Changes in depression in a cohort of Danish HIV-positive individuals: time for routine screening

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Abstract. **Background**: The aim of this study was to follow a cohort of HIV-positive individuals for 3 years in order to assess changes in depression, adherence, unsafe sex and emotional strains from living with HIV. **Methods**: Participants were assessed for depression, adherence, emotional strain and unsafe sex via a questionnaire. The Beck Depression Inventory II (BDI) was used to assess the prevalence and severity of depressive symptoms. Patients with a BDI score of 20 or above (moderate to major depression) were offered a clinical evaluation by a consultant psychiatrist. **Results**: In 2005, 205 HIV-positive individuals participated in the study. Symptoms of depression (BDI >14) were observed in 77 (38%) and major depression (BDI $\geq$20) in 53 (26%) individuals. In 2008, 148 participants were retested (72% of original sample). Depression (BDI >14) was observed in 38 (26%) and symptoms of major depression (BDI $\geq$20) in 24 (16%) individuals. Patients at risk of moderate to major depression were more likely to be non-adherent to medications, to practice unsafe sex and to suffer from emotional strains compared with patients not at risk of depression, both at baseline (2005) and follow-up (2008). **Conclusion**: This study demonstrated a decline in depression scores over time and an association between the risk of depression and low medication adherence, stress and unsafe sex. We recommend routine screening for depression to be conducted regularly to provide full evaluations and relevant psychiatric treatment.

Additional keywords: adherence, AIDS, compliance, psychiatry, psychological factors, stress.

Introduction

Depression is the most common form of psychological distress experienced by individuals with HIV or AIDS.[1,2] Up to one-third of people living with HIV or AIDS have been shown to have mood disorders or clinically significant depressive symptoms.[3] Individuals living with HIV have a two-fold greater risk of major depression than HIV-negative controls.[4] Treatment of depression is critical for several reasons. The diagnosis of HIV infection is typically a traumatic event,[5] and depression compounds the physical and emotional stress associated with HIV. Studies examining the impact of stressful events on changes in disease markers have suggested that psychological factors may affect HIV disease progression. Depression, depressive symptoms and psychological stress have also been associated with poor adherence to highly active antiretroviral treatment (HAART).[6,7] Furthermore, several studies that examined depression at the initiation of HAART found that, compared with non-depressed patients, patients with depression exhibited over five times the risk of clinical progression to AIDS,[2,8] slower viral suppression[9] and

shorter survival.[10] Thus, depression has been associated with deterioration in psychosocial functioning, reduced immune response, more rapid progression of HIV and higher mortality rates.[11–14] Studies have found that depression was also associated with unsafe sex (unsafe sex is defined as unprotected intercourse (including anal intercourse) with a partner of opposite or unknown HIV status) and thus, increased the risk of transmitting or contracting HIV.[15,16]

HIV infection tends to advance very slowly. The most compelling evidence for the role of depression in this disease comes from studies of cohorts over long intervals.[2] Several recent studies have reported conflicting rates of depression due to differences in diversity in the populations sampled, variations in assessment methods and differences in study timeframes. These factors have complicated the ability to compare findings across studies;[1,17] thus, it is impractical to arrive at a mean estimate of the prevalence of depression associated with HIV.

Due to these challenges, depression has been under-recognised and undertreated.[1,17,18] Many studies have relied solely on self-reported symptom scales to assess depression.

However, the 'gold standard' is to combine self-reported symptom scales with structured psychiatric interviews by a professional mental health investigator.[1,19]

In 2005, we used the 'gold standard' to investigate the risk of depression in people at a single HIV clinic in Denmark and the factors associated with that risk. We found signs of depression in over one-third of the HIV-positive patients. Moreover, before the beginning of the study, over one-quarter of the people had untreated moderate or major depression.[16]

The aims of this study were to follow up that cohort of HIV-positive individuals for 3 years in order to assess changes in their risk of depression, HAART adherence, the emotional strains of living with HIV, and unsafe sex.

Methods

Study participants

From May 2005 to September 2005, 391 HIV-positive patients were recruited from the Department of Infectious Diseases at Aarhus University Hospital, Skejby. For inclusion, patients had to be diagnosed with HIV, aged 18 or older, and able to read and write in Danish. Fifty patients were excluded who could not read or write Danish; thus, 341 patients were enrolled in the study. All patients gave written informed consent before participation. Of those eligible for the study, 73.9% ($n = 252$) responded to the questionnaire and 205 participants completed the Beck Depression Inventory II (BDI) questionnaire correctly.[16,20] Therefore, a total of 205 HIV-positive patients were included in the study.

During the same months in 2008, 72% of patients were retested with the questionnaires ($n = 148$). A packet was mailed to each person that included a questionnaire, patient information and a prepaid response envelope. Reasons for not responding included death ($n = 4$), consultation at another hospital ($n = 10$) and no specific reason ($n = 43$). The withdrawal of the 57 non-responders in 2008 did not change the comparability of the characteristics between the 2005 and 2008 cohorts.

The outpatient clinic at the Department of Infectious Diseases at Aarhus University Hospital provides care for 11% of the total HIV-positive population in Denmark. The patients in this study were representative of the total Danish HIV-positive population ($n = 3968$ total) regarding gender, age, route of infection and HIV exposure, but were not representative regarding injected drug use, because only a few injected drug users participated in this study.[21] The study population was also comparable to the total Danish HIV-positive population regarding baseline characteristics of the disease.[21] The study was approved by the Aarhus Health's Human Research Ethics Committee and the Danish Data Protection Agency. Development of the questionnaire used in both 2005 and 2008 was described previously.[19] The questionnaires regarding unsafe sex were asked; 'During the last year, how often did you have unprotected intercourse or anal intercourse with a partner of opposite or unknown HIV status?' The question could be answered with the following options: 'never', 'less than half of the time', 'more than half of the time' or 'always'.

The questions regarding adherence were (1) 'How often did you forget to take your HIV medicine during the last 4 days?' and (2) 'Did you stop taking HIV medicine for 7 days or more during the last 12 months?' The first question could be answered with 'none', '1 day', '2 days', '3 days' or '4 days'; the second could be answered with 'yes' or 'no'.

The question regarding the emotional strain of living with HIV was asked 'Are there some of the following feelings that have an emotional strain in relation to HIV in your daily life? Guilt, shame, anxiety, concerns, stress, loneliness, HIV influences my whole life, constant thoughts about HIV, live a double life with HIV as a secret, HIV limits my way of living and stigmatisation.' The patient had the following options to answer each emotional strain: 'not at all', 'a little', 'somewhat' or 'a lot'.

Depression measurements

The BDI[20] was used to assess the prevalence and severity of depressive symptoms. The BDI has shown high validity and reliability in measuring depressive symptoms, and it has shown acceptable test–retest reliability ($r = 0.79$) in a non-clinical population. Respondents were required to rate 21 items from 0 to 3 according to how they had felt during the preceding 2 weeks. The BDI focuses on both the cognitive–affective symptoms of depression, e.g. pessimism and diminished self-esteem; and the somatic symptoms of depression, e.g. weight loss. A BDI score ≥ 14 is widely accepted as an indication of depression. In this study, the score categories included: 0–13 – minimal depression; 14–19 – mild depression; 20–28 – moderate depression; 29–63 – major depression. Scores ≤ 20 were validated with the Hamilton Depression Scale.[22]

The Hamilton Depression Scale (HDS-17) was used to validate the diagnoses of minimal to moderate depression based on the scores of the BDI. The HDS-17 consists of a semi-structured interview with 17 items. Scores represent a synthesis of severity and frequency of occurrence. The score categories included: 7–12 – mild depression; 13–20 – moderate depression; >20 – severe depression.[22]

Diagnosis of depression based on medical records

Data on diagnosed depression were also obtained from the medical records of those that did not respond to the questionnaires (non-responders) in both 2005 and 2008.

Procedures

All patients with a BDI score of 20 or above were offered a clinical interview by a consultant psychiatrist. The consultant psychiatrist also checked all questionnaires with cut-offs between 14 and 19, and interviewed 10 randomly selected patients to be sure that the patients were not at risk of depression or committing suicide. The result of the BDI was documented in the medical records to ensure follow-up of patients who declined an interview with the consultant psychiatrist.

Statistical analysis

We conducted statistical analyses with STATA 10 (StataCorp LP, College Station, TX, USA). All data were double-entered. The primary endpoint at baseline was the prevalence of

symptoms of depression (according to the BDI). We used unadjusted and adjusted (multiple) logistic regression models to determine the relationship between the dependent variable (depression) and independent variables (e.g. psychological factors). Statistical significance was defined as $P < 0.05$. Variables significant in each of the multivariate models were tested in a final multivariate model by backwards elimination with $P < 0.05$.

Results

In 2005 (baseline), 205 HIV-positive patients participated. Symptoms of depression (BDI >14) were observed in 77 (38%) and symptoms of moderate to major depression (BDI ≥ 20) in 53 (26%) patients. Among the 148 patients that were re-examined in 2008 (follow-up), symptoms of depression (BDI >14) were observed in 38 (26%) and symptoms of moderate to major depression (BDI ≥ 20) in 24 (16%). In both 2005 and 2008, more patients had a history of depression after they were

Table 1.   Prevalence of the severity of depression (based on the Beck Depression Inventory II score (BDI)) and history of depression at baseline (2005) and follow-up (2008)

| | 2005 | | 2008 | |
	$n = 205$	% of n	$n = 148$	% of n
BDI score				
Minimal (0–13)	128	62	110	74
Mild (14–19)	24	12	14	10
Moderate (20–28)	30	15	9	6
Major (29–63)	23	11	15	10
History of depression				
Pre-HIV diagnosis	16	25	9	6
Post-HIV diagnosis	48	75	46	31

diagnosed with HIV (Table 1). The HDS-17 categories of depression correlated well with those determined by the BDI. Of the 53 patients found at risk of moderate to major depression during follow-up, 16 had had a BDI ≥ 20 both at baseline and follow-up due to periodic depression. The mean BDI scores at both baseline and follow-up were in the range of major depression. Twenty-one patients had a BDI ≥ 20 at baseline, but not at follow-up; these had recovered from depression. Eight patients were at risk of moderate to major depression at follow-up, but not at baseline (Fig. 1).
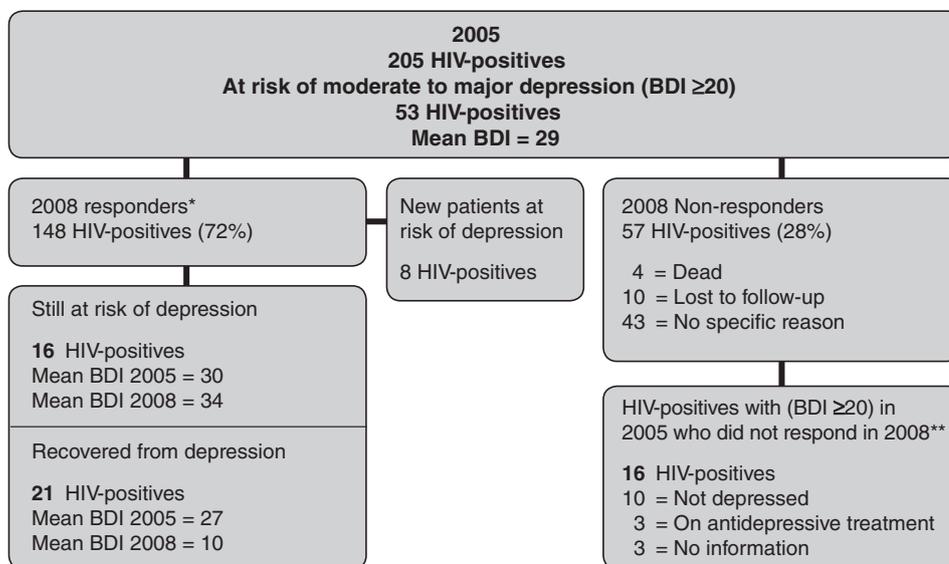
Univariate analyses conducted in 2005 and 2008 indicated a higher risk of moderate to major depression among patients who had primary and secondary school <9 years, no higher education, received unemployment benefits, were undergoing rehabilitation, received sickness or disability benefits, and experienced their financial situation as hopeless (Table 2). We conducted an unadjusted odds ratio analysis to determine whether depression was associated with the emotional strain of living with HIV. We found that the degree of emotional strain was significantly associated with the risk of depression, both in 2005 and 2008 (Table 3). In multivariate analyses, only stress was independently associated with the risk of depression, both in 2005 and 2008 (Table 4).

Patients at risk of moderate to major depression were more likely to have missed at least one dose of HAART in the 4 days before assessment in 2005, and they were more likely to have stopped HAART for 7 days or more during the last 12 months in 2008 (Table 5).

At baseline, the risk of moderate to major depression was correlated with unsafe sex, the number of partners (>10 partners the last year) and a dissatisfying sex life. We found a trend in the degree of depression with respect to the frequency of unsafe sex. At follow-up, we observed a 1% increase compared with baseline (Table 6). However, due to the fact that there were

2005
205 HIV-positives
At risk of moderate to major depression (BDI ≥20)
53 HIV-positives
Mean BDI = 29

2008 responders*
148 HIV-positives (72%)

New patients at risk of depression

8 HIV-positives

2008 Non-responders
57 HIV-positives (28%)

4 = Dead
10 = Lost to follow-up
43 = No specific reason

Still at risk of depression

16 HIV-positives
Mean BDI 2005 = 30
Mean BDI 2008 = 34

Recovered from depression

21 HIV-positives
Mean BDI 2005 = 27
Mean BDI 2008 = 10

HIV-positives with (BDI ≥20) in 2005 who did not respond in 2008**

16 HIV-positives
10 = Not depressed
3 = On antidepressive treatment
3 = No information

*Patients that responded to mailed questionnaires (responders) were assessed for indications of depression, based on the Beck Depression Inventory Scale (BDI).

**Among those that did not respond to the questionnaires (non-responders), information was obtained from medical records.

Fig. 1.   Risk of depression in a cohort of HIV-positive patients at baseline (2005) and follow-up (2008).

Table 2. Data on demographic and risk of depression at baseline (2005) and follow-up (2008)

| | Baseline | | Follow-up | |
	$n = 205$	Depressed n (%)[A]	$n = 148$	Depressed n (%)
Gender				
Female	49 (24)	14 (29)	32 (22)	5 (16)
Male	156 (76)	39 (25)	116 (78)	19 (16)
Age (years)				
18–29	12 (6)	2 (17)	21 (14)	3 (14)
30–44	81 (40)	24 (30)	65 (44)	11 (17)
45–59	89 (43)	24 (27)	55 (37)	9 (16)
60+	23 (11)	3 (13)	7 (5)	1 (14)
Ethnicity				
White	165 (80)	38 (23)	128 (86)	18 (14)
Other ethnicities	40 (20)	15 (38)	20 (14)	6 (30)
Married or living with partner				
Yes	87 (42)	21 (24)	51 (35)	9 (18)
Have a partner, but live alone				
Yes	19 (9)	5 (26)	35 (24)	6 (17)
Have a partner				
Yes	55 (27)	15 (27)	35 (24)	9 (26)
Education				
Primary or secondary school <9 years	49 (24)	13 (27)	39 (26)	7 (18)
Primary or secondary school >9 years	149 (73)	38 (25)	109 (74)	17 (16)
Unknown	7 (3)	2 (28)		
Further education				
Short course length of higher education	34 (17)	8 (24)	28 (19)	3 (11)
Medium course length of higher education	104 (51)	23 (22)	77 (52)	13 (17)
Long course of higher education	18 (8)	6 (33)	18 (12)	2 (11)
No higher education	23 (11)	9 (39)	15 (10)	3 (20)
Other	9 (4)	1 (11)	7 (7)	3 (43)
Unknown	17 (8)	5 (29)		
Employment				
Employed	88 (43)	15 (17)	74 (50)	8 (11)
Unemployment benefit, rehabilitation, social security	24 (12)	11 (45)	6 (4)	4 (67)
Sickness or disability support pension	43 (21)	14 (33)	39 (26)	7 (18)
Student	8 (3)	1 (13)	2 (1)	0
Pensioner or part time	22 (11)	5 (23)	16 (11)	4 (25)
Subsidised flexible job	12 (6)	3 (25)	0	0
Other	8 (4)	4 (50)	11 (7)	1 (9)
Experience finances as hopeless				
Yes	17 (8)	12 (71)	7 (5)	4 (60)
No	188 (92)	41 (22)	141 (95)	20 (14)
Route of infection				
Sexual	172 (83)	46 (27)	122 (83)	22 (18)
Blood transfusion	13 (6)	3 (23)	6 (4)	0
Injected drug use	5 (2)	2 (40)	2 (1)	0
Unknown	15 (7)	2 (13)	18 (12)	2 (11)
HIV exposure groups				
Homosexual	114 (56)	34 (30)	67 (45)	10 (15)
Heterosexual	87 (42)	18 (20)	67 (45)	11 (16)
Bisexual	4 (2)	1 (25)	8 (5)	2 (25)
Unknown	0	0	6 (4)	1 (13)

[A]The percentage of depressed patients in that category.

fewer patients at risk for depression at follow-up than at baseline, it was not possible to test for a trend.

Discussion

The findings in this study indicated that individuals infected with HIV experienced high levels of depressive symptoms, but screening and treatment for depression was associated with a decline in the prevalence of depression.

We found patients with undiagnosed depression, both at baseline in 2005 ($n = 18$)[16] and at follow-up in 2008 ($n = 8$), and these subsequently started treatment (medication, psychological consultation or both). We also found that the level of moderate and major risk of depression declined significantly between baseline and follow-up, presumably due to the increase in the number of patients that started treatment after the results of the first survey.

Table 3.   Data on the emotional strains of living with HIV at follow-up (2008)
Baseline data is presented in: Rodkjaer *et al.*[16] NA, not applicable

HIV-associated feelings		Follow-up		
	$n = 148$	Depressed n (%)	Unadjusted odds ratio (95% confidence interval)	P-value
Guilt				
Not at all	102 (69)	11 (11)	1 (Reference)	0.06
A little	25 (17)	7 (28)	3.2 (1.1–9.5)	
Somewhat	14 (9)	4 (29)	3.3 (0.8–12.4)	
A lot	6 (4)	2 (33)	4.1 (0.6–25.5)	
Shame				
Not at all	84 (57)	9 (11)	1 (Reference)	0.02
A little	37 (25)	5 (14)	1.3 (0.4–4.2)	
Somewhat	18 (12)	7 (39)	5.3 (1.6–17.3)	
A lot	8 (5)	3 (38)	5.0 (1.0–24.8)	
Anxiety				
Not at all	70 (47)	4 (6)	1 (Reference)	0.00
A little	53 (36)	7 (13)	2.5 (0.7–9.2)	
Somewhat	16 (11)	6 (38)	10.05 (2.4–41.9)	
A lot	8 (5)	7 (88)	117.2 (11.4–1199.6)	
Concerns				
Not at all	40 (27)	0	1 (Reference)	0.00
A little	71 (48)	8 (11)	5.2 (0.6–43.1)	
Somewhat	23 (16)	8 (35)	21.8 (2.5–189.8)	
A lot	12 (8)	7 (58)	57.4 (5.8–567.8)	
Stress				
Not at all	76 (51)	3 (4)	1 (Reference)	0.00
A little	42 (28)	5 (12)	3.33 (0.7–14.7)	
Somewhat	17 (11)	6 (35)	13.4 (18.3–830.5)	
A lot	12 (8)	10 (83)	123.3 (18.3–830.5)	
Loneliness				
Not at all	80 (54)	2 (3)	1 (Reference)	0.00
A little	38 (26)	7 (18)	5.8 (1.4–24.1)	
Somewhat	19 (13)	7 (37)	15.1 (3.4–66.8)	
A lot	10 (7)	7 (70)	60.6 (10.2–358.7)	
HIV influences my whole life				
Not at all	87 (59)	4 (5)	1 (Reference)	0.00
A little	40 (27)	6 (15)	2.9 (0.8–10.3)	
Somewhat	14 (9)	8 (58)	22.4 (5.5–90.0)	
A lot	5 (3)	5 (100)	NA	
Constant thoughts about HIV				
Not at all	94 (64)	7 (7)	1 (Reference)	0.00
A little	39 (26)	6 (15)	2.2 (0.7–7.3)	
Somewhat	9 (6)	6 (67)	25.1 (5.1–122.7)	
A lot	5 (3)	5 (100)	NA	
Live a double life with HIV as a secret				
Not at all	78 (53)	6 (8)	1 (Reference)	0.02
A little	30 (20)	6 (20)	2.5 (0.7–8.4)	
Somewhat	24 (16)	5 (21)	2.7 (0.7–9.4)	
A lot	15 (10)	6 (40)	6.8 (1.8–24.9)	
HIV limits my way of living				
Not at all	61 (41)	0	1 (Reference)	0.00
A little	40 (27)	4 (10)	6.7 (0.7–63.0)	
Somewhat	29 (20)	11 (38)	37.2 (4.5–308.5)	
A lot	17 (11)	8 (47)	54.2 (6.0–486.1)	
Stigmatisation				
Not at all	67 (45)	3 (4)	1 (Reference)	0.00
A little	45 (30)	7 (16)	3.0 (0.8–11.2)	
Somewhat	19 (13)	6 (32)	7.7 (1.9–31.2)	
A lot	13 (9)	7 (54)	19.5 (4.4–86.3)	

Table 4. The emotional strains of living with HIV at baseline (2005) and follow-up (2008)

Adjusted odds ratio shows the odds of depression associated with the degree of stress. Adjusted for guilt, shame, anxiety, concerns, stress, loneliness, influence of HIV on respondent's life, constant thoughts about HIV, living a double life with HIV as a secret, HIV limiting way of life and stigmatisation

	Adjusted odds ratio (95% confidence interval (CI)) Baseline	*P*-value	Adjusted odds ratio (95% CI) Follow-up	*P*-value
Stress				
Not at all	1 (reference)		1 (reference)	
A little	0.7 (0.23–2.6)	0.68	6.2 (0.7–55.2)	0.10
Somewhat	3.0 (0.83–11.5)	0.09	14.2 (1.6–134.2)	0.02
A lot	13.5 (2.8–63.3)	0.00	70 (6.5–742.2)	0.00

Table 5. Adherence to antiretroviral treatment and relative risk of depression among HIV-positive patients at baseline (2005) and follow-up (2008)

HAART, highly active antiretroviral therapy; CI, confidence interval

	2005		2008	
	n 205 (%)	Depressed *n* (%)	*n* 148 (%)	Depressed *n* (%)
On HAART				
Yes	164 (80)	42 (26)	131 (88)	22 (17)
No	41 (20)	11 (27)	17 (12)	2 (12)
	Relative risk	*P*-value	Relative risk	*P*-value
Forgot to take HAART during the last 4 days				
No	1 (reference group)		1	
Yes	2.8 CI (1.7–4.6)	0.00	1.8 CI (1.0–3.6)	0.07
Stopped taking HAART for 7 days or more during the last 12 months				
No	1		1	
Yes	2.1 CI (0.6–7.5)	0.24	6.1 CI (2.0–18.7)	0.00

Table 6. Degree of depression (based on Beck Depression Inventory II (BDI) score) and self-reported unsafe sex in HIV-positive patients at baseline (2005) and follow-up (2008)

Test for trend *P* = 0.03 in 2005

	Baseline				Follow-up			
Level of depression	Minimal	Mild	Moderate	Major	Minimal	Mild	Moderate	Major
BDI	0–13	14–19	20–28	29–63	0–13	14–19	20–28	29–63
% of HIV-positive patients								
Unsafe sex[A]	30	38	57	57	22	14	33	33
>10 partners the last year	11	4	10	17	10	7	11	0
Not satisfied with sex life	42	75	80	87	45	71	89	87

[A]Unsafe sex = unprotected intercourse (including anal intercourse) with a partner of opposite or unknown HIV status.

Our results corroborated those of Gibbie *et al.*, who found that 34.8% of patients with HIV (AIDS) had scored >14 on the BDI scale and 27% of those met the criteria for current depression after consulting a psychiatrist; furthermore, after a 2-year follow-up, they also found a decline in the depression scores.[19] In fact, the rates of depression have varied considerably among studies, due to differences in measures, timeframes, settings and risk groups. In this study, we used the 'gold standard' measure, which included two validated methods (BDI and HDS-17), supplemented with a structured clinical interview by a consultant psychiatrist. Therefore, the present study was likely to provide a representative estimate of the true prevalence of moderate to major depression among patients with HIV.[17,19] In the Danish HIV population, 10% were infected through injected drug use.[21] Thus, our study population was not representative of the entire HIV-positive population in Denmark.[21] This might have biased our estimates towards a lower prevalence of depression, because the prevalence of depression in the group of substance abusers is reportedly high.[23,24] Atkinson *et al.* found that symptomatic HIV disease (AIDS), but not solely HIV infection, increased the intermediate-term risk of major depression, and that a previous psychiatric history could predict future vulnerability.[24] In our cohort, one out of four patients had a history of depression before the HIV diagnosis, but three out of four had a history of depression after the HIV diagnosis. This underlines the importance of preventing depression in these patients.

The present study had some limitations. Depressive symptoms tend to change over time; therefore, a cross-sectional study will miss ~20–25% of depressed patients. This is because BDI scores are less likely to identify previously depressed patients that are presently taking medication and patients with periodic symptoms of depression.[17] We do not have information on patient compliance to the antidepressive treatment recommended by the psychiatrist. It is well known that many patients discontinue treatment before completing an acceptable 3-month regimen and that patients with depression can recover without antidepressive treatment.[25] The study itself might have increased the attention and focus on symptoms of depression, both among the patients and the providers, which also could have led to a reduction in depressive symptoms.

Both at baseline and follow-up, there was a higher risk of moderate to major depression (BDI $\geq$20) among patients who received unemployment benefits, were undergoing rehabilitation, received sickness or disability benefits, or experienced their financial situation as hopeless.

As the demographic factors among patients at risk of depression were comparable at baseline and follow-up, including the abovementioned variables, the decline in depression could not be explained by a change in these.

Depression plays a role in the decision to stop working and acts as a barrier for returning to work once health is stable. In a longitudinal study, the major predictors of unemployment, in order of influence, were financial considerations (patients receiving disability benefits were less likely to work), psychiatric factors (past or current diagnosis of major depression), medical status, cognitive factors and education. Unemployment has previously been associated with higher rates of depressive symptoms, lower quality of life, and higher levels of HIV RNA with lower CD4 counts.[26] With improvements in HIV treatments, individuals have been able to continue work, which has been associated with a better quality of life, less psychological distress and increased socioeconomic status.[26,27]

We found that HIV-related emotions, as presented in Table 3 including guilt, shame, anxiety, concerns, stress, loneliness, HIV influences my whole life, constant thoughts about HIV, live a double life with HIV as a secret, HIV limits my way of living and stigmatisation, were associated with a higher risk of depressive symptoms, in accordance with the existing literature.[15] These factors were not part of the BDI inventory, and they may represent independent HIV-specific factors for identifying vulnerable HIV patients that require special attention. HIV presents individuals with multiple challenges that may overwhelm their coping resources and impair psychological adjustment to the ongoing demands of managing this stigmatised chronic illness.[8,28,29] Both depression[5,29] and a stressful life[5,29] have been linked to more rapid HIV disease progression and lower survival rates.[30] Stress is difficult to define, because it can describe many conditions. For example, it can refer to the strain involved in coping with the illness, to the physical and mental changes taking place in the body, and to an individual's sense of inadequacy. Qualitative studies are needed to provide further information for refining our definition of stress in this context.

Our group is currently conducting a qualitative study to investigate stressors related to HIV. Moreover, although there are a variety of quality indicators for the care of depression designed for investigations of general populations, there is not a set of quality indicators for the care of depression in the context of HIV.[31]

In this study, patients at risk of moderate to major depression (BDI $\geq$20) had a higher risk of non-adherence to HAART. Several studies have shown an association between depression and non-adherence to medication related to HIV.[6,32] Furthermore, antidepressant treatment has been shown to improve adherence to HAART.[33] Understanding the contribution of depression and depression treatments on adherence to HAART might enable clinicians to make earlier identifications and to prescribe more aggressive treatments among this population.

We also found that depression was associated with unsafe sex, consistent with findings in the existing literature.[15,16] Furthermore, depression, non-adherence and unsafe sex were associated with the risk of transmitting HIV or contracting HIV.[15,16]

We suggest that screening for depression should be conducted regularly, for example every year, when patients have symptoms that overlap with those of an HIV infection (i.e. poor appetite, weight loss, loss of energy, insomnia). In particular, patients should be screened for depression at the time of HIV diagnosis, before initiating HAART, to provide a full evaluation and relevant psychiatric treatment. Future research should examine psychological variables related to HIV-positivity that may provide specific indicators of elevated depressive symptomatology.

In conclusion, we found that symptoms of depression declined in our cohort from 2005 to 2008. Depression was associated with non-adherence, unsafe sex and psychological factors. These results suggested that treating depressed HIV-positive patients could improve adherence to HAART, reduce the risk of transmission of HIV and improve quality of life. We recommend that screening of HIV-positive patients for depression should be conducted regularly to provide a full evaluation and relevant psychiatric treatment.

Conflicts of interest

None declared.

Acknowledgements

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