)	81 (60.4)		
Sex						
Male	211 (34.0)	132 (62.6)	41 (19.4)	38 (18.0)	2.473	0.290
Female	409 (66.0)	237 (57.9)	76 (18.6)	96 (23.5)		
Alcohol intake						
No	565 (90.3)	352 (62.3)	108 (19.1)	105 (18.60	35.534	0.000*
Yes	55 (8.9)	17 (30.9)	9 (16.4)	29 (52.7)		
Pills per day						
1	422 (68.1)	273 (64.7)	76 (18.0)	73 (17.3)	23.079	0.001*
2	166 (26.8)	76 (45.8)	37 (22.3)	53 (31.9)		
3-4	29 (4.7)	8 (27.6)	4 (13.8)	17 (58.6)		
> 4	3 (0.5)	1 (33.3)	0 (0)	2 (66.7)		
Duration on ART (months)						
6 - 11	284 (45.8)	139 (48.9)	56 (19.7)	89 (31.3)	33.402	0.000*
12 - 24	190 (30.6)	132 (69.5)	35 (18.4)	23 (12.1)		
> 24	146 (23.5)	98 (67.1)	26 (17.8)	22 (15.1)		
Distance from clinic (hours)						
< 1	412 (66.5)	264(71.5)	63 (53.8)	85 (63.4)	13.181	0.01*
≥ 1 hour	208 (33.5)	105 (28.5)	3 (5.5)	43 (78.2)		
Average transport fare						
< #500	379 (61.1)	241 (65.3)	53 (45.3)	85 (63.4)	40.003	0.000*
#500 - #1500	208 (33.5)	83 (22.5)	30 (25.6)	41 (30.6)		
#1501 - #3000	58 (9.4)	31 (8.4)	19 (16.2)	8 (6.0)		
≥ #3001	29 (4.7)	14 (3.8)	15 (12.8)	0 (0.0)		
Mode of transportation						
Private	84 (13.5)	52 (14.1)	18 (15.4)	14 (10.4)	1.530	0.465
Commercial	536 (86.5)	317 (85.9)	99 (84.6)	120 (89.6)		

*Statistically significant @ p value < 0.05

Table 1: Socio-demographic factors determining ART adherence among PLWHA

Table 2 shows that majority of PLWHA (48.6%) that do forget the timing of their drug had low adherence while majority (71.8%) of those that always remember their timing had high adherence. Also, those (48.6%) that did not take their drugs because they felt better, those (83.3%) that indulge in alcohol intake while on ART, those (51.6%) that don't use their drug when they are fasting, those (41.8%) that left it because of side effect and those (88.9% and 100%) that took local and imported herbal medicine respectively all had low adherence level to ART while those that did not do all these had high adherence to ART. This implies that all these patient related factors had significant effect ($p<0.05$) on the level of adherence of PLWHA to ART.

Variables	Frequency N (%)	Level of Adherence			Chi Square	p value
		High N=369 (%)	Medium N=117 (%)	Low N=134 (%)		
Forget timing						
No	482 (77.7)	346 (71.8)	69 (14.3)	67 (13.9)	141.096	0.000*
Yes	138 (22.3)	23 (16.6)	48 (34.8)	67 (48.6)		
Busy schedule						
No	463 (74.7)	343 (74.0)	59 (12.7)	61 (13.2)	161.789	0.000*
Yes	157 (25.3)	26 (16.6)	58 (36.9)	73 (46.5)		
I felt better						
No	410 (66.1)	267 (65.1)	71 (17.3)	72 (17.6)	17.136	0.000*
Yes	210 (33.9)	62 (29.5)	46 (21.9)	102 (48.6)		
Too much pills						
No	599 (96.6)	365 (60.9)	112 (18.7)	122 (20.4)	122.016	0.000*
Yes	21 (3.4)	3 (14.3)	5 (23.8)	13 (61.9)		
Started new relationship						
No	591 (95.3)	362 (61.3)	114 (19.3)	115 (19.5)	34.703	0.000*
Yes	29 (4.7)	7 (24.1)	3 (10.3)	19 (65.5)		
Travelled						
No	552 (89.0)	357 (64.7)	93 (16.8)	102 (18.5)	61.248	0.000*
Yes	68 (11.0)	12 (17.6)	24 (35.3)	32 (47.1)		
Wanted to avoid side effect						
No	541 (87.3	352 (65.1)	88 (16.3)	101 (18.7)	42.017	0.000*
Yes	79 (12.7)	17 (21.5)	29 (36.7)	33 (41.8)		
Religion (fasting)						
No	556 (89.7)	359 (64.6)	96 (17.3)	101(18.2)	63.114	0.000*
Yes	64 (10.2)	10 (15.6)	21 (32.8)	33 (51.6)		
Too much alcohol						
No	608 (98.1)	368 (60.5)	116 (19.1)	124 (20.4)	39.921	0.000*
Yes	12 (1.9)	1(8.3)	1(8.3)	10(83.4)		
Taking local herbs	41 (6.6)	12 (29.3)	18 (43.9)	11 (26.8)		
No	611 (98.5)	369 (60.4)	116 (19.0)	126 (20.6)	24.852	0.000*
Yes	9 (1.5)	0 (0.0)	1 (11.1)	8 (88.9)		
Taking imported herbs						
No	615 (99.2)	369 (60.0)	117 (19.0)	129(21.0)	39.921	0.000*
Yes	5 (0.8)	0 (0.0)	0 (0.0)	5 (100.0)		

*Statistically significant @ p value < 0.05

Table 2: Patient related factors determining level of Art adherence among PLWHA

The psychosocial factors of the respondents such as shortage of food, no food to eat, previous stigmatization, non-disclosure of status, no transport fare and being depressed were associated with low level of adherence to ART among them and they were statistically significant, $p<0.05$ as shown in table 3.

Variables	Frequency N (%)	Level of Adherence			Chi Square	p value
		High N=369 (%)	Medium N=117 (%)	Low N=134 (%)		
Shortage of food						
No	565 (91.1)	360 (63.7)	114 (20.2)	91 (16.1)	10.059	0.007*
Yes	55 (8.9)	9 (16.4)	3 (5.4)	43 (78.2)		
No food to eat						
No	604 (97.4)	364 (60.2)	117 (19.4)	123 (20.4)	9.473	0.009*
Yes	16 (2.6)	5 (31.3)	0 (0.0)	11 (68.7)		
Stigmatized before						
No	558 (90.0)	354 (63.4)	102 (18.3)	102 (18.3)	16.169	0.000*
Yes	62 (10)	15 (29.5)	15 (21.9)	32 (48.6)		
Have you disclosed your status?						
No	193 (31.1)	60 (31.8)	41 (21.2)	92 (47.7)	54.303	0.000*
Yes	427 (68.9)	309 (72.4)	5 (23.8)	42 (9.8)		
No transport fare						
No	566 (91.3)	357 (63.1)	103 (18.2)	106 (18.7)	10.830	0.004*
Yes	54 (8.7)	12 (22.2)	14 (25.9)	28 (51.9)		
Need to be intimate with partner						
No	554 (89.4)	347 (62.6)	109 (19.7)	98 (17.7)	6.784	0.034*
Yes	66 (10.6)	22 (33.3)	8 (12.2)	36 (54.5)		
Do not want others to drugs notice me taking my drugs						
No	458 (73.9)	319 (69.7)	83 (18.1)	56 (12.2)	36.141	0.000*
Yes	162 (26.1)	50 (30.9)	34 (21.0)	78 (48.1)		
I felt depressed and disappointed in myself						
No	523 (84.4)	351 (67.1)	85 (16.3)	87(16.6)	82.891	0.000*
Yes	97 (15.6)	18 (18.6)	21 (33.0)	47 (48.5)		

*Statistically significant @ p value < 0.05

Table 3: Psychosocial factors determining level of ART adherence among PLWHA

On regression analysis of the various significant factors influencing level of ART adherence among PLWHA (from Chi-square analysis), sex and occupation of the participants, forgetting timing of medication, feeling better, pill burden, side effects of medication, religious fasting/praying, non-disclosure of status and depression were the determinant factors affecting level of ART adherence among PLWHA as shown in Table 4.

Variables	Coefficient	Standard Error	P>/Z/	95%CI
Socio-economic factors				
Age (years)	0.0106217	0.0075261	0.158	-0.0041 - 0.0254
Sex	0.7237442	0.2084093	0.001*	0.3152 - 1.1322
Marital status	0.0967689	0.0606924	0.111	-0.0221 - 0.2157
Religion	0.4205863	0.2267516	0.064	-0.0238 - 0.8650
Education	0.04965	0.1222378	0.685	-0.1899 - 0.2892
Occupation	-0.15046	0.0681505	0.027*	-0.2840 - 0.0168
Patient related factors				
Forget timing	0.8754996	0.2186134	0.000*	0.4470 - 1.3040
My busy schedule	0.4086769	0.2332263	0.080	-0.0484 - 0.8658
I felt better	0.4648624	0.2145024	0.030*	0.0444 - 0.8852
Having too many pills	1.910485	0.4755743	0.000*	0.0978 - 2.8424
Started new relationship	0.1434076	0.4081716	0.725	-0.6565 - 0.9434
Avoiding side effects	-1.892175	0.366523	0.000*	-2.6105 - 1.1738
Religious (fasting)	1.16237	0.3172802	0.000*	0.5405 – 1.7842
Too much alcohol	-1.702155	16.42786	0.917	-33.9001-30.4958
Taking local herbs	2.08036	1.269128	0.101	-0.4071 – 4.5678
Taking imported herbs	1.17236	0.876345	0.211	-0.2341 - 2.1442
Psychosocial factors				
No food to eat	-0.9775463	0.6226444	0.116	-2.1979 - 0.2428
Stigmatized before	-0.3756959	0.2585311	0.146	-0.8824 - 0.1310
Status disclosure	-0.9470666	0.1870826	0.000*	-1.3137- -0.5803
No transport fare	0.0363653	0.2860054	0.899	-0.5241 - 0.5969
Intimacy with partner	-0.5037984	0.3255292	0.122	-1.1418 - 0.1342
Fear of my spouse knowing	-0.5249318	0.3617761	0.147	-1.2340 - 0.1841
Don't want others noticing	0.6439676	0.2137397	0.003*	0.2250 – 1.0629
Feel depressed	0.9051007	0.2160949	0.000*	0.4816 - 1.3286
Can't afford cost of drugs	1.360097	0.5364335	0.011*	0.3087 - 2.4115

*Statistically significant @ p value < 0.05 CI: Confidence Interval

Table 4: Regression analysis of factors determining ART adherence among PLWHA

Discussion

The study found that more respondents scored high in ART adherence in the state and this finding was in accordance with what was reported by Adeoti et al [8]. This shows that the adherence rate in Ekiti State generally is high compared to most other states in Nigeria. Health education on the benefits and importance of drug adherence are likely to explain the reason for this finding. Proximity of clients to the health facility seems to also influence why more of those who adhered to ART medication achieved high level of adherence. Similar to the study carried out by some group of researchers in a rural setting in Cross Rivers State, PLWHA from urban setting achieved a higher level of adherence than PLWHA from rural setting [9]. This was attributed to low socioeconomic status of the PLWHA. Despite the high level of adherence to ART demonstrated by PLWHA in Ekiti State, the minority of them that had low level of adherence to ART associated this with fear of stigmatization, non-disclosure of their status and forgetfulness.

Also, a higher level of adherence to ART was recorded among PLWHA who are male compared to their female counterpart. This was similar to findings of other studies that reported that higher percentage of male respondents achieved higher level of adherence compared to their female counterpart [15-17]. This might be due to their low socioeconomic status and gender inequality which makes non-disclosure of status to be higher among female ART users. These reasons were discovered from this study and corroborated by the responses of the female PLWHA from the in-depth interviews. This is still embedded in gender inequality that always plays out in patriarchal societies as it was also opined by other researchers in previous studies [17, 18].

PLWHA within the age group 40-59 years demonstrated better adherence to ART than the other age groups in this study. This finding is consistent with a study carried out at Nnewi, Nigeria by Okoronkwo et al, where they found a significant association between age group of respondents and ART adherence [19]. This was also supported by the report of a survey done by Uwakwe et al at a tertiary hospital in Imo State that found a significant association between age of the respondents at the hospital and their level of adherence [20]. This might be as a result of the fact that people in this middle age group tend to be concerned about their health status because of the various health challenges that may come up within this age group and sociocultural pressure on them to survive. Hence, they are more careful and take instructions and counseling from health workers including medication adherence very serious.

PLHWA with higher education status adhered more to their drugs than those with low education status in this study. This was similarly reported in a previous study by Heestermans et al that there exist a significant association between education status of the clients and ART adherence [21]. The likely explanation to this finding could be as a result of the fact that education improves access to information including health information that increases their knowledge and awareness of health-related issues.
This study also found a significant association between religion and adherence to ART by the PLWHA. This is in agreement with findings in previous studies where a significant association was established between religion and ART adherence among PLWHA. Majority of people living in Ekiti State are Christians and this would probably explain why Christian PLWHA adhered more to their ART than their Muslim counterpart.

Furthermore, under psycho-social factors, this study found out that depression and fear of stigmatization in the form of avoiding people who can notice them when taking ART medication as major factors contributing to medication adherence failure. This was supported by findings from studies carried out by Afe et al and Babatunde et al where they opined that social or family stigmatization and fear of the consequences of status disclosure are significantly related to poor adherence [14, 22]. According to Afe et al, stigmatization and discrimination against PLWHA still persist in our society despite the efforts that both government and non-governmental organizations have channeled towards reducing stigmatization [14]. In addition, it was discovered in this study that some of female in-depth interview participants had not disclosed their HIV status to anyone and this non-disclosure was due to the fear of being stigmatized. The reason for stigmatization could be due to the fact that majority of people still view HIV/AIDS as infirmity resulting from promiscuity.

Furthermore, depression and feeling of self-disappointment were reasons why some of the PLWHA would miss taking their drugs. This was supported by the findings of the study conducted Afolabi et al who reported that depression was a predictor of non-adherence to ART [23]. Good relationship with the health workers was associated with good adherence to ART in majority of the respondents in this study and this was similarly reported by Sakthivel et al in their study. They opined that good relationship between the health care workers and the clients would promote good adherence to ART [7]. This was corroborated by the participants in the in-depth interview during which some of the respondents mentioned that the health care workers even called them to remind them of their hospital appointment and encouraged them to use their drugs well and this strengthens their level of adherence.

The strength of this study is the fact that both qualitative and quantitative methods were used. The limitation of the study included the use self-reported recall by PLWHA as a measure of adherence and this is subject to recall bias of the drugs missed in the last two weeks. In addition, blood viral load estimation should have been done to actually measure real time viral suppression expected to be associated with optimum adherence to ART medication.

In conclusion, this study revealed that there is high level of adherence to ART among PLWHA in Ekiti State. However, socio-economic factors such as age and occupation of participants; patients' factors such as feeling better, side effects of the medication, high pill burden and religious fasting and praying; psycho-social factors like stigmatization, non-disclosure of status and depression; and healthcare factors such as long clinic waiting time and absence of support are some of the barriers to optimum ART adherence. The medical social workers in Ekiti State should address psycho-social factors like lack of food, stigmatization, non-disclosure of status and domestic or gender-based violence that could have adverse effects on the clients' use of their medication. This will thereby improve the social functioning of PLWHA, enable them to achieve a reasonable degree of fulfillment and consequently function as productive and contributing members of the society.

Acknowledgments

The authors wished to acknowledgment the clients who participated in the study as well as the research assistants who helped in the administration of the questionnaires. The authors declared no conflict of interest and there was no external funding.

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Supplementary Information

Excerpts from In-depth Interviews on Level of Adherence to ART in Ekiti State

Data gathered from selected ART users in EKSUTH and FETHI on level of adherence to ART show that there is high level of adherence from both facilities unlike that gathered from the quantitative data where EKSUTH patients had a higher level of adherence, Since I have started the once daily drug I have been consistent in taking my medication, Though twice last week I missed my drug because I travelled and I thought I will come back that day but I could not for two days and I did not go with my drugs, I still take alcohol and once in a while and I take herbal medicine to treat malaria, (**IDI/FETHI/Married/Male/50 Years/Driver/Islam)** I had never for one day forget to take my drug, I had set it on alarm I use it as soon as my alarm beeps I think setting alarm has really helped me to stick to my medication plans, Also the support I always get from the hospital staff has really helped me in sticking to my medication plan, The health workers are very good and always ready to explain and give assistance whenever and wherever is needed, Also one of the things I will say that help me with the drugs and keep me going with my condition is the support group we use to have that time, This group consists of PLWHA and we do share our burden and experience together, (**IDI/FETHI/Divorced/Female/62Years/Self Employed/Christianity)** I use my drug very well, I don't miss my drug since I set an alarm for it, I started using this drug eight years ago, I started with the one we take at night before the one we are now taking in the morning, So presently I take my drug in the morning, (**IDI/EKSUTH/Single/Female/26Years/**

Student/Christianity) I use my drug at 7am and I have set it on alarm, Once the alarm on my phone beeps I will quickly use my drugs, Even when I am travelling I go with my drugs, I am a farmer before setting out in the morning I would have taken my drugs, There should not be anything that will make one not to use one's drug, I have never been stigmatized before I only told my children, (**IDI/EKSUTH/Female/38 Years/Farming/Christianity)** Despite the high level of adherence to ART reported by respondents from both health facilities some also reported they had abandoned their ART drugs at some points due to the side effects of their usage:

I have abandoned my drug before and the repercussion was severe, I was sick to near death, I use my medication once daily 7am, I don't forget to use the drug because I use Radio programme (News) to remember my timing, During the COVID 19 lockdown I had no transport fare so I could not come to the hospital for refill and I missed my drugs completely for days before I could get transport, At times I forget the timing but I don't miss the drug, I travelled one day and I did not go with my drugs so I missed the drug, Side effects of the drug initially affected my drug use, (**IDI/EKSUTH/Widower/Male/55Years/Teaching/Christianity**) I will not say I use my drug well sometimes because at a particular time I got tired of using drug every day, So I started skipping my drugs and at-times I will miss the time until when I did my viral load and my nurse told me my viral load was high, Immediately I know it was because I had not been using the drug well, So since that time that the counselor told me the consequences of my actions I have started using it as expected, (**IDI/FETHI/Married/ Male/49 Years/Trading/Christianity)**

The socio-demographic factors determining ART adherence among PLWHA from excerpts from qualitative findings from FETHI and EKSUTH ranges from personal work psychological marital economic religious activities (fasting) people around among others, I have never missed my drug since I started using my medication, my phone alarm will always remind me and even my children are supporting me, though at the initial stage it was not easy.

The health workers have been trying by giving us adequate information whenever I am in the clinic, they are all approachable and even call you to remind you of your hospital appointment, I have a good time with all the health workers; the only challenge is long waiting time, I don't have any challenges taking my drugs at all, **(IDI/EKSUTH/Female/38 Years/Farming/Christianity)**

As for me settling alarm to remind me of the time of my medication has been working for me since I started doing that, also busy schedule can make one to forget completely to use once drug either at the stipulated time of not even use it at all, No I did not tell anyone about my status so no one can stigmatize me at all, I have a very cordial relationship with all the staff, they all have good human relations, (**IDI/EKSUTH/Married/Male/47Years/Civil Servant/Christianity)**

If one set one's phone on alarm the tendency that one will forget to use one drug is low, Even though one may be busy- because this can also make one to miss one drug but if you set alarm on your phone it will remind you, Also lack of money like now I am a student if there is no transport fare for me to come to the hospital for my drug pick up and I ran out of my drug there is no way I will not miss my drug, Well nobody knows about my status not even my parents, I use my drug before leaving for class and I don't discuss my personal issue with anybody, So there is no room for stigmatization at all, But I know if my friends get to know they might start running from me, Very cordial all the clinic staff members are very okay and very caring they make me fell wanted, **(IDI/EKSUTH/**

Single/Female/26Years/Student/Christianity)

Some respondents from FETHI added that:

There are lots of factors that can make one to use or not to use one's drug for example if one forgets or mistakenly left it at home while going out or traveling, Also if one feels depressed about having to take this drug all the time throughout one's life time it can weigh one down and at times one will not even feel like taking the drug, It could also be fear of someone getting to see that one is using drug, Avoiding side effect can also make one to stop, But for me none of these affects me because I have determined to use my drug any drug well, Nothing can make me stop using my drugs, My relationship with health care workers at the clinic is very cordial I am always happy to go for my appointment, (**IDI/FETHI/Married/Male/50 Years/Civil Servant/Islam**)

There could be so many factors out of which can be (1) forgetfulness (2) traveling and leaving the drug behind (3) when one is tired of using the drug fear of one spouse getting to know especially if one has not disclose to him/her (4) some people can also miss their drug because of fasting, Even if the hospital environment is not friendly some will prefer to stay at home and die instead of coming to a place where they will be stigmatized, **(IDI/FETHI/Divorced/Female/62Years/Self-Employed/Christianity)**

There are lots of things that could make one to use or not to use the medication well things like: busy schedule forgetfulness and travelling like that time I told you I travelled and did not come back the same day, Another one is stigmatization which I think is still very common, Religious fasting and long waiting period of time at the clinic can also contribute to one not using one's drugs very well, On the other hand with good counseling and adequate support from the clinic the burden will be less, **(IDI/FETHI/Married/Male/49 Years/Civil Servant/Islam)**

Questionnaire

Centre: EKSUTH ☐ FETHI ☐ (tick as applicable) Case note Number……,

Section A: SOCIO-ECONOMIC BACKGROUND (Kindly tick where appropriate)

1. Age: ----------
2. Sex: Male[ ] Female[ ]
3. Marital status: Married[ ] Single[ ] Co-habiting[ ] Divorced [ ] Separated [ ] Widowed[ ]
4. Religion: Christianity [ ] Islam[ ] Traditionalist [ ] others[ ]
5. Educational Level: No formal education[ ] Primary[ ] Secondary[ ] Graduate/Tertiary[ ]
6. Occupation: Unemployed [ ] Employed[ ] Retired[ ] Student[ ] Trading/Business[ ]
7. Distance from clinic: <1hour[ ] >1hour[ ]
8. Average transport fare from house to clinic: <₦500[ ] ₦501-₦1500 [ ] ₦1600-₦3000 [ ] ₦3001 - ₦5000[ ]
9. Transport [ ] Private[ ] Commercial[ ]
10. Do you take alcohol Yes [ ] No [ ]
11. What is the prescribed dosage of your medication: Twice daily once daily
12. How many pills do you take per day 1 ☐ 2 ☐ 3-4 ☐ >4 ☐
13. Duration of your ART 6 -11 months ☐ 12-24months ☐ >24months ☐

Section B: ART KNOWLEDGE: Please read through and tick the one that is most appropriate to you, Section C: Prevalence of Adherence to ART (1) (0)

Option		Yes	No	Don't know
1.	HIV is controlled by ART			
2.	ART reduces HIV related morbidity			
3.	ART reduces HIV related mortality			
4.	ART is very effective			
5.	ART can cure HIV			
6.	ART reduces pain			
7.	ART reduces progression of HIV			
8.	ART can prevent mother to child transmission			
9.	Missing ARV doses can lead to disease progression			
10.	I know how to deal with the side effect of my drug			

1. Do you ever forget to take your medicine Yes [ ] No[ ]
2. Do you always take your medication at the time indicated? Yes [ ] No[ ]
3. Sometimes if you feel worse do you stop taking your medication? Yes [ ] No[ ]
4. Thinking about last week how often have you not taken your Medicine

   Never ( ) 1-2 times ( ) 3-5 times ( ) 6-10 times ( ) >10 times ( )
5. Did you take any of your medication over the past weekend Yes [ ] No[ ]
6. Over the past two months how many days have you not taken any medicine at all

   None ( ) 1-2days ( ) 2days ( ) >2days ( )

Section D: Level of ART Adherence to ART

Questions	Answer (Yes or No)	Score
1. Do you sometimes forget to take your medication?		Y=1 N=0
2. People sometimes miss taking their medication for reason other than forgetting, thinking over the past 2 weeks were there any days when you did not take your medications?		Y=1 N=0
3. Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it?		Y=1 N=0
4. When you travel or leave home do you sometimes forget to bring along your medications?		Y=1 N=0
5. Did you take all your medicine yesterday?		Y=1 N=0
6. When you feel like your symptoms are under control do you sometimes stop taking your medications?		Y=1 N=0
7. Taking medicines every day is a real inconvenience for some people, do you ever feel hassled about sticking to your treatment plan?		Y=1 N=0
8. How often do you have difficulty remembering to take your medicine? A, Never/rarely B, once in a while C, Sometimes D, Usually E, All the time	A= 0 B - E= 1	

38. What factors do you think contribute to your using or not using your medications as required?

Tick as appropriate

Patient related factors (1) (0)

i. I Forget the timing Yes[ ] No [ ]
ii. My Busy schedule Yes[ ] No [ ]
iii. I Feels better Yes[ ] No [ ]
iv. Having too many pills to take Yes[ ] No [ ]
v. I started a new relationship Yes[ ] No [ ]
vi. I travelled Yes[ ] No [ ]
vii. I wanted to avoid side effects Yes[ ] No [ ]
viii. Religious (fasting Praying) Yes[ ] No [ ]

ix. Having too much alcohol to drink Yes[ ] No [ ]
x. I was taking local remedies native herbs Yes[ ] No [ ]
xi. I was introduced to imported herbal remedy Yes[ ] No [ ]

Psycho-social Challenge (1) (0)
xii. I Felt depressed disappointed in myself Yes [ ] No [ ]
xiii. I Fear of my spouse getting to know Yes[ ] No [ ]
xiv. I do not want others to notice me taking medication Yes[ ] No [ ]
xv. I need to be intimate with my partner Yes[ ] No [ ]
xvi. I can no longer afford the cost of the medication Yes[ ] No [ ]
xvii. I don't have transport fare Yes[ ] No [ ]
xviii. Have you disclosed your status to anyone? Yes [ ] No [ ]
If yes to who_____
If no why_____
xix. Have you been stigmatized before by anyone who knows your status or you think might know your status? Yes[ ] No[ ]
xx. I have no food to eat Yes [ ] No [ ]
xxi. Shortage of food Yes[ ] No [ ]
xxii. Is there anyone who is supporting your treatment Yes [ ] No[ ]
If yes who (you can pick more than one options)
Parent siblings Spouse Pastor/Imam Children NGO Government