Published in final edited form as:

Addiction. 2010 August ; 105(8): 1416–1421. doi:10.1111/j.1360-0443.2010.02978.x.

Alcohol use and non-adherence to antiretroviral therapy in HIV-infected patients in West Africa

Jaquet Antoine^{1,2}, K Ekouevi Didier^{1,3}, Bashi Jules⁴, Aboubakrine Maiga⁵, Messou Eugène⁶, Maiga Moussa⁵, Traore Hamar Alassane⁷, Zannou Marcel Djimon⁴, Guehi Calixte⁸, Ba-Gomis Franck Olivier⁹, Minga Albert¹⁰, Allou Gérard³, Eholie Serge Paul¹¹, Bissagnene Emmanuel¹¹, J Sasco Annie², and Dabis Francois¹

¹HIV Epidemiology, INSERM CRE U 897, ISPED, Université Victor Segalen, Bordeaux, France

²Epidemiology for Cancer Prevention, INSERM CRE U 897, ISPED, Université Victor Segalen, Bordeaux, France

³Programme PAC-CI, CHU de Treichville, Abidjan, Côte d'Ivoire

⁴Centre de Prise en Charge des Personnes vivant avec le VIH, CHNU, Cotonou, Benin

⁵Service d'Hépatogastro-Entérologie, Hôpital Gabriel Touré, Bamako, Mali

⁶CePreF, ACONDA, Abidjan Côte d'Ivoire

⁷Centre de Prise en Charge des Personnes vivant avec le VIH, Hôpital du point G, Bamako, Mali

⁸Unité de Soins Ambulatoires et de Conseil (USAC), Abidjan, Côte d'Ivoire

⁹Centre Intégré de Recherche Bioclinique d'Abidjan (CIRBA), Abidjan, Côte d'Ivoire

¹⁰Centre Médical de Suivi de Donneurs de Sang/CNTS/PRIMO-CI, Abidjan, Côte d'Ivoire

¹¹Service de Maladies Infectieuses et Tropicales (SMIT), CHU de Treichville, Abidjan, Côte d'Ivoire

Abstract

AIM—To investigate the association between alcohol use and adherence to Highly Active Antiretroviral Treatment (HAART) among HIV-infected patients in sub-Saharan Africa.

DESIGN and MEASURES—Cross sectional survey conducted in eight adult HIV treatment centers from Benin, Côte d'Ivoire and Mali. During a four-week period, health workers administered the Alcohol Use Disorders Identification Test to HAART-treated patients and assessed treatment adherence using the AIDS Clinical Trials Group follow-up questionnaire.

RESULTS—A total of 2920 patients were enrolled with a median age of 38 years (IQR 32–45 years) and a median duration on HAART of 3 years (IQR 1–4 years). Overall, 91.8% of patients were identified as adherent to HAART. Non-adherence was associated with current drinking (OR

1.4; 95% CI 1.1–2.0), hazardous drinking (OR 4.7; 95% CI 2.6–8.6) and was inversely associated with a history of counseling on adherence (OR 0.7; 95% CI 0.5–0.9).

CONCLUSION—Alcohol consumption and hazardous drinking is associated with non-adherence to HAART among HIV-infected patients from West Africa.

thus providing a framework for developing and reinforcing the necessary prevention and intervention strategies.

Keywords

alcohol use; HIV/AIDS; antiretroviral treatment; adherence; sub-Saharan Africa

INTRODUCTION

Research in industrialized countries indicates that there is a high prevalence of alcohol use among people living with HIV/AIDS (1–4). Although few data exist concerning alcohol consumption in sub-Saharan Africa, a recent report showed that excessive alcohol drinking was not uncommon in some West African countries(5). For example, in the Côte d'Ivoire more than 20% of current drinkers were identified to be drinking heavily. In industrialized countries, alcohol use has also been identified as a determinant of non-adherence to highly active antiretroviral therapy (HAART), even in individuals that do not meet the criteria for hazardous drinking (1, 6–9). Despite the fact that almost seven million patients were still in need for HAART in sub-Saharan Africa in 2008, access to HAART has sharply improved during these past five years with now three million HAART-treated African patients (10). There is now a priority need to identify the barriers to treatment adherence, especially those amenable to prevention strategies that can improve public health. The objective of the present study was thus to investigate the association between alcohol use and treatment adherence in a HIV clinic network in West Africa.

METHODS

Design and population

This was a cross-sectional survey conducted within the International epidemiological Database to Evaluate AIDS (IeDEA) initiative (<http://www.iedea-hiv.org>). By collecting and harmonizing data from multiple HIV/AIDS cohorts from industrialized and resource-limited countries, this network aims to address unique and evolving research questions in the field of HIV/AIDS care and treatment. In the West African region, this collaboration was initiated in July 2006 and currently involves 14 adult HIV/AIDS clinics spread over eight countries (<http://www.iedeawestafrica.org>). Of these countries, three of them (Benin, Côte d'Ivoire and Mali) volunteered and had the logistic capacity to perform the present study in a total of eight HIV treatment centers. The study population was assembled by enrolling consecutively all HIV-infected patients on HAART attending for consultation at the participating HIV clinics during a four-week period. Patients were randomly selected in two Côte d'Ivoire clinics that were unable to recruit in an exhaustive manner during the study period, using systematic sampling, a form of one-stage cluster sampling. Social health workers included every n^{th} HIV-infected patient on HAART (depending on the monthly

number of attendees) after randomly selecting the first patient as the starting point through n statistical elements. Patients included had to fulfill the following criteria: to be aged 18 or more, diagnosed with HIV-1 or HIV-2 or HIV1+2 infection, and being treated with HAART defined as the combination of three antiretroviral drugs for a minimum of one month.

Procedure

Study protocol trained social health workers administered a standardized questionnaire which recorded socio-demographic characteristics, alcohol use and adherence to HAART. Data collected during these interviews were secondarily linked with the IeDEA clinical database, using the identification number attributed to each patient. This linkage allowed the use of baseline and follow-up clinical and biological data such as CD4 cell count and duration of HAART. A written informed consent was obtained from all study participants. This study was approved by national research ethics committees from Côte d'Ivoire, Mali and Benin.

Measurements

The four-day recall on adherence to HAART was determined with the AIDS Clinical Trials Group (ACTG) follow-up questionnaire for adherence to antiretroviral medications (11). Adherence was coded as a dichotomous variable, where patients <95% adherent during the previous four days were considered non-adherent, based on previous studies suggesting that missing 5% missed doses was associated with poorer virological outcomes (12). The frequency of alcohol use and symptoms of hazardous and harmful use was measured by the Alcohol Use Disorders Identification Test (AUDIT) developed by the World Health Organization (WHO) (13). This AUDIT has been successfully administered in previous studies conducted in sub-Saharan Africa (14, 15). It is a 10-item questionnaire, each of them scored from 0 to 4 points, giving a maximum total score of 40 points. Present alcohol drinkers were defined as patients declaring any alcohol consumption within the past year. A criterion score of eight on the AUDIT characterized hazardous drinking. A standard drink was defined as equivalent to 10 grams of alcohol. Health workers were asked to adjust the number of drinks in the response categories according to drink sizes and alcohol type stated by patients.

Statistical analysis

A logistic regression of the determinants of adherence to HAART was performed. We constructed a first multivariate model by selecting available variables with a P-value less than 0.2 in the univariate analysis and other variables of interest (age, gender, formal education, number of pills per day, frequency of pills intake, protease inhibitors-based regimen, CD4 count at HAART initiation and HAART duration). We then checked for potential interactions among selected variables (i.e. gender, country of living and previous adherence counseling) for the association between alcohol use and HAART adherence. For the "HAART duration" variable, we arbitrarily choose thresholds close to the observed median value and its inter-quartile range (IQR) in order to balance the number of subjects in each category. The CD4 count was taken as a dichotomized variable with a 50 cells/mm³ threshold to reflect a severe immunological impairment. Thereafter, a stepwise descending procedure was applied. Variables that were not found significantly associated with

adherence were removed and systematically checked for a potential modification effect of the association between alcohol use and HAART adherence, using a threshold of relative variation in odds ratio estimators of 0.2. A P-value threshold of 0.05 was used for the final regression model. Whereas neither interaction nor confusion was identified, some variables considered highly relevant were kept in the model (age, gender, formal education, CD4 count at HAART initiation and HAART duration). All statistical analyses were performed using SAS software (version 9.1; SAS Institute Inc).

RESULTS

Sample characteristics

A total of 2920 HAART-treated patients (1838 from five clinics in Côte d'Ivoire, 486 from one clinic in Benin and 596 from two clinics in Mali) were included in the present study. All but three patients accepted to participate. The male to female ratio from our study sample (0.41:1) did not differ significantly from the remaining 2380 HAART-treated HIV-infected patients seen in the participating clinical centers during the same study period and that could not be interviewed (0.42:1) ($P=0.93$). The median age of the 2920 patients surveyed was 38 years (IQR 32–45 years) and the median duration on HAART was 3 years (IQR 1–4 years). The median CD4 count at HAART initiation was 162 cells/mm³ (IQR 76–245). The prevalence estimates of present alcohol consumption and hazardous drinking were 26.6% (95% CI 25.0–28.2) and 2.9% (95% CI 2.3–3.5), respectively. Present alcohol consumption and hazardous drinking were reported in 37.9% (34.3–41.1) and 6.1% (4.5–7.7) of men and in 21.9% (20.1–23.7) and 1.6% (1.1–1.2) of women, respectively. In the 777 patients who declared a current alcohol use, 40% of men and 15% of women stated that they drank alcohol more than once a month. Regarding the quantity of alcohol intake on typical drinking days, 25% of men and 12% of women stated more than four standard alcohol drinks per day.

Adherence to HAART

Among the 2920 patients screened with the ACTG questionnaire, 91.8% of the patients were classified as adherent, such that they were taking >95% of their pills within the last four days. The most frequent reasons reported for missing HAART (any) were as follows: being busy or simply forgot (16.3%), being away from home (12.2%), being out of stock for HAART because of the pharmacy (7.0%), being out of stock of HAART at home (6.9%), being depressed (2.0%) and being influenced by traditional healers or religious leaders (0.7%). We were able to match the questionnaires of 2065 surveyed patients (71%) with the pre-existing IeDEA database that was closed to follow-up in October 2007. Compared to the remaining 855 patient records not identified in the IeDEA database, these 2065 matched patients did not differ significantly with regard to the prevalence of adherence to HAART and hazardous drinking (p -values of 0.1 and 0.7, respectively). The determinants of non-adherence to HAART taken as the dependent variable in a logistic model are summarized in table 1.

Alcohol use and a history of adherence counseling were the only factors significantly associated with poor adherence to HAART in univariate and multivariate analyses. For

alcohol use, the positive association with non adherence to HAART was significant even for non-hazardous drinkers. In univariate analysis, there was a significant association between country of residence and being adherent to HAART. However, this association was not significant after adjustment for prior counseling on adherence.

DISCUSSION

The high adherence to HAART rate found in our study is consistent with previous reports from other West African settings such as Senegal where mean adherence rates have been reported close to 90% for several years (16–19). The relationship between alcohol use and adherence to HAART is important to investigate because drinking patterns are potentially modifiable. This association between alcohol use and poor adherence in HAART-treated patients has already been highlighted in industrialized countries even at a moderate level of alcohol use. For example, Samet and colleagues found that good adherence was associated with a non-drinking reported behaviour, compared with at-risk level usage (OR = 3.6, 95% CI 2.1–6.2) or compared with moderate usage (OR = 3.0, 95% CI = 2.0–4.5) (9). Elsewhere, Tucker *et al* found that compared to non-drinkers, moderate and heavy drinkers were more likely to be non adherent to HAART with respective ORs of 1.6 (95% CI 1.3 – 2.0) and 2.7 (95% CI 1.7 – 4.5), respectively (4). The association we report between non-hazardous drinking and non-adherence to HAART is consistent with previous reports and might be related to the lack of sensitivity associated with the definition of hazardous drinking. Additional analysis is thus needed to explore characteristics of alcohol use as predictors for non-adherence to HAART. Although we could not identify published epidemiologic studies specifically addressing the association between alcohol use and adherence in HAART-treated patients in sub-Saharan Africa, a previous publication from Martinez *et al* in 2007 found that among a subset of HIV-infected patients from Uganda eligible for HAART, drinking in the last year was associated with not initiating HAART with an OR of 1.95 (95% CI 1.13–3.37) (20). Another recent report by Marcellin *et al* showed that binge drinking was associated with unplanned antiretroviral treatment interruptions in 533 HIV-infected patients on HAART in Yaoundé, Cameroon (OR 2.87; 95% CI 1.39–5.91) (21). Despite the increasing number of patients in HIV treatment programmes, the positive association between adherence to HAART and history of adherence counselling enforces the need to maintain a minimum of one systematic adherence counselling session for every patient on HAART. Sensitisation of health care providers to the negative effect of alcohol use should be a key priority for HIV clinic providers and interventions to tackle hazardous drinking are urgently needed. The brief interventions model development by WHO based on the AUDIT could be adapted for this purpose (22).

We acknowledge several limitations to our study. First, the direct administration to patients of a questionnaire to assess adherence to HAART tended to overestimate the adherence rate. This limitation is particularly important in resource-limited settings where access to HAART is still more likely to be perceived as a rare opportunity (23). Indeed, a somewhat lower adherence rate was found in a previous study conducted in Côte d'Ivoire where Eholié *et al* reported a median adherence rate of 78% (24). A second limitation could be the possible recall bias that might have led patients not declaring alcohol consumption also not declaring non-adherence to HAART. We tried to limit this bias by choosing social health workers

already working in these clinics but not usually in contact with these patients for interviewing them. Although the assessment of alcohol consumption during a one-year period and adherence to HAART during a four-day period might have lead to a possible information bias, we choose to use these two standardized tools for reproducibility and comparability reasons. Finally, the association observed between alcohol use and adherence to HAART described through this cross-sectional survey design did not allow us to draw any formal causal relation between these two factors.

In closing, we note non-adherence to HAART in Africa may compromise treatment effectiveness during scaling up (25). Our study highlights the association between alcohol consumption and non-adherence to HAART among HIV-infected patients in West Africa. There is a clear case for integrating programmes to reduce hazardous and harmful drinking in all adult HIV care programs across the continent.

Acknowledgments

Source of support

This work was funded by the following institutes: the National Cancer Institute (NCI), the Eunice Kennedy Shriver National Institute of Child Health & Human Development (NICHD) and the National Institute of Allergy and Infectious Diseases (NIAID) (grant n° 5U01AI069919).

We are indebted to the interviewers who performed the data collection and to the data clerks from the PAC-CI office who entered all the data in Abidjan.

References

1. Braithwaite RS, McGinnis KA, Conigliaro J, Maisto SA, Crystal S, Day N, et al. A temporal and dose-response association between alcohol consumption and medication adherence among veterans in care. *Alcohol Clin Exp Res*. 2005; 29(7):1190–7. Epub 2005/07/28. [PubMed: 16046874]
2. Kleeberger CA, Phair JP, Strathdee SA, Detels R, Kingsley L, Jacobson LP. Determinants of heterogeneous adherence to HIV-antiretroviral therapies in the Multicenter AIDS Cohort Study. *J Acquir Immune Defic Syndr*. 2001; 26(1):82–92. Epub 2001/02/15. [PubMed: 11176272]
3. Lucas GM, Gebo KA, Chaisson RE, Moore RD. Longitudinal assessment of the effects of drug and alcohol abuse on HIV-1 treatment outcomes in an urban clinic. *AIDS*. 2002; 16(5):767–74. Epub 2002/04/20. [PubMed: 11964533]
4. Tucker JS, Burnam MA, Sherbourne CD, Kung FY, Gifford AL. Substance use and mental health correlates of nonadherence to antiretroviral medications in a sample of patients with human immunodeficiency virus infection. *Am J Med*. 2003; 114(7):573–80. Epub 2003/05/20. [PubMed: 12753881]
5. Clausen T, Rossow I, Naidoo N, Kowal P. Diverse alcohol drinking patterns in 20 African countries. *Addiction*. 2009; 104(7):1147–54. Epub 2009/05/12. [PubMed: 19426287]
6. Braithwaite RS, Conigliaro J, Roberts MS, Shechter S, Schaefer A, McGinnis K, et al. Estimating the impact of alcohol consumption on survival for HIV+ individuals. *AIDS Care*. 2007; 19(4):459–66. Epub 2007/04/25. [PubMed: 17453583]
7. Chesney MA. Factors affecting adherence to antiretroviral therapy. *Clin Infect Dis*. 2000; 30 (Suppl 2):S171–6. Epub 2000/06/22. [PubMed: 10860902]
8. Howard AA, Arnsten JH, Lo Y, Vlahov D, Rich JD, Schuman P, et al. A prospective study of adherence and viral load in a large multi-center cohort of HIV-infected women. *AIDS*. 2002; 16(16):2175–82. Epub 2002/11/01. [PubMed: 12409739]
9. Samet JH, Horton NJ, Meli S, Freedberg KA, Palepu A. Alcohol consumption and antiretroviral adherence among HIV-infected persons with alcohol problems. *Alcohol Clin Exp Res*. 2004; 28(4): 572–7. Epub 2004/04/22. [PubMed: 15100608]

10. WHO, UNAIDS, UNICEF. [accessed October 6, 2009] Towards universal access: scaling up priority HIV/AIDS interventions in the health sector. Progress report 2009. 2009. http://data.unaids.org/pub/Report/2009/20090930_tuapr_2009_en.pdf
11. Chesney MA, Ickovics JR, Chambers DB, Gifford AL, Neidig J, Zwickl B, et al. Self-reported adherence to antiretroviral medications among participants in HIV clinical trials: the AACTG adherence instruments. Patient Care Committee & Adherence Working Group of the Outcomes Committee of the Adult AIDS Clinical Trials Group (AACTG). AIDS Care. 2000; 12(3):255–66. Epub 2000/08/06. [PubMed: 10928201]
12. Paterson DL, Swindells S, Mohr J, Brester M, Vergis EN, Squier C, et al. Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. Ann Intern Med. 2000; 133(1):21–30. Epub 2000/07/06. [PubMed: 10877736]
13. Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption--II. Addiction. 1993; 88(6):791–804. Epub 1993/06/01. [PubMed: 8329970]
14. Bohn MJ, Babor TF, Kranzler HR. The Alcohol Use Disorders Identification Test (AUDIT): validation of a screening instrument for use in medical settings. J Stud Alcohol. 1995; 56(4):423–32. Epub 1995/07/01. [PubMed: 7674678]
15. Chinyadza E, Moyo IM, Katsumbe TM, Chisvo D, Mahari M, Cock DE, et al. Alcohol problems among patients attending five primary health care clinics in Harare city. Cent Afr J Med. 1993; 39(2):26–32. Epub 1993/02/01. [PubMed: 8261500]
16. Landman R, Schiemann R, Thiam S, Vray M, Canestri A, Mboup S, et al. Once-a-day highly active antiretroviral therapy in treatment-naïve HIV-1-infected adults in Senegal. AIDS. 2003; 17(7):1017–22. Epub 2003/04/18. [PubMed: 12700451]
17. Laniece I, Ciss M, Desclaux A, Diop K, Mbodj F, Ndiaye B, et al. Adherence to HAART and its principal determinants in a cohort of Senegalese adults. AIDS. 2003; 17 (Suppl 3):S103–8. Epub 2003/10/21. [PubMed: 14565616]
18. Laurent C, Diakhate N, Gueye NF, Toure MA, Sow PS, Faye MA, et al. The Senegalese government's highly active antiretroviral therapy initiative: an 18-month follow-up study. AIDS. 2002; 16(10):1363–70. Epub 2002/07/20. [PubMed: 12131213]
19. Orrell C, Bangsberg DR, Badri M, Wood R. Adherence is not a barrier to successful antiretroviral therapy in South Africa. AIDS. 2003; 17(9):1369–75. Epub 2003/06/12. [PubMed: 12799558]
20. Martinez P, Andia I, Emenyonu N, Hahn JA, Hauff E, Pepper L, et al. Alcohol Use, Depressive Symptoms and the Receipt of Antiretroviral Therapy in Southwest Uganda. AIDS Behav. 2007; 12(4):605–12. Epub 2007/10/31. [PubMed: 17968651]
21. Marcellin F, Boyer S, Protopopescu C, Dia A, Ongolo-Zogo P, Koulla-Shiro S, et al. Determinants of unplanned antiretroviral treatment interruptions among people living with HIV in Yaounde, Cameroon (EVAL survey, ANRS 12-116). Trop Med Int Health. 2008; 13(12):1470–8. Epub 2008/11/13. [PubMed: 19000156]
22. WHO. [accessed July 8, 2009] Management of Substance Dependence Screening and Brief Intervention. 2003. http://www.who.int/substance_abuse/publications/en/SBIFactSheet.pdf
23. Eholie SP, N'Dour CT, Cisse M, Bissagnene E, Girard PM. Observance of antiretroviral treatments: African specificities [French]. Med Mal Infect. 2006; 36(9):443–8. Epub 2006/10/10. [L'observance aux traitements antiretroviraux: particularites Africaines.]. [PubMed: 17027212]
24. Eholie SP, Tanon A, Polneau S, Ouiminga M, Djadji A, Kangah-Koffi C, et al. Field adherence to highly active antiretroviral therapy in HIV-infected adults in Abidjan, Cote d'Ivoire. J Acquir Immune Defic Syndr. 2007; 45(3):355–8. Epub 2007/04/18. [PubMed: 17438479]
25. Brinkhof MW, Dabis F, Myer L, Bangsberg DR, Boule A, Nash D, et al. Early loss of HIV-infected patients on potent antiretroviral therapy programmes in lower-income countries. Bull World Health Organ. 2008; 86(7):559–67. Epub 2008/08/02. [PubMed: 18670668]

Appendix

IeDEA West Africa collaboration:

- Principal investigator: Pr François Dabis (INSERM U897, ISPED, Bordeaux, France)
- Co-principal investigator: Pr Emanuel Bissagnene (SMIT, Treichville, Abidjan, Côte d'Ivoire)
- Co-investigators: Clarisse Amani-Bosse, Franck Olivier Ba-Gomis Emmanuel Bissagnene, Eric Delaporte, Constace Kanga-Koffi, Moussa Maiga, Eugène Messou, Albert Minga, Kevin Peterson, Papa Salif Sow, Hamar Traoré, Marcel D Zannou
- Other members: Gérard Allou, Xavier Anglaret, Alain Azondékon, Eric Balestre, Jules Bashi, Ye Diarra, Joseph Drabo, Jean-François Etard, Didier K Ekouévi, Antoine Jaquet, Alain Kouakoussui, Valérie Leroy, Charlotte Lewden, Karen Malateste, Lorna Renner, Haby Signaté Sy, Marguerite Timité-Konan, Rodolphe Thiebault, Hapsatou Touré, Annie J Sasco
- Coordinating centres: INSERM CRE U 897, ISPED, Université Victor Segalen, Bordeaux, France and Programme PAC-CI, CHU de Treichville, Abidjan, Côte d'Ivoire
- Adults clinical centers
 1. Service d'Hépto-Gastro-Entérologie, Hôpital Gabriel Touré, Bamako, Mali
 2. Centre de Prise en Charge des Personnes vivant avec le VIH, CHNU, Cotonou, Benin
 3. Centre de Prise en Charge des Personnes vivant avec le VIH, Hôpital du point G, Bamako, Mali
 4. ACONDA-CePreF, Adultes, Abidjan Côte d'Ivoire
 5. Unité de Soins Ambulatoires et de Conseil (USAC), Abidjan, Côte d'Ivoire
 6. Centre Intégré de Recherche Bioclinique d'Abidjan (CIRBA), Abidjan, Côte d'Ivoire
 7. Centre Médical de Suivi de Donneurs de Sang/CNTS/PRIMO-CI, Abidjan, Côte d'Ivoire
 8. Service de Maladies Infectieuses et Tropicales (SMIT) de l'hôpital de Treichville, Abidjan, Côte d'Ivoire
 9. ACONDA-MTCT+ Adultes, Abidjan, Côte d'Ivoire

Table 1

Determinants of non adherence to HAART in HIV-infected patients (N=2065^{*}). IeDEA West Africa collaboration, 2007–2008

	Number of patients		Univariate analysis			Multivariate analysis		
	Non adherent [†]	Exposed	OR	95% CI	P	OR	95% CI	P
Country					<10 ⁻³			0.07
Benin	23 / 335	1	1			1		
Côte d'Ivoire	165 / 1603	1.6	1.1 – 2.4			1.4	0.9 – 2.3	
Mali	3 / 127	0.3	0.1 – 1.1			0.3	0.1 – 1.1	
Gender					0.99			0.71
Women	134 / 1463	1				1		
Men	57 / 602	1.0	0.7 – 1.3			0.9	0.7 – 1.4	
Age (years)					0.43			0.45
18–30	27 / 348	1				1		
30–40	93 / 927	1.3	0.8 – 2.1			1.3	0.8 – 2.1	
40 and over	71 / 790	1.0	0.7 – 1.9			1.1	0.7 – 1.8	
Formal education					0.99			0.35
none	48 / 499	1				1		
primary	60 / 653	1.0	0.7 – 1.4			0.9	0.6 – 1.4	
secondary and over	83 / 913	1.0	0.7 – 1.4			0.7	0.5 – 1.1	
Marital status					0.18			0.67
Married, cohabitant	93 / 1060	1						
Single, widowed, divorced	90 / 940	1.2	0.9 – 1.7			1.1	0.7 – 1.4	
Alcohol use					<10 ⁻⁴			<10 ⁻⁴
None	112 / 1439	1				1		
Present drinkers [‡]	60 / 557	1.7	1.3 – 2.3			1.4	1.1 – 2.0	
Hazardous drinkers [§]	19 / 69	5.0	3.0 – 8.4			4.7	2.6 – 8.6	
Immunological status at HAART initiation					0.80			0.66
CD4 cell count ≥ 50	158 / 1695	1				1		
CD4 cell count < 50	33 / 370	0.9	0.6 – 1.4			1.0	0.7 – 1.6	
History of adherence counselling					0.03			0.03
No	82 / 745	1				1		

	Number of patients		Univariate analysis			Multivariate analysis		
	Non adherent	/ Exposed	OR	95% CI	P	OR	95% CI	P
Yes	109/1320		0.7	0.6 – 0.9		0.7	0.5 – 0.9	
HAART duration					0.45			0.98
1 month to 2 years	63 / 650	1				1		
2 to 3 years	79 / 850		1.2	0.9 – 1.6		1.0	0.7 – 1.4	
4 years	49 / 565		1.1	0.8 – 1.6		0.9	0.6 – 1.4	

* 71% of the 2920 interviewed subjects for whom clinical information was retrieved from the leDEA West Africa data base

[†] non-adherence defined by taking less than 95% of their HAART treatment assessed by the ACTG, 4-days recall, follow-up questionnaire

[‡] Patients who declared consuming alcohol within the past year

[§] hazardous drinkers defined by an AUDIT score of 8 points or more.

HAART: Highly Active Antiretroviral Treatment, OR: Odds Ratio, CI: Confidence Interval.