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ORIGINAL ARTICLE

Menopausal symptoms are associated with non-adherence to highly active antiretroviral therapy in human immunodeficiency virus-infected middle-aged women

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ABSTRACT

Objective: This study aimed to evaluate the association between the intensity of menopausal symptoms and highly active antiretroviral therapy (HAART) adherence in middle-aged women with human immunodeficiency virus (HIV) infection.

Methods: In this cross-sectional study, 313 Peruvian women with HIV infection (age 40-59 years) were surveyed and classified as adherent or non-adherent to HAART based on the Antiretroviral Treatment Adherence Evaluation Questionnaire. The intensity of menopausal symptoms was assessed with the Menopause Rating Scale, and categorized as none, mild, moderate, and/or severe. Age, sexual orientation, used HAART scheme, time since HIV diagnosis, menopausal status, risk of depression, and presence of comorbidities were also assessed. Poisson generalized linear models with robust variance were performed in order to estimate crude prevalence ratios (PRs) and adjusted PRs using statistical (a_1PR) and epidemiological criteria (a_2PR).

Results: A total of 19.9%, 32.6%, and 15.0% of all women presented mild, moderate, and severe menopausal symptoms, respectively. Overall, 70.6% women were non-adherent to HAART. The probability of non-adherence was higher in women with mild, moderate, and severe symptoms as compared to asymptomatic women in the non-adjusted model (PR: 1.79, 95% confidence interval [CI]: 1.39–2.29; PR: 1.76, 95% CI: 1.38–2.23; and PR: 2.07, 95% CI: 1.64–2.61, respectively) and the adjusted model.

Conclusion: The severity of menopausal symptoms was associated with HAART non-adherence in HIV-infected middle-aged women.

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Human immunodeficiency virus; menopause symptoms; treatment adherence; highly active antiretroviral therapy

Introduction

Human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS) are serious health problems, especially in low and middle-income countries[1]. Currently, this infection significantly contributes to the societal morbidity and mortality burden[2]. In Peru, it has been estimated that nearly 70,000 subjects are infected with HIV, of which 69,000 are aged 15 years or older and approximately 19,000 are women[1]. The development of highly active antiretroviral therapy (HAART) constitutes a relevant milestone that has played a positive role in the control of HIV infection in the global health framework[3,4].

HAART confers several beneficial effects to HIV-infected individuals, which largely depend on patient adherence. Indeed, this modality of treatment provides a better immune response, contributes to suppression or maintenance of HIV replication, and improves patients' quality of life[4]. Treatment failure or success is directly related to HAART adherence[5,6]. In this sense, drug side effects directly correlate to failed HAART adherence[7]. Other identified factors include age, female gender, illiteracy, marital status, distance between home and health-care center, duration of treatment, economic problems, and short interval since medical prescription, among the most important[8,9]. Consequently, improving

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adherence to HAART requires an approach from different perspectives.

HIV infection is currently managed as a chronic disease, due to the favorable effect that HAART has on reducing premature mortality[3,10]. This greater survival has increased the frequency of women being middle-aged (40–59 years old), a period in which hormonal changes usually occur[11]. During the menopausal transition, decreased estrogen secretion causes symptoms related to the psychological, urogenital, and somatic domains, which finally affect female quality of life. The prevalence and intensity of these menopausal symptoms may vary according to the studied population[11]. HIV women have a higher probability of early menopause[12] and, thus, present more severe menopausal symptoms[13,14], which could negatively affect adherence to HAART[15,16]. Since Latin American women have specific singularities in terms of social, cultural, and economic factors and of symptomatic response to mid-life hormonal changes[11], the objective of the present research was to evaluate the association between menopausal symptoms and HAART adherence in middle-aged women with HIV infection after adjusting for sociodemographic and clinical variables.

Methods

Study design and population

This analytical cross-sectional study was carried out from January 2016 to December 2017 in the outpatient clinic of three general hospitals of the Peruvian Ministry of Health: Hospital Nacional Dos de Mayo (Lima, Peru), Hospital Nacional Daniel Alcides Carrión (Callao, Peru), and Hospital Nacional Arzobispo Loayza (Lima, Peru). These centers provide subsidized health services to individuals of low economic resource. Women aged 40–59 years with HIV infection who were receiving HAART for at least 6 previous months were eligible for inclusion in the study. Women were excluded if they had aphasia, were non-Spanish speakers, and/or had moderate/severe cognitive impairment. Participants were selected according to a probabilistic sampling method, stratified by proportional allocation in each hospital.

The sample size was calculated using Nquery Advisor® version 4.0 (Statistical Solutions, Ireland), considering a β coefficient of 34.7 for the association between menopausal symptoms and adherence to HAART, previously described in a population of HIV-infected women[15]. Based on 25.4% adequate adherence[9], a sample size of 313 women was estimated in order to perform Poisson generalized linear models with an exposure variable adjusted for other control variables (covariates) with a 5% level of significance, 80% power for two-tailed tests, and a 15% correlation between control and exposure variables. Considering a 10% rejection rate, a total of 347 women were invited to participate.

Ethical considerations

The corresponding Research Ethics Review Committee of each participating center approved the study protocol. All women were informed of the study and its aims, and were invited to participate after providing signed consent, in accordance with the Declaration of Helsinki[17].

Response variable: adherence to HAART

Adherence to HAART was assessed with the Antiretroviral Treatment Adherence Evaluation Questionnaire validated in Peru[18], from the original version developed in Spain[19]. The instrument has good psychometric properties, with adequate validity and reliability (Cronbach's $\alpha = 0.71$)[18,20], and has previously been used in a Peruvian HIV population[9,21]. The tool renders a global score that may fluctuate between 17 and 89 points. According to this score, patients are classified as having low (<73 points), insufficient (74–80 points), adequate (81–85 points), and strict (>85 points) adherence[18,20]. For our association analysis, two categories were defined: non-adherent (low and insufficient adherence) and adherent (adequate and strict adherence). This classification has previously been used[9]. Cronbach's α for the Antiretroviral Treatment Adherence Evaluation Questionnaire was 0.754 in the present study.

Exposure variable: intensity of menopausal symptoms

Questionnaires included the corresponding exposure, response, and control variables which were applied by three health-care professionals (nurse and two midwives), trained for such a task. The Spanish-language version of the Menopause Rating Scale (MRS) was used to measure the severity of menopausal symptoms[22]. This tool has been used in various Latin American countries, including Peru[11,23,24]. Total MRS scores may range from 0 to 44. The scale is based on 11 items or symptoms divided into three domains: somatic, psychological, and urogenital. According to the achieved total MRS score, the intensity of menopausal symptoms were categorized as: none (score 0–4), mild (score 5–8), moderate (score 9–16), and severe (score >16)[25,26]. Cronbach's α for the MRS was 0.854 in the present series.

Control variables

Sociodemographic variables were assessed, including: age; marital status (married and cohabiting [stable union] or single, widowed, and divorced [unstable union]); sexual orientation; and time required to go from their home to the hospital (min). Risk of depression was defined as a global score ≥10 points as measured with the Peruvian version of the Patient Health Questionnaire-9, which includes 10 items that explore depressive symptoms[27]. Clinical measures included: time since HIV diagnosis (months); time since current HAART use (months); menopause hormone therapy use; menopausal stage (premenopausal, perimenopausal, and postmenopausal) as defined by criteria of the Stages of Reproductive Aging Workshop (STRAW)[28]; presence of major comorbidities (e.g., diabetes mellitus, tuberculosis, osteoporosis, dyslipidemias, and arterial hypertension); and currently used HAART scheme. Regarding the latter, the HAART scheme was classified according to the drugs used (efavirenz, nevirapine, lopinavir/ritonavir, and atazanavir/ritonavir).

Clinical and demographical variables were obtained and/or confirmed through patients' clinical records.

Statistical analyses

A database was generated in Microsoft Excel 2015® (Microsoft Corporation, USA) by double and independent digital recording. Quality control was performed by concordance between two primary databases, and agreement between digital and paper questionnaires in a random sample of 16 (5%) women. Then, this dataset was exported to STATA® version 14.0 (StataCorp. LP, USA). Median and interquartile ranges (non-normal distribution according the Shapiro–Wilk test) were used to describe numerical variables, and frequencies/percentages used to describe categorical variables. During bivariate analysis, the association between HAART adherence and categorical variables was examined using the Pearson chi-square test (after assessing assumptions based on the expected values). The Kruskall–Wallis test was used to evaluate the association with numerical variables (non-normal distribution of data, Shapiro–Wilk test; and homogeneity of variance assumptions, Levene test).

Due to the non-compliance of observations with the probabilistic structure of assumptions for a generalized linear model, we used a non-parametric bootstrap, a resampling technique, with corrected and accelerated bias with 1000 replications (Table 3). Moreover, we did not include the risk of depression in the adjusted models due to collinearity with the MRS score, specifically with the psychological domain. Also, hormone therapy use was not incorporated into the adjusted models due to the low number of observations and collinearity with the menopausal stage.

We performed Poisson generalized linear models with robust variance to evaluate the association between intensity of menopausal symptoms – with no symptoms used as the exposure category – and HAART adherence, and estimated crude and adjusted prevalence ratios (PRs) with 95% confidence intervals (95% CIs). We implemented a crude model, and two adjusted models. The first adjusted model used statistical criteria (a_1PR) adjusted for variables found to be marginally associated with HAART adherence ($p < 0.2$) upon bivariate analysis: time since disease diagnosis (months), time currently using the HAART scheme (months), time required to go from their home to the hospital (min), osteoporosis (yes/no), and partner (yes/no). The second model used epidemiological criteria (a_2PR) adjusted by confounding variables according to classical definition: menopausal stage, partner, used HAART scheme, diabetes mellitus, tuberculosis, osteoporosis, dyslipidemias, and arterial hypertension.

Results

Characteristics of women

A total of 337 women were invited to participate. Eighteen refused to participate. No statistically significant difference was found in terms of age and time of current HAART scheme use between participants and non-participants. Six participants were excluded due to non-answering of various items on the questionnaires. Finally, a total of 313 women were surveyed and their data analyzed. A flow chart of patient recruitment is shown in Figure 1.

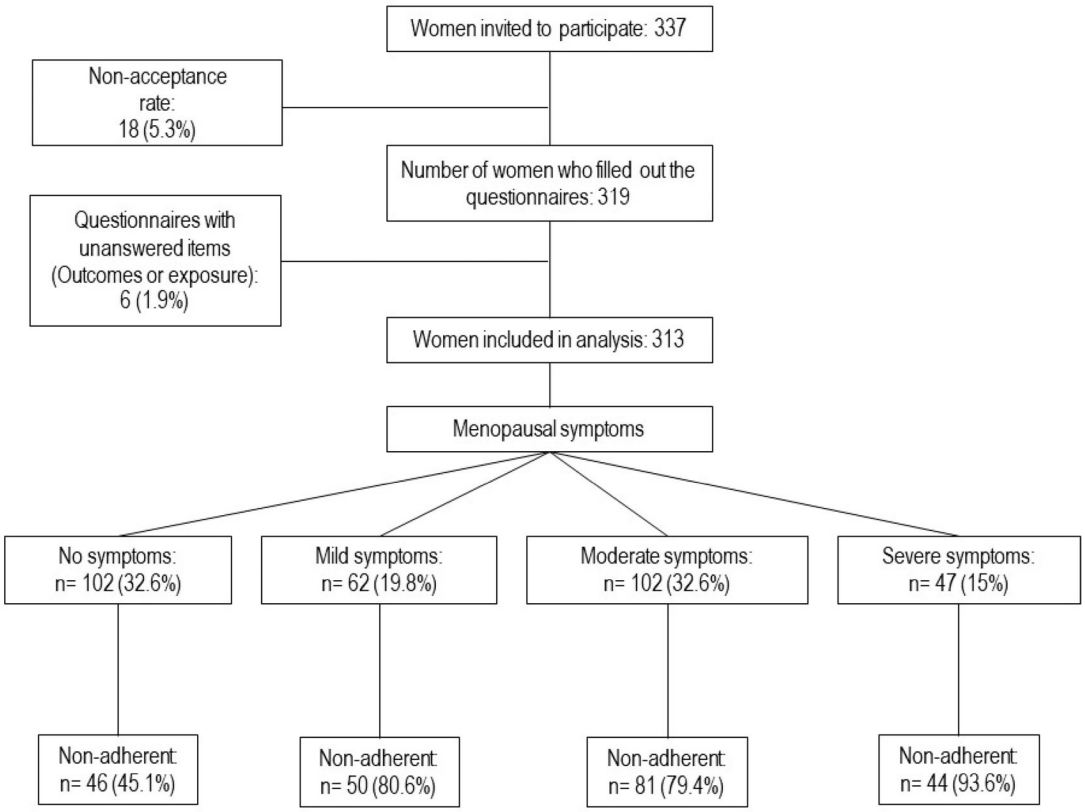

Figure 1. Flow chart for recruitment of women in the study.

The median age and time since HIV diagnosis were 47 years and 86 months, respectively. A total of 98.1% of surveyed women were heterosexual, 1.6% used hormone therapy, more than half were postmenopausal, and 19.8% were at risk of depression. Diabetes and tuberculosis were the most frequent comorbidities. The most frequently used HAART scheme was zidovudine/lamivudine/nevirapine (27.5%) and efavirenz was the most frequent base drug (50.2%). A total of 19.8%, 32.6%, and 15.0% of all surveyed women presented mild, moderate, and severe menopausal symptoms, respectively. A total of 70.6% of all women were non-adherent (25.6% low and 45.0% insufficient) and 29.4% were adherent (24.3% adequate and 5.1% strict) to HAART (Table 1). The proportion of women with viral suppression was 97.8% and 89.5% for the adherent and the non-adherent group, respectively. Median CD4 levels in adherent women was 0 copies/ml, whereas for the non-adherent group this was 499 copies/ml.

Bivariate analysis by hypothesis test

A statistically significant association was observed between the intensity of menopausal symptoms and adherence to HAART. The rate of non-adherence was 45.1%, 80.7%, 79.4%, and 93.6% for women with no, mild, moderate, and severe symptoms, respectively (Figure 2). The median total MRS score was higher in non-adherent women as compared to adherent women ($p < 0.001$). Likewise, we found a statistically significant association between HAART adherence and time since HIV diagnosis, time of current HAART scheme use, time required to go to the hospital from their home (min), and the risk of depression. There was also a marginal statistical association between the outcome of interest and having a partner and/or osteoporosis. No associations were observed between the HAART adherence and menopausal stage, hormone therapy use, diabetes mellitus, tuberculosis, dyslipidemias, and arterial hypertension (Table 2).

Crude and adjusted models

The three models are presented in Table 3. The probability of non-adherence to HAART was higher in women with mild, moderate, and severe symptomatology versus women with no symptoms in the non-adjusted model (PR: 1.79, 95% CI: 1.39–2.29; PR: 1.76, 95% CI: 1.38–2.23; and PR: 2.07, 95% CI: 1.64–2.61, respectively). These associations were similar in the adjusted models: statistical model, a_1PR: 1.80, 95% CI: 1.41–2.29; a_1PR: 1.72, 95% CI: 1.36–2.18; and a_1PR: 2.06 95% CI: 1.64–2.60, respectively; and epidemiological model, a_2PR: 1.84, 95% CI: 1.45–2.34; a_2PR: 1.83, 95% CI: 1.44–2.32; and a_2PR: 2.17, 95% CI: 1.73–2.73, respectively.

Discussion

Our findings show that the intensity of menopausal symptoms was associated with lower HAART adherence in

Table 1. General characteristics of the studied women ($n = 313$).

Characteristic	*Value*
Age (years)	47 [8.0]
Time since current use of HAART (months)	74 [90.0]
Time needed to go from their home to the hospital (min)	60 [50.0]
Time since HIV diagnosis (months)	86 [84.0]
Overall score onthe MRS	8 [11.0]
Age (categorized)	
40–44 years	110 (35.1)
45–49 years	95 (30.4)
50–54 years	62 (19.8)
55–59 years	46 (14.7)
Marital status	
Cohabiting with partner	148 (47.3)
Risk of depression (PHQ-9)	
Yes	62 (19.8)
Comorbidities	
Diabetes mellitus	21 (6.7)
Tuberculosis	20 (6.4)
Osteoporosis	17 (5.4)
Dyslipidemias	16 (5.1)
Arterial hypertension	15 (4.8)
Sexual orientation	
Heterosexual	307 (98.1)
Homosexual	1 (0.3)
Bisexual	5 (1.6)
Hormonal therapy	
Estrogen plus progestogens	1 (0.3)
Estrogen alone	4 (1.3)
Non-hormone therapy	308 (98.4)
Menopausal stage	
Premenopausal	75 (24.0)
Perimenopausal	74 (23.6)
Postmenopausal	164 (52.4)
Natural	150 (91.5)
Surgical[a]	14 (8.5)
HAART scheme	
Based on efavirenz	157 (50.2)
Tenofovir/lamivudine/efavirenz	62 (19.8)
Abacavir/lamivudine/efavirenz	55 (17.6)
Zidovudine/lamivudine/efavirenz	33 (10.5)
Didanosine/lamivudine/efavirenz	7 (2.2)
Based on nevirapine	100 (32.0)
Zidovudine/lamivudine/nevirapine	86 (27.5)
Estavudine/lamivudine/nevirapine	11 (3.5)
Abacavir/lamivudine/nevirapine	3 (1.0)
Based on lopinavir/ritonavir	38 (12.1)
Tenofovir/lamivudine/lopinavir/ritonavir	15 (4.8)
Abacavir/lamivudine/lopinavir/ritonavir	13 (4.2)
Didanosine/lamivudine/lopinavir/ritonavir	10 (3.2)
Based on atazanavir/ritonavir	18 (5.7)
Abacavir/lamivudine/atazanavir/ritonavir	7 (2.2)
Tenofovir/lamivudine/atazanavir/ritonavir	7 (2.2)
Zidovudine/lamivudine/atazanavir/ritonavir	4 (1.3)
Adherence	
Low	80 (25.6)
Insufficient	141 (45.0)
Adequate	76 (24.3)
Strict	16 (5.1)
Menopausal symptoms (according to the MRS)	
None	102 (32.6)
Mild	62 (19.8)
Moderate	102 (32.6)
Severe	47 (15.0)

Data are presented as median [interquartile range] or frequency (%).
HAART: highly active antiretroviral therapy; HIV: human immunodeficiency virus; MRS: Menopause Rating Scale; PHQ-9: Patient Health Questionnaire-9.
[a]Bilateral oophorectomy.

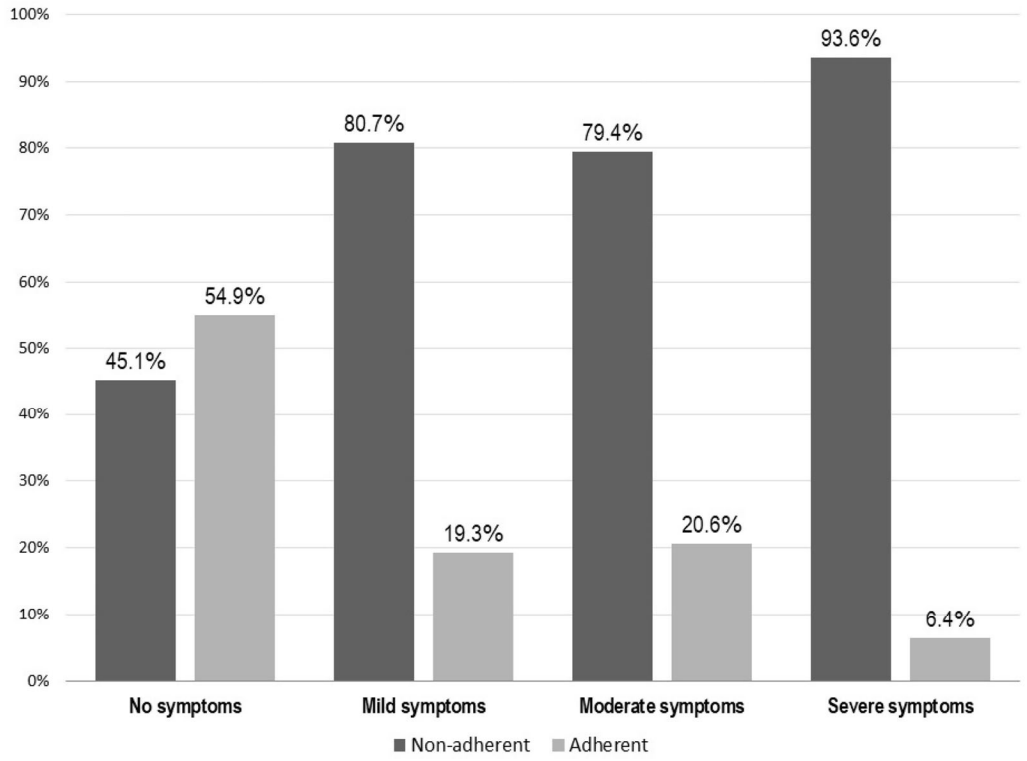

Figure 2. Frequency of adherence to highly active antiretroviral therapy according to menopausal symptom severity.

middle-aged women with HIV infection. Since adherence is pivotal to achieve the clinical goals of antiretroviral therapy[29–32], good medical information and empathy from health-care providers will reinforce adherence and improve quality of life and the holistic approach for middle-aged HIV-infected women[13]. Additionally, a proportion of non-adherence to HAART is increased and directly related to the severity of menopausal symptoms, with a notorious difference observed between women with severe symptoms as compared to asymptomatic women. This observed trend seems to reveal a potential dose–response relationship, which could have important implications related to clinical management[13], beyond the limited outline of a potential causal effect[33]. This complex context imposes a challenge for clinical practice in infectious diseases[13,34]. Furthermore, it is important to bear in mind that problems with HAART adherence are more frequent in the female sex[8,35–37].

In our series, more than 70% a patients displayed low to insufficient adherence, with only 5.1% having strict adherence. Duff *et al.*[16] reported that 70.6% of perimenopausal and postmenopausal Canadian women had strict adherence to antiretroviral therapy. This finding marks a contrast between developed and developing countries. Two recent Peruvian studies reported in adults high rates of non-adherence using the Antiretroviral Treatment Adherence Evaluation Questionnaire. Indeed, Tello-Velasquez *et al.*[9] reported 79.4% non-adherence at a Ministry of Health hospital, and Parraga Sandoval and Vargas Alayza[21] reported 85.7% non-adherence at a Social Security hospital. Both institutions belong to the Peruvian public health-care system, characterized as being segmented and fragmented and having marked differences in financial aspects, the provision of health services[38], and the socioeconomic characteristics of users mostly related to low income[39]. By means of other instruments, two other studies, carried out among adult women at Ministry of Health hospitals in Lima, Peru, reported lower non-adherence to HAART rates (35.9% and 48.1%)[40,41].

In the present study, nearly 50% of HIV-infected middle-aged women displayed moderate–severe menopausal symptoms, a rate that is similar to the 51.6% observed among non-HIV infected Peruvian middle-aged women in a multicenter Latin American study[11]. Both studies used the MRS to assess the severity of symptoms. As assessed with the same tool, 21.6% of Nigerian HIV-infected women had severe menopausal symptoms[14], a rate that is similar to the 15% found in our study. Important to mention is the fact that evidence regarding the severity of menopausal symptoms in HIV-infected women is scarce. Looby *et al.*[42] studied a small sample of perimenopausal women in Boston, USA, reporting that the mean total MRS scores were significantly higher among HIV-positive women. However, this underpowered article cannot detect the different trajectories of vasomotor symptoms across the menopausal transition as other studies have[43].

Research indicates that vasomotor symptoms, musculoskeletal complaints, and sleep disorders are experienced more frequently in the HIV-infected population[34,42,44]. Tello-Velasquez *et al.*[9] showed that poor quality of sleep was associated with less adherence to antiretroviral therapy in Peruvian HIV-infected women. As for the urogenital domain, studies show that HIV-infected women display vaginal dryness and dyspareunia at a higher rate[34,45], which could be an adverse effect of antiretroviral drugs[46]. In the psychological domain, it has been reported that symptoms of

Table 2. Factors associated with adherence to HAART in studied women ($n = 313$).

Parameter	*Non-adherent women*	*Adherent women*	p-*Value*
Age (years)	47 [8.0]	47 [9.8]	0.461[a]
Time since current use of HAART (months)	70 [92.0]	89 [76.0]	**0.009**[a]
Time needed to go from their home to hospital (min)	60 [60.0]	40 [33.8]	**0.001**[a]
Time since HIV diagnosis (months)	84 [91.5]	96 [94.8]	**0.008**[a]
Overall score on the MRS	9 [10.0]	3 [8.0]	**0.001**[a]
Menopausal symptoms (MRS)			**<0.001**[b]
None	46 (45.1)	56 (54.9)	
Mild	50 (80.7)	12 (19.3)	
Moderate	81 (79.4)	21 (20.6)	
Severe	44 (93.6)	3 (6.4)	
Risk of depression			**<0.001**[b]
No risk	162 (64.5)	89 (35.5)	
Risk	59 (95.2)	3 (4.8)	
HAART scheme (base drug)			0.744[b]
Efavirenz	114 (72.6)	43 (27.4)	
Nevirapine	67 (67.0)	33 (33.0)	
Lopinavir/ritonavir	28 (73.7)	10 (26.3)	
Atazanavir/ritonavir	12 (66.7)	6 (33.3)	
Comorbidities			
Diabetes mellitus			0.932[b]
No	206 (70.5)	86 (29.5)	
Yes	15 (71.4)	6 (28.6)	
Tuberculosis			0.656[b]
No	206 (70.3)	87 (29.7)	
Yes	15 (75.0)	5 (25.0)	
Osteoporosis			0.029[b]
No	205 (69.3)	91 (30.7)	
Yes	16 (94.1)	1 (5.9)	
Dyslipidemias			0.337[b]
No	208 (70.0)	89 (30)	
Yes	13 (81.3)	3 (18.7)	
Hypertension			0.413[b]
No	209 (70.1)	89 (29.9)	
Yes	12 (80.0)	3 (20.0)	
Menopausal stage			0.415[b]
Premenopausal	57 (76.0)	18 (24.0)	
Perimenopausal	49 (66.2)	25 (33.8)	
Postmenopausal	115 (70.1)	49 (29.9)	
Type of union with partner			0.172[b]
Unstable union[c]	99 (66.9)	49 (33.1)	
Stable union[d]	122 (73.9)	41 (26.1)	

Data are presented as median [interquartile range] or frequency (%); values in bold indicate $p < 0.05$.
HAART: highly active antiretroviral therapy; HIV: human immunodeficiency virus; MRS: Menopause Rating Scale.
[a]Determined with the Kruskall–Wallis test.
[b]Determined with the chi-square test.
[c]Married and cohabiting.
[d]Single, widow, and divorced.

Table 3. Crude and adjusted models for the association between menopausal symptoms and adherence to HAART ($n = 313$).

	Crude model[a]			*Adjusted model 1*[b]			*Adjusted model 2*[c]		
Symptoms	*PR*	*(95% CI)*	p-*Value*	a_1PR	*(95% CI)*	p-*Value*	a_2PR	*(95% CI)*	p-*Value*
None	Reference			Reference			Reference		
Mild	1.79	(1.39–2.29)	<0.001	1.80	(1.41–2.29)	<0.001	1.84	(1.44–2.35)	<0.001
Moderate	1.76	(1.38–2.23)	<0.001	1.72	(1.36–2.18)	<0.001	1.83	(1.43–2.34)	<0.001
Severe	2.07	(1.64–2.61)	<0.001	2.06	(1.64–2.60)	<0.001	2.17	(1.72–2.75)	<0.001

a_1PR/a_2PR: adjusted prevalence ratio; CI: confidence interval; HAART: highly active antiretroviral therapy; PR: prevalence ratio.
[a]Poisson generalized linear regression model with robust standard errors and non-parametric bootstrap with corrected and accelerated bias with 1000 replications.
[b]Statistical model: adjusted by marginally associated variables found during bivariate analysis (time since HIV diagnosis, time since current HAART use, time needed to go from their home to the hospital, osteoporosis, and partner).
[c]Epidemiological model: adjusted for variables that met the criteria for confusion (menopausal stage, HAART, diabetes mellitus, tuberculosis, dyslipidemias, and arterial hypertension).

anxiety related to the climacteric appear in greater magnitude in HIV-infected subjects; and anxiety is a crucial factor associated with cognitive function deterioration in this population[47]. This situation could reduce the possibility of remembering medication administration schedules. Similarly, depressive symptoms are common in menopausal HIV patients[48]. It has been reported that 43.3% of HIV patients with depressive disorders are tired of taking retroviral medication, and perhaps any other type of drugs, including hormone therapy[49], hence explaining the association of lower

adherence to HAART and increased menopausal symptoms. In addition, one should mention a low awareness among patients of the changes and manifestations caused by the climacteric; and the low interest among health-care providers treating HIV patients (generally infectologists) regarding gynecological and endocrinological issues[34,50].

Despite the aforementioned, our results suggest that menopausal symptoms should be treated, and this could eventually improve HAART adherence. However, menopause hormone therapy may interfere with HAART. Well-designed clinical trials are needed to find appropriate treatments for HIV-infected perimenopausal and postmenopausal women.

As for the limitations of the present study, one should mention its cross-sectional design, which does not aid determining causal effect. Nonetheless, the objective of our study was to evaluate an association, performing appropriate statistical strategies of associative models with control of variables. In addition, the included women do not constitute a representative sample of Peruvian patients under HAART therapy. Finally, potential measurement bias may arise from the non-use of the 'gold standard' for the measurement of main variables. However, instruments used in our study have shown validity and reliability in other Latin American and Peruvian female populations (HIV infected or non-HIV infected)[9,11,21].

Despite the aforementioned limitations, our results could help improve the comprehensive clinical management of middle-aged women with HIV[51], and aid in formulating guidelines and policies, that could be extrapolated to other populations. It is advisable to consider performing a comprehensive evaluation of middle-aged women who are on HAART, through a multidisciplinary team.

In conclusion, our study found that the intensity of menopausal symptoms increased the probability of HAART non-adherence in HIV middle-aged women. Hence, early detection would be relevant in clinical practice. Longitudinal studies are required to assess a possible causal effect.

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