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Factors associated with non-adherence of HIV/AIDS patients to HAART regimen in a healthcare facility in Ikot Ekpene, Akwa Ibom State, Nigeria

Augustina Onwunata[1*], Omotayo O. Ebong[2] and Geoffrey Enoh[1]

[1]General Hospital Ikot Ekpene, Akwa Ibom State, Nigeria.
[2]Department of Pharmacology, Faculty of Basic Medical Sciences, College of Health Sciences, University of Port Harcourt, Port Harcourt, Rivers State, Nigeria.

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Adherence to highly active antiretroviral therapy (HAART) regimen, of at least 95%, is necessary for effective therapeutic response among people living with human immunodeficiency virus (PLWHIV). This study determined the factors associated with non-adherence of PLWHIV to HAART regimen among patients attending a healthcare facility in Akwa Ibom State, Nigeria. Two hundred and fifty one patients, aged 18 to 70 years, attending a healthcare facility in Akwa Ibom State, Nigeria from 8th July to 8th August 2018, were adequately informed and their consent was obtained to enroll in the study. The enrollees were defined as non-adherent (NA), if, for any reason, they missed at least one dose of their drug within the last 30 days. These NA enrollees were purposively selected. The data was obtained using interviewer-administered semi-structured questionnaire. The data obtained was checked for completeness, coded and technique analyzed using Statistical Package for Social Science (SPSS) version 22 software. The statistical association between variables was described using logistic regression. Of the 251 PLWHIV, 100 (39.84%) were NA enrollees. Three major reasons provided by enrollees for missing medication were: (1) forgetfulness 41%, (2) travelling with incomplete medication and difficulty in the accessing drug from a new clinic, 15% and (3) not willing to take HIV/AIDS drugs with other prescribed drugs, 10%. This study has shown that a majority of PLWHIV (60.16%) complied with therapy regimen. Forgetfulness was the most common factor reported for non-adherence by the enrollees. This suggests that there is an increasing need for healthcare personnel to encourage patients to use memory aids, and to increase the awareness of the consequences of non-adherence during drug administration.

Key words: Highly active antiretroviral therapy, HIV/AIDS, medication non-adherence, healthcare facility.

INTRODUCTION

Human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome is one of the public health crises facing our world today. Research has shown that the disease continues to spread disproportionately fast in

*Corresponding author. E-mail: augustinaonwunata@yahoo.com.

most marginalized populations (WHO, UNAIDS and UNICEF, 2009). The use of highly active antiretroviral therapy (HAART) amongst people living with HIV (PLHIV) has become crucial in the absence of a cure for HIV and no availability of vaccination for its prevention. Use of HAART has slowed disease progression, decreased mortality and improved the quality of life for many persons with HIV (Okonji et al., 2012). Treatment efficacy relies, however, on sustained adherence, which constitutes a serious challenge to those receiving HAART (Meresse et al., 2014).

Antiretroviral drugs have to be taken as a lifelong therapy and their success relies on continual adherence to the medication regimen as human immune-deficiency virus poses a unique challenge due to its rapid replication and mutation rates hence. A rate of adherence of approximately 90 to 95% is required to prevent development of drug resistance, viral suppression, disease progression, and death (Liao et al., 2012).

In a study in Ibadan, it was shown that about two-fifths (37.1%) of the respondents patients attending the Antiretroviral Clinic had less than 95% adherence to HAART, while Mohammed et al. (2004) in their study reported that adherence rates in the country ranged from 49.2% in Port-Harcourt to 75.3% in Enugu. Evidence-based data from developing countries regarding antiretroviral therapy adherence rates are still limited most especially in Akwa Ibom State of Nigeria. Diverse factors have been associated with non-adherence, hence the need for this investigation. The objectives of the study were to assess how poverty, accessibility to HAART and patient perceptions to HAART influences non-adherence among PLWHIV in the study area.

There is a rapid increase in patients' access to HAART in Akwa Ibom State, where there are NGOs like Family Health International (FHI360) providing free ARV drugs regularly to patients. It is important to establish ways of continuously monitoring treatment adherence, in order to identify and stem the incidence of non-adherence as early and possible.

Non-adherence to HAART has been associated with diverse factors. These include patient related factors, health condition/disease, health care system/health care team, therapy/treatment and socio-economic factors (Carballo et al., 2004; Murri et al., 2004; Byakika-Tusiime et al., 2005). Reasons for non-adherence are multi factorial, for example, age (younger), perceived treatment side effects, dosing frequency different from twice daily, depression and lack of support from the main partner were associated with non-adherence (Carrieri et al., 2006).

Just having medicine available cannot solve the HIV and AIDS problem worldwide. Regardless of the illness or treatment, ordinarily, many people do not take their medications correctly. A significant proportion of all hospital admissions and mortality are due to medication non-adherence. Published data on factors associated with non-adherence to HAART in Akwa Ibom State is limited. Therefore, this study seeks to determine the factors associated with non-adherence HAART among PLWHIV in the General Hospital Ikot Ekpene Akwa Ibom State Nigeria. Specifically, the study sourced for information on the role of poverty, accessibility and patient's perception to ARV drugs as factors associated with non-adherence to HAART among enrollees.

MATERIALS AND METHODS

Study design and population

A descriptive cross sectional design was used to determine factors associated with non-adherence to medication therapy among 100 PLWHIV at the General Hospital Ikot Ekpene, Akwa Ibom State from 8th July to 8th August. Primary data was collected from PLWHIV aged ≥18 years on HAART attending the healthcare services from 8th July to 8th August 2018. The study participants and health care providers were interviewed using a semi-structured questionnaire.

Secondary data were obtained from medical records of clients after obtaining consent from health administrators and study participants. The clients files were checked for viral load and 100 of them with >1000 copies/ml were considered as poor adherence or non-adherent to HAART and were enrolled for study.

The study area was the FHI 360 unit of General Hospital Ikot Ekpene a Health care facility owned by the Government of Akwa Ibom State. The General Hospital Ikot Ekpene provides HAART services through the support of Family Health International (FHI360), which is a global health and development organization working on family planning, reproductive health and HIV/AIDS. The hospital HIV care and treatment department (FHI360) registers admitted patients diagnosed with HIV infection in the wards and out-patient's diagnosed in the HIV counseling and testing unit. Based on the current (2012) local HIV care guidelines, HIV-infected patients with CD4 counts below 350 cells/mm^3 regardless of the WHO clinical stage or with WHO stage 3 or 4 regardless of CD4 counts are eligible for highly active antiretroviral therapy. Trained health personnel carry out counseling for HIV-infected patients before and after treatment initiation. Based on clinical status and baseline laboratory tests, clinic physicians initiate medications while clinic pharmacists are responsible for final counseling and dispensing. Continued drug refill visits are scheduled every one or two months depending on patient's clinical status and FHI360 HAART stock status. The hospital HIV care and treatment team (FHI360) is responsible for assessing patient progress as they visit for drug refills. The FHI360 pharmacy also stocks drugs for opportunistic infections on prescription.

Inclusion criteria

The inclusion criteria comprise HIV/AIDS patients on HAART who were willing to participate in the study and had not complied fully with medication instructions.

The benchmark for adherence was set at the day the patient started on HAART regimen. A miss of one dose of HAART in a week translates to 92.8% adherence, which is sub-optimal (Paterson et al., 2000).

Exclusion criteria

The exclusion criteria comprise HIV/AIDS patients who had not

started HAART.

Sampling method

Polit and Hungler (2004) defined a sample as "a representative portion of the population under study". Sampling is a process by which samples are selected so that research findings can be generalized to the population. Purposive sampling technique was used to select PLWHIV who met the inclusion criteria and attended the hospital as at the time the study was carried out.

Sample size

A purposive sampling technique was used to select 100 enrollees on HAART who met the inclusion criteria, and attended General Hospital Ikot Ekpene, Akwa Ibom State from 8th July to 8th August, 2018.

Data collection

A semi-structured questionnaire consisting of sections A, B and C was adopted. Sections A requested the socio demographic characteristics of respondents; Section B, respondents accessibility to HAART and Section C Patient's perception to HAART regimen.

Validation of instrument

The questionnaire was pretested for clarity, understanding, and appropriateness of the instrument.

Method of data collection

The data was collected over a period of four weeks using Interviewer Administered Questionnaire.

Data analyses

Data collected was analyzed with descriptive and inferential statistics. Research questions were analyzed using frequency and percentage distribution. Results were presented using charts and tables.

Ethical consideration

Ethical clearance was obtained from the Ethical Research Committee of the Ministry of Health, Akwa Ibom State and from the Medical Superintendent of the General Hospital, Ikot Ekpene, Akwa Ibom State. Written consent was obtained from enrollees after assuring them of the anonymity and confidentiality of information supplied by them.

RESULTS

The enrollees comprised 31 males and 69 females. Age distribution was 18-20 years, 3%; 21-29 years, 22%; 30-39 years, 45%; 40-49 years, 17%; 50-59 years, 8%; and ≥60 years, 5%. Marital status of the enrollees was 56% married, 25% single, 9% divorced and 10% and widowed. Two respondents (2%) had no education, twenty two (22%), had primary education; fifty seven (57%) had secondary education and nineteen (19%) had tertiary education. Ninety-nine respondents (99%) were Christians and one (1%) Muslim.

Assessment of poverty level

Influence of poverty level on enrollees' adherence to HAART regimen was carried out through collection of information on their occupation, employment, monthly earnings and meal consumption per day. Four (4%) of the enrollees were students; 27 (27%), unemployed with some in varied with seasonal jobs in local farms; 27 (27%), employed; 41 (41%) self-employed and one (1%) retired. Of the enrollees, twenty-eight (28%) earned less than ₦5000 per month, 42 (42%) earned ₦5001-10000; 19 (19%) earned N10001-15000, 6(6%) earned ₦15001-20000 and 5 (5%) earned ≥₦20000 per month (Table 1). From figure 1, Twelve of them stated that they eat only once a day, 23 (23%) eat twice a day, and 65 (65%) eat three times or more daily. Some of the enrollees said that the lack of food does not stop them from taking their drugs as drug is taken 2 h after food, so with or without food, they swallow their drugs.

From the interviews, 61% of the enrollees said that they are the sole breadwinners, 30% got support from their respective families, friends and relatives; 5% get food from their farms and 4% from NGOs

Accessibility and adherence

Enrollees come to the clinic for various reasons, such as refilling of HAART drugs, checking of viral load, confirmation of CD4 count and counseling. On the factor of accessibility, the results as reflected in Table 2, showed that 28% enrollees did not live far from the hospital. They came from within the Ikot Ekpene villages and surrounding locations such as Ifuho, Abak Road, Uyo Road and Umuahia Road; 78% of the enrollees came from outside Ikot Ekpene and as far as other states like Calabar, Delta and Abia States. Some of the respondents who came from far said distance did not affect them but they wanted to avoid possible recognition or stigmatization by family and friends during their follow-up appointments. However, this posed a challenge because of additional cost of transportation, which made them miss their appointments when not available. Other enrollees said appointment dates coincided with other duties and they did not have the time to go (57%). There was insufficient cost of transportation, 15% and poor weather conditions and impassable roads, 11%. as reflected in figure 3.

These results show in Table 3 revealed that the enrollees had one reason or the other to miss a dose.

Table 1. Distribution of enrollees according to poverty level.

Variable			Frequency	%
Occupation	Student	a) Secondary	1	1
		b) Tertiary	3	3
	Employed	a) Civil servant	9	9
		b) NGO	1	1
		c) Private Institution	17	17
		d) Business/self- employed	41	41
	Unemployed		27	27
	Others		1	1
	Total		100	
Approximate Monthly income (₦)	< 5000		28	28
	5001-10000		42	42
	10001-15000		19	19
	15001-20000		6	6
	20001 and above		5	5
	Total		100	
Number of food consumption per day	Once		12	12
	Twice		23	23
	Thrice		65	65
	Total		100	
Who provides the food	I feed myself		61	61
	I get from welfare/NGO support		4	4
	I have a household farm/garden		5	5
	My family/friends/relatives		30	30
	Total		100	

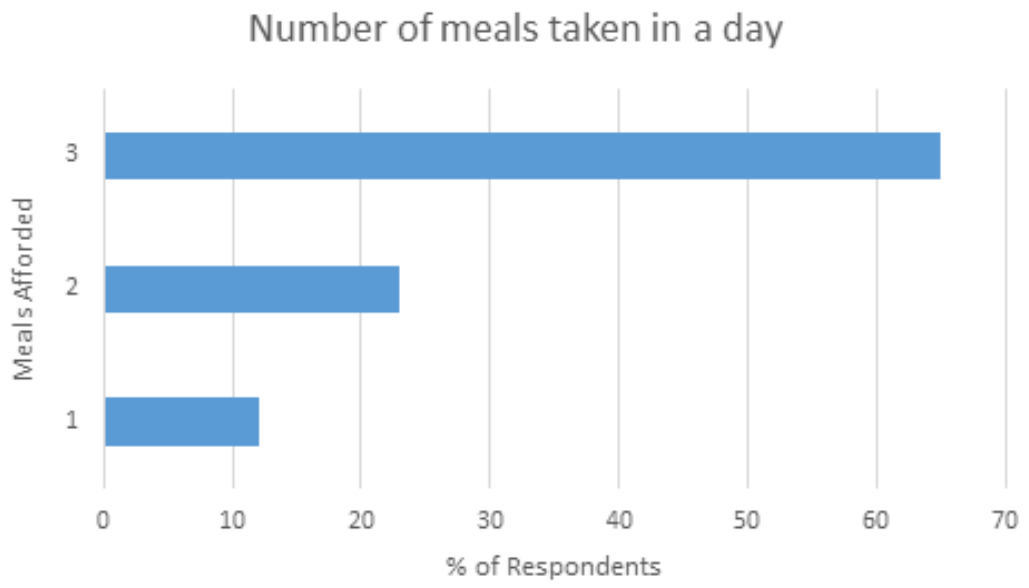

Figure 1. Showing number of meals taken in a day.

Table 2. Distribution of enrollees according to accessibility of ART.

Variable		Frequency	%
Do you live far away from the hospital	Yes	72	72
	No	28	28
	Total	100	
Does the distance you travel keep you from coming regularly for your drugs as required	Yes	27	27
	No	73	73
	Total	100	
Have you ever missed your appointment day	Yes	42	42
	No	58	58
	Total	100	
Reason for missing appointment day	Lack of time	57	57
	Poor Weather condition	12	11
	Lack of transport Means	16	15
	Lack of transport Fare	15	17
	Total	100	

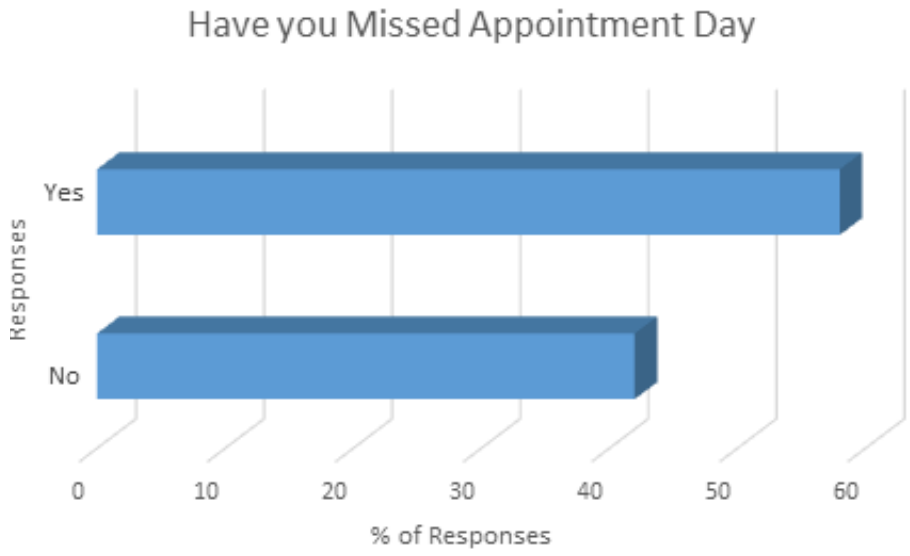

Figure 2. Showing number of appointment you missed a day.

Some of the reasons proffered include: being busy and forgetting to take the drug (41%); travelling without enough drugs and not having access to any (15%); sick and too ill to take drugs (10%); feeling sick from side effects of the drug (9%); not having food to eat (8%); tired of taking drugs and being depressed (6%); lacking privacy and unable to take drugs in the presence of others (4%); religious doctrine (3%); on purgatives (3%); and unavailability of drugs in the hospital (1%).

In response to the question on positive attitude towards ARV drug use, a majority of respondents (96%) accepted the use ARV drugs for AIDS management while others did not respond (Table 3).

Enrollees had different views and perceptions on the benefit of ARV drugs to them. Thirty-two (32%) enrollees said taking the drug reduced their frequency of sickness; 16% said they had less adverse effects; 21% said their appetite increased and they gained weight; 20% believe their disease will be cured; and 11% were not quite convinced on the benefits of the drugs and take them in

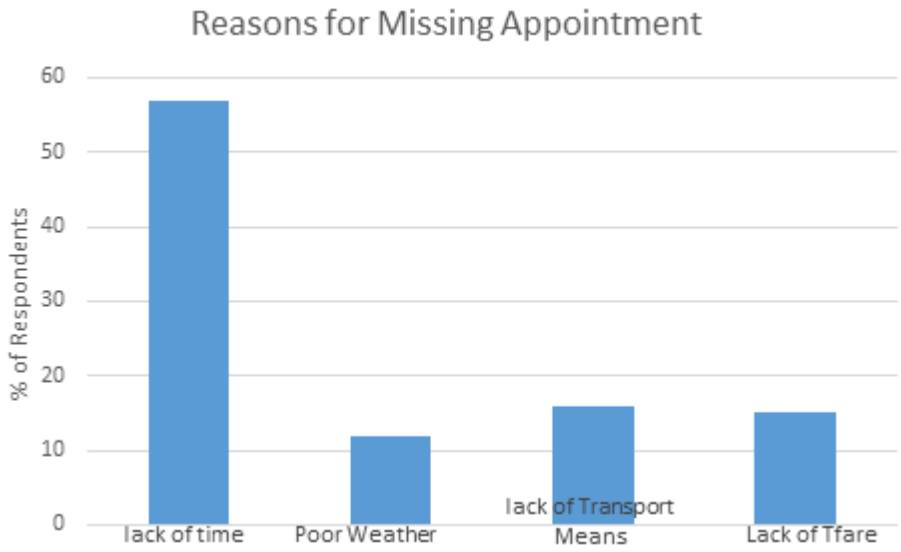

Figure 3. Showing reasons for missing appointment.

the hope that of getting better.

On the issue of stigma, a majority of the enrollees, 76% said that they did not have the issue of stigma between them and their relatives, while for others, 24%, friends and relatives stigmatized them.

On input of support on ARV drug use, 52% of enrollees reported constant psychological support and encouragement from family and friends; while 38% of the respondents claimed too little or no support from family making them have a tough task in adhering to their drugs sometimes. For those who received support in their medication taking, 50% were supported by a family member including spouses, children and parents, and 35% got support from close friends, whereas 15% got support from spiritual directors. The support they got included reminders of date of appointment and time for drug consumption, moral support, and encouragement.

DISCUSSION

The World Health Organization (2005) defines adherence as ‘‘the extent to which a person’s behavior in taking medication, following a diet, and/or executing lifestyle changes that correspond with agreed recommendations from a health-care provider.’’ Suboptimal adherence to HAART regimen leads to inadequate inhibition of viral replication, immunological failure, emergence of drug-resistant strains, and transmission of resistant strains, which ultimately lead to primary regimen failure (Kuritzkes, 2004; Mhaskar et al., 2013). From the available evidence, an average rate of 24.8% of non-adherence to medication has been reported in most of the patients having chronic diseases (DiMatteo, 2004). According to Carrieri et al. (2006), reasons for non-adherence are multi factorial, and include age (younger), perceived treatment side effects, dosing frequency different from twice daily, depression and lack of support from the main partner. In this study, poverty, accessibility to HAART regimen, people’s attitude and perception of HAART regimen were factors assessed as associated with non-adherence.

Assessing poverty

The results of this study show that when food is limited in supply or unavailable, there is increased non-adherence to ARV drugs. The enrollees (8%) that could not afford regular meals tended to skip their drugs. Therefore, availability of daily food increases the adherence rate to HAART regimen. This finding was similar to that of a study in Lusaka Zambia on HIV-patients who skipped drug treatment because of lack of food (Chishimba and Zulu, 2004). In essence, sufficient nutrition for patients on HAART regimen is very crucial because it boosts their immune system, which helps them to cope with medication. In this way, the patient is able to tolerate the side effects of drugs.

Accessibility and adherence

In this study, 22% enrollees who accessed nearby clinics, within a walking distance (5 km) from their homes, were about 1.7 times more likely to be non-adherent to medication than the 73% who live further away (>5 km) from a health facility. This is in line with a study done in Kenya in 2011 which showed that accessing antiretroviral therapy in a clinic within walking distance from home

Table 3. Distribution of Enrollees on Attitude and Perception of HAART.

Variable		Frequency	%
Reasons for missed dose	Being busy and forgot	41	41
	Short of drugs and unable to access any	15	15
	Sick and on other medications	10	10
	Side effects of drug	9	9
	Lack of food for drug consumption	8	8
	Tired of taking drugs and felt depressed	6	6
	lack of privacy and unable to take drugs in the presence of others	4	4
	Religious Doctrine	3	3
	Used purgatives	3	3
	Unavailability of ART drug in the hospital	1	1
	Total	**100**	
Do you approve of HAART drugs	Yes	99	99
	No	-	-
	Undecided	1	1
	Total	100	
positive health perception of HAART drugs	Yes	96	96
	No	-	-
	Undecided	4	4
	Total	**100**	
Benefits gained from taking HAART drugs	Better appetite and increase weight gain	21	21
	Reduction of frequency in illness	32	54
	Growing normally	16	24
	Curing HIV/AIDS	20	23
	No idea, taking it because I was encouraged to take	11	11
	Total	**100**	
Avoidance of friends and relatives	Yes	24	24
	No	76	76
	Total	**100**	
Support on HAART Drugs	Yes	52	52
	No	48	48
	Total	**100**	
Person who supports	Family	26	50
	Friend	18	34.6
	Others	8	15.3
	Total	**52**	**100**

predicted non-adherence (Wakibi et al., 2011). The choice of a more distant clinic from home by some enrollees could be attributed to the avoidance of social stigma associated with antiretroviral drug use. This because a majority of the enrollees who accessed medical treatment at clinics, far from their homes, said were avoiding being seen by people who know them. This suggests that some of the respondents who accessed free therapy in clinics within walking distance to their homes, may also prefer long distance clinics, but for lack of funds for transportation. Another study in Uganda (Nakinyemba et al., 2004), however, reported that distance, transport, and finance, were main barriers to adherence.

It is also significant to note that enrollees reported the lack of time and money for transportation as other reasons for non-adherence. Some enrollees (54%) said that they failed to meet the appointment schedule because they were otherwise occupied. Lack of transport means especially during rainy seasons, roads may be impassable; some feel weak to walk while raining. According to Veenstra et al. (2010) in Southern Africa there are a huge range of different crises that can potentially undermine ART treatment. For example, the 2008 floods in Mozambique are known to have contributed to several health-related problems including poor access to health care.

Patient's perception and attitude towards ARV drugs

In this study, 99 (99%) enrollees approved and one (1%) enrollee neither approved nor disapproved that the use of highly active antiretroviral regimen is essential in their life. However, study done in Kenya in 2016 found that all the respondents approved that the use of antiretroviral therapy is essential in their life (Billy Bortich, 2016). The slight inconsistence could be due to difference in awareness among persons living with HIV/AIDS at the two study settings; 54.1% of the respondents said in the last 30 days, they have never missed their drugs, while 35.6% said they have. The reasons for missing antiretroviral therapy doses were forgetting 41 (41%), Short of drugs and unable to access at the new area one travelled to 15 (15%) Sick and on other medications so could not tolerate the side effect of both 10 (10%), side effects of the ARV drugs 9 (9%), tired of taking drugs and felt depressed 6 (6%), lack of privacy and hiding from colleagues 4 (4%), religious doctrine 3 (3%), used purgatives 3 (3%), and unavailability of drugs in the hospital 1 (1%). Among these reasons forgetting, travelled without enough drugs and unable to access any at new area and side effect gotten when other drugs such as anti-malaria is combined with antiretroviral therapy drugs are the major reasons for non-adherence. Similarly, a study done in North-West Ethiopia indicated that the reasons for missing doses were forgetfulness 29 (43.3%) and side-effect of antiretroviral therapy drugs were 2 (3%) (Tsega et al., 2015). Likewise, a study done in Addis Ababa, Ethiopia showed that the major reasons for non-adherence include simply forgot (33.9%) (Tadios and Davey, 2006). A study done in Harari showed that main reasons for non-adherence were forgetting (47.2%) (Mitiku et al., 2013). This is an indication that due to regularity of the drugs, people tend to become weak and tired especially after the day's activity, so they tend to forget.

In this study, the adverse effects of antiretroviral therapy reported by the respondents did not significantly influence non-adherence. However, Study done in Brazil in 2015 showed that adverse drug reaction was associated with non-adherence (Silva et al., 2015). A study done in Tanzania in 2011 showed that reasons for non-adherence were side effects of antiretroviral therapy drugs which was 53.3% and the side effects antiretroviral therapy drugs were found to be statistically significant (Baltazary et al., 2011). Similarly, a study done in 2009 indicated that non-adherence was independently associated with side effects of antiretroviral drugs (Protopopescu et al., 2009). Likewise, study done in 2005 showed that self-report of three or more reactions that are adverse were associated with an increased risk of non-adherence (Bonolo et al., 2005). The possible explanations have to be explored.

Some enrollees said that they could not afford to take drugs in the presence of others, for their status not to be known. This was an indication that stigma was still high in the study area. This finding was supported by another study on AIDS patients among whom 67.65% reported fear of disclosure (Mills et al., 2006). Enrollees who were open and had told friends and family members their HIV-status were supported during ARV treatment as they always remind the patient on the need to take their drugs as at when due. This finding agrees with studies in USA and Belgium that positive interpersonal relationship made adherence to ARV treatment successful (Mills et al., 2006). The use of family members and peers to enhance ARV drug adherence has emphasized the importance of social support in the treatment of HIV patients (Alice and Friendland, 1998).

Conclusion

Level of adherence (54.1%) was sub-optimal but comparable to other developing countries, to enhance ART adherence the study recommends the following for Ministry of Health and other stakeholders. Forgetfulness is the most common reason for missing doses. Hence, antiretroviral therapy counselors need to emphasis on memory aids. Creation of awareness on the risks of non-adherence is needed. Routine consumption of ARV drugs have been associated with non-adherence, hence HAART drugs should be reviewed with consumption rate decreased because it is tiring and depressing to swallow drugs routinely and this can be associated with forgetfulness which is a major factor influencing non-adherence. Taking ARV drugs without eating any food made patients suffer from side effects thus making them avoid taking the medication. Poverty contributes to lack of food hence strategies to ensure food security in households with people living with HIV and AIDS should be developed as food increases the absorption rate of a drug. For PLWHIV/AIDS who lack appetite to eat Appetite boosters and haematonics should be included as one of the drugs been given to them, as it helps in nourishing their body and with the appetite booster, food consumption will be increased which will as well increase their immune system. Stigma, negative perception, lack of family and community support are some obstacles to

ART adherence. Health education campaigns against stigma and promote family and community support for people living with HIV and AIDS should be intensified. Accessing HAART in areas other than where one was initiated can be difficult and this increases non-adherence rate. PLWHIV should be encouraged always to carry more than sufficient drugs when travelling far. Also, access to HAART should be improved in all areas of different states like it is in Akwa Ibom.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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REFERENCES

Baltazary G, Akarro RR, Mussa AS (2011). Some Factors Associated with Non–Adherence to Antiretroviral Therapy (ART) in People Living with HIV/AIDS (PLHA) in Tanzania: A Case Study of Dar es Salaam Region. East African Journal of public Health 8(4):244-52.

Billy B (2016). Factors influencing non-adherence to anti-retroviral therapy among HIV/AIDS patient visiting Kapkatet County Hospital, Kericho Count, Kenya. https://www.researchgate.net/publication/305456918_FACTORS_INFLUENCING_NON-ADHERENCE_TO_ANTI-RETROVIRAL_THERAPY_AMONG_HIVAIDS_PATIENTS_VISITING_KAPKATET_COUNTY_HOSPITAL_KERICHO_COUNTY_KENYA

Bonolo Pde F, Cesar CC, Acurcio FA, Ceccato Md, de Pauda CA, Alvares J, Campos LN, Carmo RA, Guimaraes MD (2005) Non-adherence among patients initiating antiretroviral therapy: a challenge for health professionals in Brazil. AIDS 19 Suppl 4:S5-13.

Byakika-Tusiime OJ, Tumwikirize WA, Katabira ET, Mugyenyi PN, Bangsberg DR (2005). Adherence to HIV antiretroviral therapy in HIV+ Ugandan patients purchasing therapy. International Journal of STD and AIDS 16:38-41.

Carballo E C-SC, Carrera I, Fraga J, De La Fuente J, Ocampo A, Prieto A (2004). Assessing relationships between health-related quality of life and adherence to antiretroviral therapy. Quality of Life Research 13:587-589.

Carrieri P, Caillenton V, Le M (2006). The dynamic of adherence to highly active antiretroviral therapy: results from the French National APROCO cohort. Journal of acquired immune deficiency syndromes 28(3):232-239.

Chishimba S, Zulu F (2004). The 3× 5 HIV and AIDS treatment plan, challenges for developing countries from zambian perspective. In Proceedings of the International Conference of AIDS Vol. 15.

DiMatteo MR (2004). Variations in patients' adherence to medical recommendations: a quantitativereview of 50 years of research. Medical Care 42(3):200-209.

Emmanuel M, Andrea S, Ita O, Osaro M, James E (2010). Adherence to antiretroviral therapy in Nigeria: an overview of research studies and

Kuritzkes DR. (2004). Preventing and managing antiretroviral drug resistance AIDS Patient Care and STDS. 18(5):259-273.

Lamiraud K, Moatti JP, Raffi F, Carrieri MP, Protopopescu C, Michelet C, Spire B (2012). Adherence to and effectiveness of highly active antiretroviral treatment for HIV infection: Assessing the bidirectional relationship. Medical Care 50:410-418.

Lamiraud K, Moatti JP, Raffi F, Carrieri MP, Protopopescu C, Michelet C, Spire B (2012). Adherence to and effectiveness of highly active antiretroviral treatment for HIV infection: Assessing the bidirectional relationship. Medical Care 50:410-418.

Liao L, Xing H, Su B, Wang Z, Ruan Y, Wang X, Vermund SH (2012). Impact of HIV drug resistance on virologic and immunologic failure and mortality in a cohort of patients on antiretroviral therapy in China. AIDS 27:1815-1824.

Liao L, Xing H, Su B, Wang Z, Ruan Y, Wang X, Vermund SH (2012). Impact of HIV drug resistance on virologic and immunologic failure and mortality in a cohort of patients on antiretroviral therapy in China. AIDS 27:1815-1824.

Meresse M, March L, Kouanfack C, Bonono RC, Boyer S, Laborde-Balen G, Carrieri MP (2014). Patterns of adherence to antiretroviral therapy and HIV drug resistance over time in the Stratall ANRS 12110/ ESTHER trial in Cameroon. HIV Medical 15:478-487.

Mhaskar R, Alandikar V, Emmanuel P, Djulbegovic B, Patel S, Patel A, Kumar A (2013). Adherence to antiretroviral therapy in India: a systematic review and meta-analysis. Indian Journal Community Medical 38(2):7482.

Mills EJ, Nachega JB, Buchan I (2006) Adherence to antiretroviral therapy in Sub-Saharan Africa and North America: A meta-analysis. JAMA. 2006;296(6):679-690

Mitiku Habtamu, Tekabe Abdosh and Zelalem Teklemariam (2013) Factors affecting adherence to Antiretroviral treatment in Harari National Regional State, Eastern Ethiopia. ISRN AIDS 2013, Article 1D 960954.

Mohammed MD (2004). Adherence to antiretroviral drugs in North Central Zone of Nigeria. East and Central African Journal of Pharmaceutical Sciences 7(3):52-55.

Murri R AA, Trotta MP, De Luca A, Melzi S, Minardi C, Scasso A (2004). Patient reported and physician-estimated adherence to HAART: Social and clinic center-related factors are associated with discordance. Journal of General Internal Medicine 19:1104-1110.

Nakinyemba A, Aurugai D.A, Kwasa R, Oyobba T. (2005) Factors that facilitate or constrain adherence to antiretroviral therapy among adults in Uganda: A pre-intervention study

Okonji JA, Zeh C, Weidle PJ, Williamson J, Akoth B, Masaba RO, Thomas TK (2012). CD4, viral load response, and adherence among antiretroviral-naive breast-feeding women receiving triple antiretroviral prophylaxis for prevention of mother-to child transmission of HIV in Kisumu, Kenya. Journal Acquired Immune Deficiency Syndrome 61:249-257.

Paterson D, Swindells S, Mohr J, Brester M, Vergis EN, Squier C, Wagener MM, Singh N (2000). Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. Ann Internal Med. 133:21-30

Peretti-Watel P, Spire B, Schiltz MA, Bouhnik AD, Heard I, Lert F, Vespa Kuritzkes DR (2004). Preventing and managing antiretroviral drug resistance AIDS Patient Care and STDS 18(5):259-273.

Polit DF, Hungler BP (2004). Nursing research: Principles and methods. Lippincott Williams and Wilkins.

Protopopescu C, Raffi F, Roux P, Reynes J, Dellamonica P, Spire B, Leport C, Carrieri MP (2009). Factors associated with non-adherence to long-term highly active antiretroviral therapy: a 10 year follow-up analysis with correction for the bias induced missing data. Journal of Antimicrobial Chemotherapy 64(3):599-606.

Tadios Y, and Davey G, (2006) ''Antiretroviral treatment adherence and its correlates in Addis Ababa, Ethiopia''. Ethiopia Medical Journal 44(30):237-244.

Tsega B, Srikanth B.A, and Shewamene Z. (2015). Determinants of non-adherence to antiretroviral therapy in adult hospitalized patients, Northwest Ethipoia. Patient Prefer Adherence 9:373-380.

Veenstra N, Whiteside A, Lallo D, and Gibbs A (2010). Unplanned antiretroviral treatment interruptions in Southern Africa: how should we be managing these? Globalization and Health 6:4.

Wakibi SN, Ng'ang'a ZW, Mbugua GG (2011). Factors associated with non-adherence to highly active antiretroviral therapy in Nairobi, Kenya. AIDS Research Therapy 8:43.

World Health Organization (2005). Adherence to medication. World Health Organization; 2005; Geneva, Switzerland.