Factors Associated with Adherence to HAART in Patients with HIV/Aids

Fatores Associados à Adesão ao HAART em Pacientes com HIV/Aids

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ABSTRACT

Introduction: the need for optimal adherence to Highly Active Antiretroviral Therapy (HAART) is essential for successful treatment in Acquired immune deficiency syndrome (aids). **Objective:** assess HAART's adherence and related socio-demographic, clinical and laboratory variables. **Methods:** cross-sectional study. Sample calculation: 81 among 870 patients using HAART. Data collected between 14/09/2009 and 20/10/2009 at HIV/aids Outpatient Clinic of Federal University of Espírito Santo, Vitória – ES. Standardized forms and CEAT-VIH questionnaire translated and adapted to Brazilian language were used to access data and adherence, respectively. Considering the strict adherence outcomes (≥ 85% in the CEAT-VIH) and the presence or absence of possibly associated factor, univariate and multivariate analysis (binary logistic regression) were used and odds ratio (OR) was the association measure assessed. **Results:** strict adhesion was found in 42% of patients and mean adhesion was 81.1%. Medication use failure was reported by 76.5% of interviewed and main reasons were: forgetfulness (37%) and being away from home (30.9%). Strict adhesion was significantly associated with a higher number of completed years of study and a longer duration of undetectable viral load. **Conclusion:** despite an acceptable mean adhesion, strict adherence was poor. Better adherence was associated with a higher educational level and longer virological suppression.

Keywords: aids, adherence, antiretroviral therapy, DST

RESUMO

Introdução: uma ótima adesão ao esquema antirretroviral de alta eficácia (HAART) é imprescindível para o sucesso terapêutico na síndrome da imunodeficiência adquirida humana (Aids). **Objetivo: v**erificar a adesão ao HAART e identificar variáveis sociodemográficas, clínicas e laboratoriais relacionadas a esta. **Métodos:** estudo de inquérito simples com cálculo amostral de 81 pacientes dentre os 870 usando HAART no Serviço Especializado em HIV/Aids da Universidade Federal do Espírito Santo, Vitória – ES. Os dados foram coletados entre 14/09/2009 a 20/10/2009. Formulário padronizado e a versão traduzida e adaptada à realidade brasileira do questionário CEAT-VIH foram utilizados para acessar os dados e a adesão, respectivamente. Os desfechos foram adesão estrita (≥ 85% no CEAT-VIH) ou não, e presença ou ausência de fator possivelmente associado, utilizaram-se análises uni e multivariada (regressão logística binária) e cálculo da *Odds Ratio* (OR) como medida de associação. **Resultados:** adesão estrita foi encontrada em 42% dos pacientes, com a média de adesão de 81,1%. Falha no uso da medicação ocorreu em 76,5% dos entrevistados, cujos principais motivos foram: esquecimento (37%) e estar longe de casa (30,9%). Adesão estrita esteve estatisticamente associada a um maior número de anos completos de estudo e a um maior tempo de carga viral indetectável. **Conclusão:** apesar de uma média de adesão aceitável, a adesão estrita foi insatisfatória. Melhor adesão esteve associada a um maior grau de escolaridade e maior tempo de supressão virológica.

Palavras-chave: aids, adesão, terapia antirretroviral, DST

INTRODUCTION

Acquired Immune Deficiency Syndrome (aids) pandemy has a great impact in Brazil and worldwide, with an estimated 33.4 million people infected with Human Immunodeficiency Virus (HIV) and 2.7 million new cases in 2008 in the world. Latin America accounts for 1.6 million people infected, a third of these in Brazil[1].

The improved survival of patients after the introduction of Highly Active Antiretroviral Therapy (HAART) may be evidenced by the increasing decline of aids mortality worldwide. In Brazil, HAART was introduced in Unified Health System (SUS) in 1996 by Ministry of Health, but the free distribution of zidovudine (AZT), didanosine (ddI) and zalcitabine (DDC) has occurred since 1991[2]. Improvement in survival leads to increase of treatment's resistance, caused by poor treatment adherence or virologic and/or immunologic failure[3,4].

In recent years, several studies have emphasized the importance of adherence to antiretroviral treatment as a tool for drugs sustainability, where poor compliance is a major cause of treatment failure[5-7]. The adherence failures are founded mainly on ignorance about their disease and the benefits of treatment by patients; in fact by, start HAART in clinically asymptomatic patients, unfavorable doctor-patient relationship, inadequacy of treatment regimen and patient daily routine, psychological aspects of patient regarding disease and drug treatment; and its side effects, make the strict adherence a challenge[7].

There are four main ways of assessing adherence to antiretroviral therapy: the use of questionnaires, pill count techniques, dosage of drugs in plasma and electronic monitoring of medication boxes, each with advantages and limitations[8]. It is noteworthy, however, that there is still no gold standard for adherence assessment, being the most used and most cost-effective the use of questionnaires[8].

Given the many ways of measuring patient adherence to HAART and non-standardization of the questionnaires used in the studies it is complicated to compare them, so that, identification of main predictors of noncompliance as well as the development of intervention strategies to improve adherence, also become difficult[9].

Thus, it is essential to know the pattern of HAART's adherence in different clinical settings, and check socio-demographic, clinical and laboratory findings that may be associated or not with a good adherence to treatment. Thus, this study aims to check the status of adherence to

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antiretroviral treatment and factors associated with this in a specialized care service for HIV/aids in Vitória, Espírito Santo, Brazil.

METHODS

Location and study population

The HIV/Aids Outpatient Clinic is located at University Hospital Cassiano Antonio Moraes (HUCAM) in Federal University of Espírito Santo (UFES), Vitória city, Espírito Santo (ES) state, Brazil. During the study period the service was account for about 30% of 2,700 patients receiving HAART in ES. The study population was 870 patients living with HIV/aids receiving HAART.

This Outpatient Clinic had a team made up of eleven HIV specialists, two nurses, a social worker, three nurse technicians and a pharmacist. Each patient is assisted by the same infectious disease specialist at each visit.

Study design

The study is a cross-sectional survey using simple enquire. The sample size calculation was performed using EpiInfo 3.3.2 considering a power of 80% for the test and an estimate of effect for confidence interval of 95%. It was considered that the number of patients on HAART at HUCAM in April 2009 was 870 patients, and the literature data showing that the frequency of non-compliance of around 30%[5,6,10,11]. The sample size was 81 patients.

Data was collected during 28 business days between 14/09/2009 and 20/10/2009. Interviews were performed between 14/09/2009 and 20/10/2009, data was collected during 28 business days, with a mean of three patients selected every day by simple random between eligible patients of the day. HAART has been considered the use of three or more antiretroviral drugs from at least two different classes.

All randomized patients who agreed to participate signed an informed consent form. Data collection was conducted through a questionnaire entitled "Cuestionario para la Evaluación de la Adhesion in Antiretroviral al Tratamiento con personas y infected by HIV aids" (CEAT-VIH)[8,12] and a form prepared by the investigators including socio-demographic, clinical and laboratory characteristics of patients. CEAT-VIH questionnaire is an instrument to measure the degree of adherence to treatment for people living with HIV/aids using antiretroviral drugs. It includes 20 items with the following dimensions:

a) treatment adherence, which includes the following variables: adherence during last week, general adherence since principle of treatment, adherence to the time of taking the medications, assessment of the patient's level of commitment, remembering the names of drugs included in your treatment.
b) factors that modulate treatment adherence, which included: history of noncompliance (frequency in sense of feeling better before the omission of the medication, frequency with sensation of feeling worse after the ingestion of drugs and frequency of sadness or depression precede non-compliance); doctor-patient relationship; patient's beliefs about his effort and time required for adherence and difficulties in maintaining adherence and expectations for treatment outcomes; intensity of side effects; degree of drug information; degree of satisfaction with treatment; improved perception of health from the start of treatment; use of strategies to remember the schedules of drugs.

Total score of CEAT-VIH questionnaire allows us to identify an overall rate of adherence to antiretroviral therapy, which facilitates the classification of subjects according to degree of compliance ("strict adherence", "insufficient membership (regular)" and "low or inadequate"). Strict adherence is defined by an adherence rate ≥ 85% compared to the total questionnaire score[12].

After providing a written informed consent form, participants answered to CEAT-VIH questionnaire individually and then a interview was performed with trained researchers to fill the form data. CEAT-VIH questionnaire was used in Portuguese, Brazilian version; it was translated, adapted and validated for the Brazilian reality from the questionnaire proposed by Remor et al. 2007[8]. This data collection instrument was used under the author's express permission.

Eligibility criteria

Inclusion criteria were age greater than or equal to 18 years, positive serology for HIV, use of HAART for at least 6 months prior to study, be enrolled at HIV/Aids Outpatient Clinic – HUCAM.

Exclusion criteria were: illiterate, those who did not agree to participate and did not sign the consent form, pregnant women.

Characterization of variables used in the study. Socio-demographic variables were: age, marital status, occupation, gender, race/color, education level, employment status, per capita income, family status. Clinical variables were: time of diagnosis of HIV infection in years, duration of HAART in years, aids diagnosis criterion (Caracas Criterion/Rio de Janeiro or adapted "Centers of Disease Control" criteria), the way of HIV acquisition, number of tablets per day of HAART, number of doses per day of HAART, presence of concomitant diseases, use of concomitant medications, number of pills per day of concomitant medications, reason of failure in drugs administration, smoking, alcohol. Laboratory variables were: last count of CD4 + T-lymphocytes (CD4 count), HIV viral load, lower CD4 count, prior to HAART CD4 count and HIV viral load and time of undetectable HIV viral load in weeks.

Statistical analysis

The descriptive analysis of continuous quantitative variables was represented by its central location and measures of variability, mean and standard deviation if Gaussian model, otherwise median and interquartile range. Categorical variables were represented by their absolute and relative frequencies. The outcomes were presence of strict adherence (≥ 85% by the score of transformed questionnaire CEAT-VIH) or its absence, and presence or absence of associated factor (variable).

The chi-square or Fisher's exact test was used to compare categorical variables. For continuous variables, T-Student test was used for comparison of normal distributions between the two groups (strict adherence or not). For non-normal distributions it was used the Mann-Whitney test.

Multivariate analysis was performed by binary logistic regression model using the "Enter" method. Variables that have adjusted well to the model were those with requirements for logistic regression: be independent, with $p < 0.1$ in univariate analysis, cells have a value greater than or equal to one in crosstabs and not have more than 20% of cells with values below five.

Variables independency was tested to check whether there was an association or correlation between them. It was used Pearson's correlation test or chi-square test, as appropriate. When variables

were correlated or associated, it was chosen to enter the multivariate model those most significant in the univariate analysis or the one most relevant in clinical practice.

Adjustment Hosmer-Lemeshow test model was used in this study. The association measure calculated from logistic model was "odds ratio" (OR). All data were analyzed using SPSS Inc, version 18.0.

Ethical considerations

Study was approved by local Ethics Committee under registration number 147/09 in august 26th 2009.CEAT/HIV questionnaire was used with prior permission from author[8].

RESULTS

Descriptive analysis

Eligibility criteria were applied among patients admitted in HIV/Aids Outpatient Clinic-HUCAM-UFES during the study period (09/14/2009 to 20/10/2009). All these patients agreed to participate and signed the informed consent form.

Of eighty-one patients studied 50 (61.7%) were male; mean age was 43.96 years with standard deviation (SD) of 9.92 years. Most of them (85.19%) lived in Vitória Metropolitan Region (ES). About race/color, brown represented 50.6% (41), whites 27.2% (22) and blacks 22.2% (18). About marital status, 49.4% (40) were single, 32.1% (26) were married and 18.5 (15%) were separated or widowed, and only 19.8% of patients lived alone. Nine (11.1%) patients had kept their diagnosis of HIV infection in confidence (**Table 1**).

Regarding education, the average of years of study was 9.35 (SD ± 4.74). The median of per capita mensal income was R$ 750 reais with interquartile range (IQR) of R$ 82.00 to R$ 30,000.00 and mean of R$ 1,596.00 (SD ± R$ 4,418.55). Unemployed amounted 18.5% (15); others were employed, pensioners or received some sickness support (**Table 1**).

All patients had a diagnosis of Acquired Immune Deficiency Syndrome (aids) based on Caracas/Rio de Janeiro (25%) or CDC--adapted (75%) Criterion (**Table 1**), the most frequent criterion was CD4 < 350 cel/mm^3 (68.9%) (Data not shown in table). Time of HIV diagnosis had a mean of 8.77 years (SD ± 5.09) and a median of 8 years (IQR 0 to 20.7). The time of HAART was 6.61 years (SD ± 4.41), with median of 5.7 years (IQR 0.5 to 20.7) (**Table 1**).

Thirty-two (39.5%) patients had some comorbidities, with hepatitis C in 13.6% of cases, hypertension in 12.3%, dyslipidemia in 8.6%, diabetes in 4.9% and hepatitis B in 3.7% (data not shown in table). HAART used in by 45.6% of patients contained nucleoside or nucleotide analogues combined with protease inhibitor with or without ritonavir booster, 46.9% used combined regimen with non--nucleoside analogue and 7.4% an association of protease inhibitor and non nucleoside analogue. In addition, twenty-eight (34.6%) were using concomitant medications to HAART (**Table 1**).

Sixty-two (76.5%) patients declared failure to take the antiretroviral medications and cited as major causes forgetfulness (37%), the fact of being away from home (30.9%) or occupied (16%), adverse effects (12.3%), change in routine (6.2%), and depression, lack of interest and "drug holidays" with 4% each (**Table 1**); 37 were smokers (45.7%) and 11 alcoholics (13.6%) respondents (Data not shown in table).

Regarding laboratory data, the last CD4 count had a mean of 491 cells/mm^3 (SD ± 309) with a median of 434 cells/mm^3 (IQR

Table 1 – Demographic, socioeconomic, clinical and laboratorial characteristics of patients attended at HIV/aids outpatient clinic of Federal University of Espírito Santo, Vitoria, ES, 2009 (n = 81).

Characteristics of people interviewed	Descriptive analysis
Age (years)[a]	43.96 (± 9.92 SD)
Gender	
Male	61.7%
Female	38.3%
Race/color	
White	27.2%
Black	22.2%
Brown	50.6%
Marital status	
Single	49.4%
Married	32.1%
Separated/divorced/widowed	18.5%
Lives in Vitoria metropolitan area	
Yes	85.19%
No	14.81%
Years of study (years)[a]	9.35 (± 4.74 SD)
Per capita mensal income	1,596.00 (± 4,418.00 SD)
(reais)[a]	750.00 (IQR 82.00 – 30,000.00)
Work situation	
Employee	46.9%
Unemployed	18.5%
Family status	
Lives alone	19.8%
Lives with someone	80.2%
Does anyone know the HIV diagnosis?	
Yes	88.9%
No	11.1%
Aids diagnostic criterion	
Caracas/Rio de Janeiro	25%
CDC adapted	75%
Time of HIV diagnosis (years)[a]	8.77 (± 5.09)
	8 (IQR 0-20.7)
Time of HAART use (years)[a]	6.61 (± 4.41 SD)
	5.7 (IQR 0.5-20.7)
Co-morbidities	
Chronic hepatitis C	13.6%
Hypertension	12.3%
Dyslipidemia	8.6%
Diabetes mellitus	4.9%
Chronic hepatitis B	3.7%
Others or nothing	43.1%
Failure in taking HAART	
Yes	76.5%
No	23.5%
HAART	
With protease inhibitors (PI)	45.6%
With non-nucleoside analogues	46.9%
(NNRTI) with PI and NNRTI	7.4%

Continues

Table 1 (*Continuation)* – Demographic, socioeconomic, clinical and laboratorial characteristics of patients attended at HIV/aids outpatient clinic of Federal University of Espírito Santo, Vitoria, ES, 2009 (n = 81).

Characteristics of people interviewed	Descriptive analysis
Reasons for failed take HAART	
Forgetfulness	37%
Being away from home	30.9%
Being busy	16%
Adverse effects	12.3%
Change in the daily routine	6.2%
Depression	4%
Lack of interest	4%
"Drug Holiday"	4%
Other	21%
Use of concomitant medications	
Yes	34.6%
No	65.4%
Last T-CD4 lymphocytes count	491 (± 309 SD)
[a](cel/mm³)	434 (IQR 3-1699)
Patients with below detection limit VL/HIV	72.8%
Last VL/HIV[a]	1.0 Log (± 1.2 SD)
	1.0 Log (IQR 1-5.54)
Time of undetectable VL/HIV[b]	36.2 (± 30 SD)
(months)[a]	26 (IQR 1-98)
Raw score obtained from CEAT/	74.83 (± 9.3 SD)
HIV Questionnaire [a]	76.5 (IQR 43-87)
Score in percentage of CEAT/	81.14 (± 12.17 SD)
HIV Questionnaire[a]	83.3 (IQR 36-97)
Strict Adhesion (≥ 85% by score in percentage of CEAT/HIV)[a]	
Yes	42%
No	58%

Note. HIV: Human Immunodeficiency Virus; aids: Acquired Immune Deficiency Syndrome; HAART, Highly Effective Antiretroviral Therapy; CD4: T CD4-positive lymphocytes; VL/HIV: HIV viral load.

[a] Continuous variables are presented as mean ± standard deviation (SD) and median with their interquartile range (IQR).

[b] The detection limit of the tests used to quantify VL/HIV has varied over the years, having been in most of the time below 400 copies/mL and in the last years, < 50 copies/mL.

3-1699) (**Table 1**). Of the 81 respondents, 59 (72.8%) had HIV viral load below the detection limit (< 50 copies/mL). (Data not shown). And the mean last HIV viral load logarithm (log) was 1.0 (SD ± 1.2) and median 1,0 log (IQR 1 to 5.54). In relation to the time of undetectable viral load, the mean was 36.2 months (SD ± 30) and the median 26 months (IQR 1-98) (**Table 1**).

Strict adherence (≥ 85% by the score of the transformed questionnaire CEAT/HIV) was detected in 34 patients (42%) (Data not shown). Average of adherence was 81.14% (SD ± 12) and median 83.3% (IQR 36-97) (**Table 1**).

Univariate and multivariate analysis

Univariate analysis of the data is shown in **Tables 2** and **3**. It is noteworthy that variables with p-value < 0.1 and candidates for logistic regression model were: race/color, failure to take medication, age, years of study, per capita income and time of undetectable viral load. Since forgetfulness and failure to take the drugs were associated with each other, we chose to keep this last variable because of greater relevance.

After multivariate analysis by binary logistic regression remained significantly associated with strict adherence: years of study, with odds ratio (OR) for each additional year of study of 1.401 with a confidence interval of 95% (CI 95 %) from 1.098 to 1.788) and time of undetectable viral load (OR 1.035 for each month more and CI 95% 1.003 to 1.067) (**Table 4**).

DISCUSSION

The evaluation of adherence to long-term care remains a major challenge worldwide. Moreover, there is no gold standard methodology for verification of adherence to HAART in patients living with HIV/aids, and the methodology used in most studies has been the use of questionnaires with self-report[13-32]. Some studies have also used questionnaires to obtain data through interviews conducted by trained researchers[33-37].

It is found that mean adherence rates in different studies differ. This may be due to different study designs, different methods of measurement and definitions of adherence used and also by different contexts where patients are. Some use questionnaires (self-report) prepared by the authors[13,17,18,20,22,23], or using standardized questionnaires validated by other[15,16,24,25,29-32], and another have obtained the data through questionnaires in interviews[33-37]. It is worth noting that some measure the rate of compliance by percentage of drugs taken in the last two[19], three[37], four[20] or seven[18,23,33] days by patients.

CEAT-VIH questionnaire used in this study has been a powerful tool, useful and efficient way to detect adherence to HAART in different countries[29-32], and also validated for use in Brazil[8].

This study found that only 42% of patients achieved strict adherence (≥ 85% adherence by CEAT-VIH questionnaire), which can be regarded a sufficient percentage to therapeutic success. About the average of compliance obtained by scoring scale of the same instrument, it can be considered acceptable (81.14%). And regardless to mean score obtained by CEA-VIH of 74.83 ± 9.3 Standard Deviation (SD), it appeared similar to that observed by other authors using the same instrument: 74.89 ± 5.66 SD[8] and 75 ± 6 SD[37], representing an insufficient overall adhesion.

The percentage of adherence obtained by other authors was 73% by Gifford et al.[18], 74% by Lignano et al.[37], 74% by Blatt et al.[34], 75.6% by Abellan et al.[13], 70-89% by Haubrich et al.[17], 74.4 to 79.4% by Eron et al.[16], 77% by Kleberg et al.[20] and 81 to 88% by Murri et al.[22]. Other authors have shown lower rates of adherence: Kalichman et al.[19] 56%, Viciana et al.[25] 58.3%, Moatti et al.[21] 65%, Duong et al.[15] and Samet et al.[23] 67%. We emphasize that it is not possible to compare the above-mentioned percentage because it was acquired using different questionnaires, as well as designs and different definitions of adequate compliance.

Adverse events to antiretroviral therapy is one of the most frequent causes of poor adherence in some studies[36,37]. Otherwise

Table 2 – Results of univariate analysis (categorical variables) in patients attended at HIV/aids outpatient clinic of Federal University of Espírito Santo, Vitória, ES, 2009 (n = 81).

Categorical Variables	Strict Adhesion		Univariate analysis[a]
	Yes (n = 34)	*No (n = 47)*	*p-value*
Gender			
Male	21	29	0.995
Female	13	18	
Race			
White	7	15	0.094[b]
Black	5	13	
Brown	22	19	
Marital status			
Single	15	25	0.722
Married	12	14	
Other	7	8	
City of residence			
Vitória	7	13	
Serra	5	5	
Cariacica	7	8	0.950
Viana	3	2	
Vila Velha	5	9	
Guarapari	2	3	
Other	5	7	
Work situation			
Unemployed	16	22	0.984
Employee	6	9	
Other	12	16	
Does anyone know the HIV/ aids diagnosis	29	43	0.481
Yes	5	4	
No			
Family status			
Lives alone	8	8	0.468
Lives with someone	26	39	
Concomitant diseases			
Yes	12	20	0.510
No	22	27	
Chronic hepatitis C			
Yes	3	8	0.343
No	31	39	
Hypertension			
Yes	4	6	1.000
No	30	41	
Dyslipidemia			
Yes	2	5	0.693
No	32	42	
HAART			
With protease inhibitors (PI)	16	21	
With non-nucleoside analogues (NNRTI)	17	21	0.542
With PI e NNRTI	1	5	
Concomitant medications			
Yes	13	15	0.555
No	31	32	
Failure in taking HAART			
Yes	22	40	0.032
No	12	7	
Failure due to forgetfulness			
Yes	9	21	0.094[b]
No	25	26	
Failure due to being busy			
Yes	4	9	0.372
No	30	38	
Failure due to being away from home			
Yes	8	17	0.224
No	26	30	
Failure due to adverse effects			
Yes	2	8	0.180
No	32	39	
Smoking			
Yes	16	21	0.832
No	18	26	
Alcoholism			
Yes	7	4	0.754
No	40	30	

Note. HIV: Human Immunodeficiency Virus; aids: Acquired Immune Deficiency Syndrome; HAART: Highly Effective Antiretroviral Therapy.

[a] the Chi-square test or Fisher's, as appropriate.

[b] p-value < 0.1, variables that entered the binary logistic regression model.

other reasons for not taking drugs, like forgetting, being away from home, change in routine, side effects, depression, or concomitant diseases and even lack of interest or "drug holiday" are also frequent causes for missed drug doses[7,38,39]. In this study, forgetfulness, being away from home, being busy, adverse events and changes in daily routine was the main causes for the failure in taking antiretroviral therapy. These findings are similar to those described in the literature[7,38.39].

Adherence to antiretroviral therapy in this study was independently associated in multivariate analysis with time of undetectable viral load and years of study. It is possible that a longer time of study would facilitate a better understanding bout the disease and its control leading to correct use of treatment, as it has been shown by other authors[5-7,19,26,33,34,36,37,39]. What probably occur in that scenario is the better understand of disease and treatment for those patients with higher education. Similarly, Abellan et al.[13] found that patients who were instructed by trained nurses about their treatment had better adhesion and Guimarães et al.[36] found that greater degree of difficulty adhering to treatment occurred in patients with low understanding of medical advice.

Otherwise, Zago et al.[10] verified at that abandon to HAART were independent associated with illicit drug use, previous non-adherence of medication, last CD4 < 200 cells/mm^3 and last viral load higher than 1000 copies/mL. These results corroborates with ours just in lower viral loads (< 1,000 copies/mL for Zago et al. and undetectable for our study) predicting good adherence.

Due to large socioeconomic disparity that divides the population studied, we can infer this difference could be related to less

education or difficulties in accessing health services, factors that directly interfere with adherence to antiretroviral treatment. Kleeberg et al.[20] found low compliance associated with patients with low income and Reis et al.[29] found higher adherence in the highest social classes.

Low level of education can be so related to a lack understanding by the patient about severity of his health condition so that asymptomatic patients feel comfortable enough to not worry about correct use of medication. In addition, many patients due to workload added to their daily tasks, tend to allocate their health in a secondary role, which might also justify their failures.

Limitations of this study are those inherent to cross-sectional design, particularly regarding the vulnerability to selection bias and misclassification. The possibility of response bias, owing to the tendency to provide socially acceptable answers, cannot be excluded. However, descriptive studies such as this can pave the way for analytical comparisons that will allow better understanding of adherence in different populations and plan strategies to minimized associated factors to non adherence.

Thus, interventions based on improvement education and instruction of patients should be performed leading to a better understanding of infection by patients through educational programs offered by multidisciplinary team responsible for their care. Must be remembered that time of undetectable viral load is associated with good adherence so that this laboratory technique can be used when there are doubts about the patients adherence to antiretroviral therapy.

Further studies are needed to confirm factors related to adherence to HAART regimen in other clinical settings, and to verify the effectiveness of possible intervention actions in these patients with poor adherence.

Table 3 – Results of univariate analysis (continuous variables) in patients attended at HIV/aids outpatient clinic of Federal University of Espírito Santo, Vitória, ES, 2009 (n = 81).

Continuous Variables	Univariate Analysis p-value[a]
Age (years)	0.088[c]
Years of study	0.008[d]
Per capita mensal income (reais)	0.072[c]
Number of tablets of HAART per day	0.125
Number of doses of HAART per day	0.553
Last CD4 (cel/mm^3)	0.547
Last VL/HIV (copies/mL)	0.183
VL/HIV before HAART (copies/mL)	0.225
Time of undetectable VL/HIV[b] (months)	0.015[d]

Note. HAART: Highly Effective Antiretroviral Therapy; CD4: T CD4-positive lymphocytes; VL/HIV: HIV viral load.

[a] The Student t test or Mann-Whitney test, as appropriate.

[b] The detection limit of the tests used to quantify VL/HIV has varied over the years, having been in most of the time below 400 copies/mL and in the last years, < 50 copies/mL.

[c] p-value < 0.1, variables that entered the binary logistic regression model.

[d] p-value < 0.05, significant and entered the binary logistic regression model.

CONCLUSION

Despite an acceptable mean adhesion, strict adherence was poor. Better adherence was associated with a higher educational level and longer virological suppression.

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Conflict of interest

None.

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Table 4 – Results of multivariate analysis in patients attended at HIV/aids outpatient clinic of Federal University of Espírito Santo, Vitória, ES, 2009 (n = 81).

Variables	Univariate analysis			Multivariate analysis		
	p-value	*OR*	*CI 95%*	*p-value*	*Adjusted-OR*	*CI 95%*
Race						
White	0.094[a]	-	-		-	-
Black		1.21	0.30-4.76	0.65	1.76	0.14-20.94
Brown		0.40	0.13-1.19	0.24	2.93	0.47-18.27
Age	0.088[a]			0.25	1.04	0.96-1.12
Per capita mensal income	0.072[a]			0.19	1.00	1.00-1.00
Failure in taking HAART						
Yes	0.032 [b]	0.32	0.11-0.93	0.23	0.32	0.04-2.10
No		-	-		-	-
Time of undetectable VL/HIV[c] (months)	0.015[b]			0.02[b]	1.03	1.00-1.06
Years of study	0.008[b]			0.006[b]	1.40	1.10-1.78

Note. Multivariate analysis was performed by binary logistic regression model using the Enter method. OR: Odds Ratio; CI 95%: Confidence Interval 95%; HAART: Highly Effective Antiretroviral Therapy; VL/HIV: HIV viral load.

[a] p-value < 0.1.

[b] p-value < 0.05.

[c] The detection limit of the tests used to quantify VL/HIV has varied over the years, having been in most of the time below 400 copies/mL and in last years, < 50 copies/mL.

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