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ORIGINAL RESEARCH

Assessment of factors influencing health-related quality of life in HIV-infected patients

LS Briongos Figuero,[1] P Bachiller Luque,[1] T Palacios Martín,[1] M González Sagrado[2] and JM Eiros Bouza[3]

[1]Internal Medicine Department, Rio Hortega University Hospital, Valladolid, Spain, [2]Investigation Department, Rio Hortega University Hospital, Valladolid, Spain and [3]Department of Microbiology, Clinical University Hospital, Valladolid, Spain

Objectives

Health-related quality of life (HRQL) is used in the assessment of chronic illness. Regarding HIV infection, HRQL assessment is an objective for physicians and institutions since antiretroviral treatment delays HIV clinical progression. The aim of this study was to determine the factors with the most influence on HRQL in HIV-infected people and to create a predictive model.

Methods

We conducted a cross-sectional study in 150 patients in a tertiary hospital. HRQL data were collected using the Medical Outcomes Study HIV Health Survey (MOS-HIV) questionnaire. The research team created a specific template with which to gather clinical and sociodemographic data. Adherence was assessed using the Simplified Medication Adherence Questionnaire (SMAQ) and depression data were obtained using the Beck Depression Inventory, Second Edition (BDI-II) inventory. Logistic regression models were used to identify determinants of HRQL.

Results

HIV-related symptoms and presence of depression were found to be negatively associated with all the MOS-HIV domains, the Physical Health summary score and the Mental Health summary score. Patients receiving protease inhibitor (PI)-based treatment had lower scores in four of the 11 domains of the MOS-HIV questionnaire. Gender, hospitalization in the year before enrolment, depression and parenthood were independently related to the Physical Health Score; depression and hepatitis C virus coinfection were related to the Mental Health Score.

Conclusions

Optimization of HRQL is particularly important now that HIV infection can be considered a chronic disease with the prospect of long-term survival. Quality of life should be monitored in follow-up of HIV-infected patients. The assessment of HRQL in this population can help us to detect problems that may influence the progression of the disease. This investigation highlights the importance of a multidisciplinary approach to HIV infection.

Keywords: health status indicators, HIV, logistic models, quality of life

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Introduction

The biopsychological effects of HIV infection have an important impact not only on patients' lives but also on their family and communities and on overall public health. The first report of a case of AIDS was published in 1981 [1], and since then more than 60 million people world-wide have been infected with HIV, which remains a cause of premature death in developing countries [2]. Since the introduction of antiretroviral therapy (ART) in 1996, the survival rate of HIV-infected patients has increased markedly, and HIV infection is now regarded as a chronic disease [3]. Therefore, the concerns of HIV-infected patients regarding treatment now centre not only on the increased longevity it provides, but also on its impact on their quality of life.

Quality of life is a multidimensional concept that includes factors such as physical and social functioning, mental health, pain and energy [4–6]. However, in evaluating a patient's

Correspondence: Dr L. S. Briongos Figuero, Rio Hortega University Hospital, C/Dulzaina 2, Valladolid 47012, Spain. Tel: + 34983215389; fax: + 34983331566; e-mail: laisadoc@hotmail.com

state of health and the degree to which an illness affects their quality of life, the term used is 'health-related quality of life' (HRQL) [7], which takes into account the biological and psychological effects of the illness on the patient and involves state of health, functional state and quality of life [4,8]. HRQL assessment has become one of the most widely used subjective health evaluations in chronic illness.

Life experiences of HIV-infected people are as heterogeneous as the population affected. HRQL assessment in these patients provides valuable information about the effects of ART, disease progression and prognosis, and the factors that influence prognosis; results that clinical analysis is unable to provide. It must be taken into account that the evaluation of HRQL by the patient does not necessarily coincide with the severity of the illness as defined by the patient's doctor. HRQL provides valuable information for health care managers and authorities, as it allows evaluation of the efficiency, effectiveness and cost–benefit ratio of health care programmes, and for pharmaceutical companies that gather data on effectiveness, clinical benefit, satisfaction with treatment and treatment adherence [9–11]. The literature shows the importance of factors most closely related to HRQL in HIV-infected people. These factors are psychological aspects and sociodemographic characteristics, clinical indicators unrelated to the infection and the individual illness [6,12–15].

HRQL in the HIV-infected population has not previously been investigated in our region, and so the aim of this study was to determine the impact of various sociodemographic, clinical and psychological factors on HRQL in an HIV-infected population receiving care at the HIV clinic of a tertiary Spanish hospital, and to identify variables that allow us to establish a predictive model to evaluate HRQL in this population and these patients' overall perception of their health status.

Methods

A cross-sectional study was conducted in HIV-infected patients under follow-up at the Río Hortega University Hospital in Valladolid (Spain). The target population comprised individuals with HIV infection who agreed to participate in the study in the period March 2007 to April 2008. Exclusion criteria were: (a) recent diagnosis with HIV infection (less than 6 months ago); (b) age <16 years; (c) the patient not being frequently seen by our specialists; (d) refusal to participate in the study; (e) a physical or mental condition that made interviewing the patient problematic. Nine persons refused to participate in the study (six men and three women) and did not sign the medical consent form; these patients were not a homogeneous group in terms of sociodemographic, epidemiological or clinical characteristics. Following consultation with the Investigation Department, a total of 150 out-patients were consecutively selected after they had signed the medical consent form according to the principles of the Declaration of Helsinki.

HRQL was evaluated using the disease-specific Medical Outcomes Study HIV Health Survey (MOS-HIV) questionnaire developed by Wu *et al.* [16]. This questionnaire has been translated into various languages and undergone cultural adaptation and validation. The Spanish questionnaire is version 2.1 of the original one [17] and consists of 35 items grouped into 11 domains: General Health Perceptions, Pain, Physical Functioning, Role Functioning, Social Functioning, Mental Health, Energy, Health Distress, Cognitive Functioning, Overall Quality of Life and Health Transition. In addition to these subscales, the Physical Health summary score (PHS) and Mental Health summary score (MHS) can be calculated by standardizing the score of each domain using weighting coefficients given by the authors of the questionnaire [18]. The MOS-HIV domains are scored as summated rating scales from 0 (worst state of health possible) to 100 (best state of health possible). The internal consistency of the scales is high (Cronbach's $\alpha = 0.78–0.89$) and the test–retest reliabilities of the Physical and Mental Health indexes are 0.58 and 0.85, respectively [18].

To evaluate which variables may be predictors of HRQL, a specific questionnaire was created in which the second person was used as a formal manner of address (in Spanish: the form *usted*) in order to avoid possible discrepancies between the questions made and the patient's subjective feelings. Data collected included the following.

Sociodemographic variables: age, sex, nationality, marital status, domestic situation, parenthood, educational background, employment status, income level, sexual orientation (heterosexual, homosexual or bisexual), and tobacco, alcohol and drug use.

Clinical variables: CD4 cell count [determined by flow cytometry using FACSCalibur (Becton-Dickinson, Franklin Lakes, New Jersey, USA)], viral load [determined by polymerase chain reaction (PCR) using the Ultrasensitive Cobas Amplicor HIV Monitor (Roche, Pleasanton, California, USA)], HIV transmission group, AIDS classification [Centers for Disease Control and Prevention (CDC) criteria], symptoms (list compiled from contributions in the literature revised and from our observations in clinical practice) and comorbidity [dyslipidaemia, hypertension, diabetes mellitus, chronic hepatitis C virus (HCV) infection and chronic bronchopathy].

Variables related to antiretroviral therapy (ART): adherence, type of regimen and its administration, and number of pills prescribed per day.

Psychological variables: presence of symptoms of depression, health care satisfaction level, degree of trust in the attending clinical staff and self-perception of the level of support received.

ART adherence was evaluated using the Simplified Medication Adherence Questionnaire (SMAQ) created by the Spanish group Grupo Español para el Estudio Multifactorial de la Adherencia (GEEMA) [19], which has been shown to have 72% sensitivity and 91% specificity. It consists of six questions and categorizes patients as nonadherent if they respond 'yes' to any of the following questions: 'Do you ever forget to take your medicine?', 'Are you careless at times about taking your medicine?', 'Sometimes if you feel worse, do you stop taking your medicine?' and 'Did you not take any of your medicine over the past weekend?'; or if the patient has missed more than two doses in the past week or has not taken any medicine for two full days. This questionnaire is dichotomic; any answer expressing lack of adherence is considered to indicate nonadherence.

The presence of depression was evaluated using the Beck Depression Inventory, Second Edition (BDI-II) [20], which is an instrument made up of 21 items designed to identify depressive symptoms and quantify their intensity. In each item, the option that best fits the patient's mental state in the previous 2 weeks is selected from four alternatives listed in order of lesser to greater severity. Each item is scored from 0 to 3, and adding the scores together gives a final score that ranges from 0 to 63. Categories of severity are defined as follows: 0–13 points, minimal or no depression; 14–19 points, mild depression; 20–28 points, moderate depression, and 29–63 points, severe depression. This instrument has been validated for the Spanish population with high internal consistency (α coefficient of 0.87) [21]. BDI-II is one of the most widely used instruments for evaluation of depression in HIV-infected people [22].

Patients were contacted in order to schedule a personal interview, during which a trained interviewer administered the previously described questionnaires. Statistical analysis was carried out as follows. A descriptive profile analysis was performed on the sample, the results of which are expressed as mean $\pm$ standard deviation, frequencies and percentages. Subsequently, the association between variables was studied using χ^2 test with Fisher's exact test and Student's *t*-test with Bonferroni's adjustment for multiplicity. An analysis of variance (ANOVA) was used to compare differences between groups when required. Finally, logistic regression analyses were carried out using PHS and MHS as dependent variables, with patients considered to have a poor quality of life if their PHS and/or MHS was at or below the 25th percentile of the distribution. Independent variables were those with significant results in the univariate analyses, in addition to age and sex, in order to obtain a logistic regression model that permitted study of predictive variables related to PHS and MHS. The number of variables included in each model was six (one variable for every 20 patients to avoid interactions). Data were analysed using spss v.15.0 (SPSS Inc., Chicago, IL, USA) and graphics were created using the GraphPad Prism 5.0 application (La Jolla, CA, USA). Values were considered significant at a *P*-value ≤ 0.05. The HRQL analysis was carried out according to the recommendations of the original authors [23].

Results

A total of 150 out-patients were included in the study, of whom 112 were male (74.7%) and 38 were female (25.3%). The mean age of the group was 44.3 $\pm$ 8.3 years, and the median age was 44 years. The mean age of the male patients was 44.8 $\pm$ 8.2 years and that of the female patients was 43 $\pm$ 8.8 years; this difference was not significant. Of the 150 patients, 19 (17.0%) of the male patients and five (13.2%) of the female patients were >50 years old. Men were more often single than of other marital status, and women were more often married or widowed ($P<0.001$). The most common type of cohabitation was living with partner or children, or both (48.7%); cohabitation was significantly more frequent in women than in men (65.8% *vs.* 42.9%, respectively; $P=0.015$). A summary of the sociodemographic, epidemiological and clinical data is presented in Table 1. The mean PHS value was 52.3 $\pm$ 8.8 and the mean MHS value was 49.3 $\pm$ 9.9. The distribution of mean values for the MOS-HIV questionnaire is shown in Table 2.

We found that women had lower scores than men in Pain ($P=0.038$) and Cognitive Functioning ($P=0.037$), with no differences in the other HRQL domains. Patients >50 years old had higher scores than the youngest age category in Pain patients without children got higher scores than patients with children in ($P=0.018$), Health Distress ($P=0.018$) and Cognitive Functioning ($P=0.004$). Single patients ($P=0.020$), those who lived alone ($P=0.006$) and those without children ($P<0.001$) had higher scores for General Health Perceptions. In this last group, patients without children got higher scores than patients with children in Energy ($P=0.018$), Quality of Life ($P=0.007$), PHS ($P=0.005$) and MHS ($P=0.012$) scores were higher in patients with children. We found no significant differences for educational background or income level. Former smokers had higher scores than other patients in the Health Distress domain ($P=0.032$). Patients with a history of injecting drug use (IDU) had lower scores than other

Table 1 Sociodemographic, epidemiological and clinical characteristics of the patients

Characteristic	
Gender [*n* (%) female]	38 (25.3)
Age (years) (mean ± SD)	44.3 ± 8.3
Over 50 years old [*n* (%)]	24 (16)
Immigrants [*n* (%)]	12 (8)
Level of education [*n* (%)]	
Primary school	86 (57.3)
High school	47 (31.3)
University	17 (11.3)
Marital status [*n* (%)]	
Single	69 (46)
Married	53 (35.3)
Widowed	9 (6)
Separated or divorced	14 (9.3)
Common-law relationship	5 (3.3)
Domestic situation [*n* (%)]	
Living with partner/children/both	73 (48.7)
Living with relatives	47 (31.3)
Living alone/with friends/other	30 (20)
Having children [*n* (%)]	70 (46.7)
Employment status [*n* (%)]	
Unemployed without income/housewife/other	20 (13.3)
Receiving income	77 (51.3)
Pensioner/retired	53 (35.3)
Income level [*n* (%)]	
<380 euros	35 (23.3)
380–600 euros	21 (14)
601–1200 euros	45 (30)
>1200 euros	49 (32.7)
Sexual orientation [*n* (%)]	
Heterosexual	115 (76.7)
Homosexual	27 (18)
Bisexual	8 (5.3)
Tobacco consumption [*n* (%)]	
Active smoker	94 (62.7)
Ex-smoker	28 (18.7)
Daily consumption of alcohol [*n* (%)]	43 (28.7)
Occasional consumption of cocaine or cannabis [*n* (%)]	15 (10)
History of IDU [*n* (%)]	69 (46)
Treatment with methadone [*n* (%)]	18 (12)
HIV transmission group [*n* (%)]	
Shared use of drug-injecting paraphernalia	57 (38)
Heterosexual relationship (non-IDU)	53 (35.3)
Homosexual relationship	28 (18.7)
Other	12 (8)
CDC classification [*n* (%)]	
Category A	52 (34.7)
Category B	50 (33.3)
Category C	48 (32)
CD4 count [*n* (%)]	
<200 cells/μL	14 (9.3)
200–499 cells/μL	55 (36.7)
≥500 cells/μL	81 (54)
Viral load [*n* (%)]	
<40 copies/ml	35 (23.3)
40–400 copies/ml	68 (45.3)
401–1000 copies/ml	19 (12.7)
>1000 copies/ml	28 (18.7)
Lipodystrophy [*n* (%)]	80 (53.3)
Fatigue [*n* (%)]	47 (31.3)
Insomnia [*n* (%)]	46 (30.7)
Sweating [*n* (%)]	44 (29.3)
Diarrhoea [*n* (%)]	41 (27.3)
Weight loss [*n* (%)]	40 (26.7)
Pain [*n* (%)]	29 (19.3)
Memory loss [*n* (%)]	8 (5.3)
Presence of symptoms [*n* (%)]	
Asymptomatic	23 (15.3)
1–4 symptoms	96 (64)
>5 symptoms	31 (20.7)
Presence of comorbidity [*n* (%)]	133 (88.7)
Dyslipidaemia [*n* (%)]	31 (20.7)
Hypertension [*n* (%)]	13 (8.7)
Diabetes mellitus [*n* (%)]	12 (8)
Chronic hepatitis C [*n* (%)]	71 (47.3)
Chronic bronchopathy [*n* (%)]	11 (7.3)
Depression (BDI-II questionnaire) [*n* (%)]	
Minimum	106 (70.7)
Mild	16 (10.7)
Moderate	15 (10)
Severe	13 (8.7)
Hospitalization in the past 12 months [*n* (%)]	34 (22.7)
Prophylactic treatment [*n* (%)]	18 (12)
ART [*n* (%)]	126 (84)
Number of pills taken (mean ± SD)	4.6 ± 3.2
ART regimen [*n* (%)]	
Based on NNRTIs	50 (39.7)
Based on protease inhibitors	63 (50)
Nontraditional regimen (rescue)	13 (10.3)
First ART [*n* (%)]	13 (10.3)
Regimen design [*n* (%)]	
qd	32 (25.4)
bid	90 (71.4)
tid	4 (3.2)
ART adherence (according to SMAQ questionnaire) [*n* (%)]	81 (64.3)
Satisfied with information and attention received [*n* (%)]	142 (95)

Table 1. (Contd.)

ART, antiretroviral therapy; BDI-II, Beck Depression Inventory II; CDC, Centers for Disease Control and Prevention; IDU, injecting drug use; NNRTI, nonnucleoside reverse transcriptase inhibitor; SMAQ, Simplified Medication Adherence Questionnaire; qd, once a day; bid, twice a day; tid, three times a day.

patients in General Health Perceptions ($P = 0.059$), Pain ($P = 0.005$), Physical Functioning ($P = 0.003$), Social Functioning ($P = 0.070$) and PHS ($P < 0.001$).

Patients who stated that they were homosexual had lower scores than other patients in General Health Perceptions ($P = 0.007$), Pain ($P = 0.034$), Physical Functioning ($P = 0.002$) and MHS ($P < 0.001$). Furthermore, patients who contracted HIV infection through sharing of needles among heterosexual injecting drug users had lower scores than other patients in General Health Perceptions ($P = 0.034$). In terms of immune system status, we did not find a relationship between the domains of the MOS-HIV questionnaire and the variables CD4 cell count and viral load. However, patients with CDC category stage C disease (European classification) had higher scores than other patients in Mental Health ($P = 0.023$), Energy ($P = 0.050$), Cognitive Functioning ($P = 0.046$), Quality of Life ($P = 0.018$) and MHS ($P = 0.025$).

Table 2 Mean scores and percentiles for the various Medical Outcomes Study HIV Health Survey (MOS-HIV) questionnaire domains

				Percentile		
Domain	**Mean**	**Median**	**SD**	**25th**	**50th**	**75th**
Overall Physical Health summary score (PHS)	52.3	54.6	8.8	49.3	54.6	58.7
Overall Mental Health summary score (MHS)	49.3	49.6	9.9	43.8	49.6	56.9
Dimensions						
General Health Perceptions (GHP)	46.1	45	24.2	25	45	65
Pain (P)	79.4	88.9	24.2	66.7	88.9	100
Physical Functioning (PF)	84.3	91.7	19.7	75	91.7	100
Role Functioning (RF)	82.7	100	32.2	50	100	100
Social Functioning (SF)	88	100	22.7	80	100	100
Mental Health (MH)	68.1	68	21.8	56	68	88
Energy (E)	63.8	67.5	23.4	50	67.5	85
Health Distress (HD)	82.7	90	20	70	90	100
Cognitive Functioning (CF)	84.6	90	17.5	80	90	100
Quality of Life (QoL)	58.2	50	20.9	50	50	75
Health Transition (HT)	54.8	50	18.9	50	50	75

SD, standard deviation.

Regarding ART, we found no differences between patients receiving highly active antiretroviral therapy (HAART) and those not receiving HAART in any of the domains in the MOS-HIV questionnaire. Patients on their first ART regimen had higher scores than other patients in Physical Functioning ($P = 0.003$), Mental Health ($P = 0.014$), Energy ($P < 0.001$), Cognitive Functioning ($P = 0.002$), PHS ($P = 0.038$) and MHS ($P = 0.009$). Patients on a protease inhibitor (PI)-based regimen had the lowest scores in General Health Perceptions ($P = 0.032$), Energy ($P = 0.011$), Cognitive Functioning ($P = 0.002$), Health Distress ($P = 0.053$), MHS ($P = 0.026$) and PHS ($P = 0.052$). We found no differences in neither the analysis of regimen design nor the number of pills taken. In terms of individual drugs in the regimens, we found that patients taking efavirenz had higher scores than other patients in General Health Perceptions ($P = 0.006$), Mental Health ($P = 0.004$), Energy ($P = 0.001$), Health Distress ($P = 0.013$), Cognitive Functioning ($P < 0.001$), PHS ($P = 0.032$), and MHS ($P = 0.003$); however, no differences were found for other drugs. Regarding adherence, we found that nonadherent patients had lower scores than adherent patients in Cognitive Functioning ($P = 0.043$).

In the analysis of the relationships between other factors indicative of health status and MOS-HIV scores, we found that asymptomatic patients had higher scores than symptomatic patients in all domains ($P < 0.001$) except Health Transition ($P = 0.268$), while the presence of each individual symptom was significantly negatively related to MOS-HIV domain scores and PHS and MHS ($P < 0.001$). Furthermore, patients hospitalized in the year previous to the study had lower scores in Physical Functioning ($P = 0.014$), Social Functioning ($P = 0.005$), Mental Health ($P = 0.020$), and MHS ($P = 0.033$).

Patients with HIV/HCV coinfection had lower scores in General Health Perceptions ($P = 0.003$), Pain ($P = 0.048$), Physical Functioning ($P = 0.003$), Social Functioning ($P = 0.027$) and PHS ($P < 0.001$). Patients who did not present with depression had higher scores than patients with depression in all HRQL domains: General Health Perceptions ($P < 0.001$), Pain ($P = 0.018$), Physical Functioning ($P < 0.001$), Role Functioning ($P = 0.031$), Social Functioning ($P < 0.001$), Mental Health ($P < 0.001$), Energy ($P < 0.001$), Health Distress ($P < 0.001$), Cognitive Functioning ($P < 0.001$), Quality of Life ($P < 0.001$), Transitory Health ($P = 0.022$), PHS ($P < 0.001$) and MHS ($P < 0.001$). No differences were found for other chronic illnesses.

Patients who did not feel satisfied with the information they received had lower scores than other patients in General Perceptions of Health ($P = 0.033$), Pain ($P = 0.009$), Role Functioning ($P = 0.001$), Social Functioning ($P = 0.002$) and PHS ($P = 0.009$).

Regression model for PHS was significant ($P < 0.001$), explaining 83.3% of the variation of PHS index (Table 3 and Fig. 1). Of the variables considered, the strongest predictors of poor PHS were female gender and hospitalization in the past year, which were found to be independent risk factors of poor PHS; however, 'having no children' and 'no depression' seemed to be independent factors protecting against poor PHS. The model of logistic regression for MHS explained 88.1% of the index variability ($P < 0.001$) and revealed that protective variables against poor MHS were 'no depression' and 'not being diagnosed with chronic hepatitis C' (Table 4 and Fig. 2).

Discussion

The principal aim of this study was to evaluate HRQL in our HIV-infected population and the diverse factors related to HRQL in order to establish a predictive model of HRQL. Our patients were not selected for particular characteristics; their profile reflects that of the Spanish National Registry of AIDS Cases [24], which suggests that our sample was representative. Regarding external validity of our data referred to national and international studies, it is corroborated by series of large number of individuals with profiles that vary between 69.1% of males in Murri *et al.* [25], 71.2% in Préau *et al.* [26] and 73% in Ruiz Pérez *et al.* [13]

Mean scores for PHS and MHS and the 11 domains of the MOS-HIV questionnaire obtained in our study are in general agreement with the data obtained by other research groups, both national and international [13,27–30]. Living together as a couple could be an influential factor in HRQL,

Table 3 Factors associated with poor Physical Health summary score (PHS) in the logistic regression analysis ($n = 126$)

	P-value	OR (95% CI)
Age (≤ 50 years *vs.* >50 years)	0.294	0.43 (0.09–2.05)
Gender (female *vs.* male)	0.005	9.55 (2.01–45.5)
Depression (mild, moderate or severe depression *vs.* minimal or no depression)	<0.001	0.08 (0.02–0.29)
Having children (yes *vs.* no)	0.001	0.09 (0.03–0.36)
Hospitalization in the past year (yes *vs.* no)	0.014	4.29 (1.35–13.65)
ART regimen (PI *vs.* NNRTI/ nontraditional regimen)	0.340	1.74 (0.55–5.47)

ART, antiretroviral therapy; CI, confidence interval; OR, odds ratio; PI, protease inhibitor; NNRTI, nonnucleoside reverse transcriptase inhibitor.

Table 4 Factors associated with poor Mental Health summary score (MHS) in the logistic regression analysis ($n = 126$)

	P-value	OR (95% CI)
Age (≤ 50 years *vs.* >50 years)	0.494	1.85 (0.32–10.43)
Gender (female *vs.* male)	0.330	0.54 (0.15–1.87)
Depression (mild, moderate or severe depression *vs.* minimal or no depression)	<0.001	0.03 (0.01–0.09)
ART regimen (PI *vs.* NNRTI/ nontraditional regimen)	0.686	1.28 (0.38–4.37)
Chronic hepatitis C (yes *vs.* no)	0.040	0.26 (0.07–0.94)
Symptomatic *vs.* asymptomatic	0.998	0.00

ART, antiretroviral therapy; CI, confidence interval; OR, odds ratio; PI, protease inhibitor; NNRTI, nonnucleoside reverse transcriptase inhibitor.

as various authors have suggested [13,15,29]. In the present study, we found that single patients, those who lived alone and those who did not have children presented significantly better scores in General Health Perceptions, while Ruiz Pérez *et al.* [13] describe a positive relationship between living as a couple and PHS and MHS.

There is great disagreement regarding the immunological state of patients studied, given that different groups have not found a significant relationship between immunological markers (CD4 cell count and viral load) and HRQL domains [25,26], as was also the case in the present study. Nevertheless, other groups have found a positive relationship between HRQL and CD4 cell count, and a negative one between HRQL and viral load [13,15,17,28]. In our opinion, this uncertainty may indicate a need for more accurate determination of the correlation between viral load parameters and immunological status. However, in this study, patients with AIDS had higher scores in Mental Health, Energy, Cognitive Functioning, Quality of Life and MHS; a result that runs contrary to findings in the literature [13,17,28]. This could be attributable to stability reached in the illness evolution over the years, which has resulted in improvements in immunological status and long-term maintenance of patients in CDC category C.

In evaluating the health status of our patients, we found a strong relationship between HRQL domains and symptoms associated with HIV infection, with asymptomatic patients having higher scores in all domains, and a greater number of symptoms resulting in a lower score, a relationship that has also been found in previous studies [17,25,29,31,32]. However, findings for patients hospitalized in the year prior to the study agreed with those of Zinkernagel *et al.* [28] and Murri *et al.* [25]

With regard to ART adherence evaluation, it is important to note that data relevant to the relationship between HRQL and a PI-based regimen were correlated with other researchers' contribution [13,33] and moreover, are pioneer in our region. In a step-by-step analysis of the various chronic illnesses included in our questionnaire, we found that HIV/HCV coinfection was closely associated with lower scores in the domains of General Health Perceptions, Pain, Physical Functioning, Social Functioning and PHS.

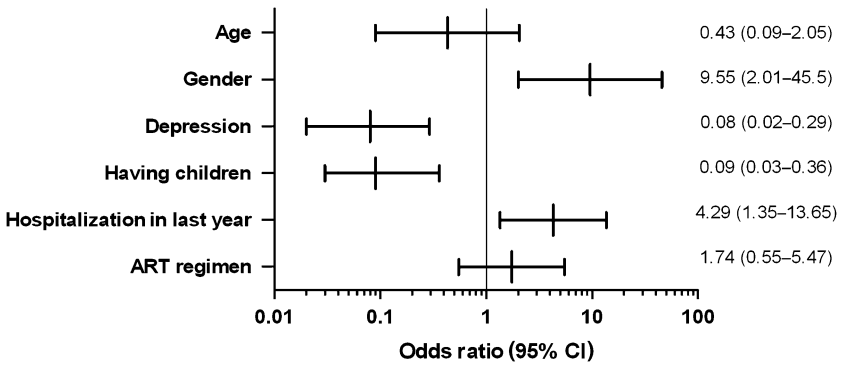

Fig. 1 Factors associated with poor Physical Health summary score (PHS). ART, antiretroviral therapy; CI, confidence interval.

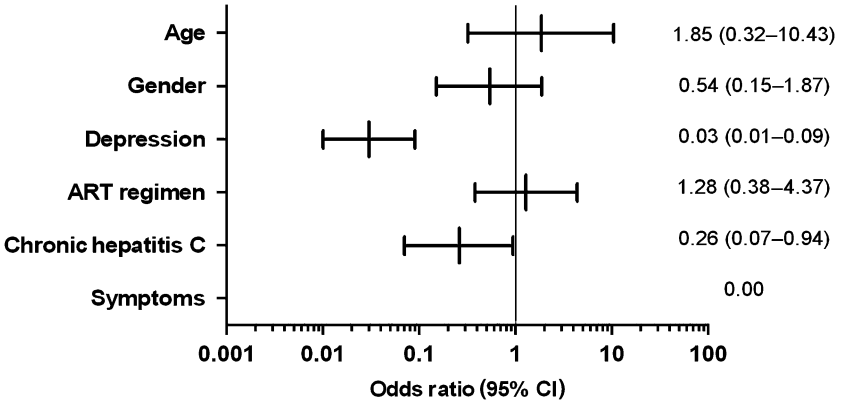

Fig. 2 Factors associated with poor Mental Health summary score (MHS). ART, antiretroviral therapy; CI, confidence interval.

There have been few previous investigations of this relationship [34]. Some studies, such as that by Préau *et al.* [26], did not find a direct correlation between HRQL domain scores and the presence of coinfection.

HRQL is influenced by diverse determinants of psychological morbidity, with depression being one of the most important predictive factors [26,35,36]. In our series, depression was significantly associated with HRQL domain scores obtained using the MOS-HIV questionnaire as well as with global indices. We found that patients who were free from depression or had minimal depression had higher scores than other patients. Similar findings have been obtained by other groups [12,13,30,35,37], but never before in our region.

A factor that has scarcely been considered in the literature is satisfaction with information received, the evaluation of which is increasingly important in assessing the quality of medical care. The data obtained in this study regarding satisfaction with information received are therefore of interest, and are in accordance with the findings of other studies [25,31]. Although there were several potentially confounding factors in the analysis of this variable, we consider it important to present our findings.

It is important to evaluate those factors most influential in HRQL and those most likely to receive specific intervention in the clinical care of HIV-infected patients. Perhaps the most novel aspect of this study is the development of a predictive model with which to classify HIV-infected patients in terms of HRQL, which also permits uniform criteria to be used in the care of these patients. We showed, by application of the regression models developed, that the strongest predictive factors for poor overall PHS were female gender and hospitalization in the previous year, and protective factors were having no children and absence of depression. This model explained 83.3% of the variation of PHS with statistic significance. In terms of the overall MHS, significantly protective factors were absence of depression and chronic HCV infection, which explained 88.1% of the variation.

In another study carried out in Spain, Ruiz Pérez *et al.* [13] developed models that explained 34% of the variation in PHS and 33.9% of that in MHS in the HRQL MOS-HIV instrument. The low percentages of variability explained by their regression models are surprising; our models explained much higher percentages of the variability, and so may be of great utility in this field. In Canada, Worthington *et al.* [29] found that employment status and the presence of symptoms were independent predictive factors of poorer quality of life scores in MOS-HIV questionnaire regression models. Similarly, in a group of Italian patients, Murri *et al.* [25] found that the factors associated with poor PHS were low CD4 cell count, having been hospitalized, and the presence of symptoms, while a low level of satisfaction with information received, having been hospitalized and the presence of symptoms were predictive factors of poor MHS.

The findings of our study highlight the importance of evaluation of HRQL and related factors in HIV-infected patients. Further investigation is warranted to verify our findings in greater numbers of patients and in studies with a prospective design, in which the significance of associations could be determined over time, which may allow more definitive conclusions to be reached regarding efficient health care for HIV-infected patients.

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