ORIGINAL PAPER

Effectiveness of Mindfulness-Based Cognitive Therapy on the Quality of Life, Emotional Status, and CD4 Cell Count of Patients Aging with HIV Infection

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Abstract Long-term diagnosed and treated HIV-infected patients have to cope with a wide range of challenges that threaten their ability to age successfully. We report the results of a randomized controlled trial testing the effects of a mindfulness-based cognitive therapy (MBCT) program on quality of life (QoL), emotional status, and immune status over a 3-month period. Forty HIV-infected patients diagnosed prior to 1996 and on cART for a minimum of 5 years were randomized to follow an MBCT program ($n = 20$) or remain as controls (routine follow-up) ($n = 20$). A regression analysis was performed, and the measurement of effect size was estimated using Cohen's d. QoL, psychological stress, depressive symptoms, and anxiety symptoms improved in the MBCT group compared with the control group. During follow-up, patients in the MBCT group had a significantly increased CD4 cell count. Effect sizes for MBCT on the variables assessed were large ($d = 0.8$). The findings suggest that this program may help to promote successful aging in these patients.

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Resumen Los pacientes infectados por el VIH largamente diagnosticados y tratados han de afrontar desafíos que amenazan su capacidad para envejecer de forma exitosa. Mostramos los resultados de un estudio controlado aleatorizado que evalúa los efectos de un programa de terapia cognitiva basada en la atención plena (MBCT) sobre la calidad de vida, estado emocional y estado inmunológico en un período de tres meses. Cuarenta pacientes infectados por el VIH diagnosticados antes de 1996 y en terapia antirretroviral combinada durante un mínimo de 5 años fueron aleatorizados a seguir un programa MBCT ($n = 20$) o permanecer como controles (seguimiento rutinario) ($n = 20$). Se llevó a cabo un análisis de regresión y la medida del tamaño del efecto se estimó usando la d de Cohen. La calidad de vida, el estrés psicológico y los síntomas de depresión y ansiedad mejoraron en el grupo MBCT al compararlo con el grupo control. Durante el seguimiento, los pacientes del grupo MBCT tuvieron un incremento significativo en su recuento de células CD4. El tamaño del efecto de la intervención MBCT en todas las variables evaluadas fue grande ($d = 0.8$). Estos hallazgos sugieren que este programa puede ayudar a promover un envejecimiento exitoso en estos pacientes.

Introduction

Advances in combined antiretroviral treatment (cART) have
made HIV infection a manageable chronic disease [1];
however, patients' health cannot be fully restored. The life
expectancy of HIV-infected individuals can be up to
13 years shorter than in the general population despite cART
[2–4], and age-related comorbidities appear earlier [5–7].

The most affected patients are those with long-term
infection [diagnosed before the highly active antiretroviral
therapy (HAART) era] and treatment [8]: this group
accumulates comorbid conditions such as severe initial
infection, long-term exposure to the virus, and exposure to
toxic cART. These factors increase patients' vulnerability
to age-related comorbidities [9], functional decline, and
death [10]. In addition, patients need to cope with the
simultaneous presence of HIV infection and aging. Both
processes are associated with immunological and inflam-
matory phenomena, suggesting that one may potentiate the
other [7]. Consequently, quality of life (QoL) is impaired
by severity of symptoms, length of time since diagnosis,
polypharmacy, grief, and lack of social support [11–15],
leaving patients more vulnerable to depression and suicidal
ideation [16]. Aging has been reported to be the main cause
of emotional discomfort in this population [17], and a
recent study by our team showed elevated scores for
depressive symptoms in HIV-infected individuals, who
believed that their aging process began earlier than in the
non-infected population [18].

Management of depression and stress is essential,
because these conditions have immunosuppressive effects
[19] and can accelerate the progression of HIV infection
[20], as shown in psychoneuroimmunology studies during
the last three decades. Moreover, stress, depression, and
anxiety can decrease adherence to cART, thus placing
nonadherent individuals at high risk for treatment failure
[21–23].

Given the difficult clinical management of this popula-
tion, a psychoeducational intervention (nonpharmacologi-
cal) could be an optimal treatment approach, and there is a
strong rationale for using mindfulness-based interventions
in this population [24]. In fact, in a recent review of the
current state of knowledge on HIV and aging, mindfulness
techniques were proposed to improve self-management of
health and successful aging [25]. Mindfulness is the culti-
vation of nonjudgmental awareness in the present moment.
It is purposefully cultivated in a range of structured inter-
ventions, the most popular of which is mindfulness-based
stress reduction (MBSR), followed by mindfulness-based

cognitive therapy (MBCT) [26]. MBCT [27] combines
elements of MBSR [28] and cognitive therapy for depres-
sion [29]. Although first developed to prevent relapse of
depression, MBCT can improve QoL and the emotional
status of diverse clinical populations, such as patients with
cancer [30] and patients with cardiovascular disease [31].

Research on mindfulness in the HIV-infected population
has increased considerably in recent years. MBSR has been
reported to be effective with young people in a feasibility
study [32]. In randomized controlled trials (RCT), it has
decreased the side effects of cART [33] and helped to
manage affective symptoms [34]. To date, five studies have
investigated the impact of MBSR on the immune response
in the HIV-infected population. In a pioneer nonrandomized
study, Robinson et al. [35] found a significant increase in
natural killer cell activity and number in the MBSR group
compared with a control group. MBSR also improved the
declining CD4 cell count in HIV-infected adults [36]. A
small pilot study of HIV-infected men in Iran showed the
effectiveness of MBSR in increasing CD4 cell count [37]. A
subsequent RCT carried out by the same research group
showed the efficacy of MBSR in maintaining CD4 cell
counts and improving psychological and clinical symptoms
in HIV-infected individuals not yet receiving cART [38].
Another trial sought to assess the effects of MBSR on
inflammatory markers in treatment-naive HIV-infected
adults. Although the authors were unable to identify effects
attributable to the intervention, psychological measures,
particularly depression, were associated with inflammatory
markers [39]. Only one published study has examined
MBCT and HIV, and, despite methodological limitations,
the program showed psychological benefits in terms of
depression, mindfulness skills, and QoL [40]. However, the
samples in all these studies were small and data reported
should be interpreted with caution.

The benefits of mindfulness for the emotional status and
immune function of individuals living with HIV infection
and the lack of studies developed exclusively in patients
with long-term infection led us to design the present study.
We aimed to assess the efficacy of an MBCT program to
improve the QoL, emotional status, and immunological
status of a group of individuals with long-term HIV
infection and treatment. Our hypothesis was that patients
following an MBCT would experience an improvement in
their QoL, emotional status, and immune function.

Methods

Study Design and Participants

We performed an RCT on a population of patients treated
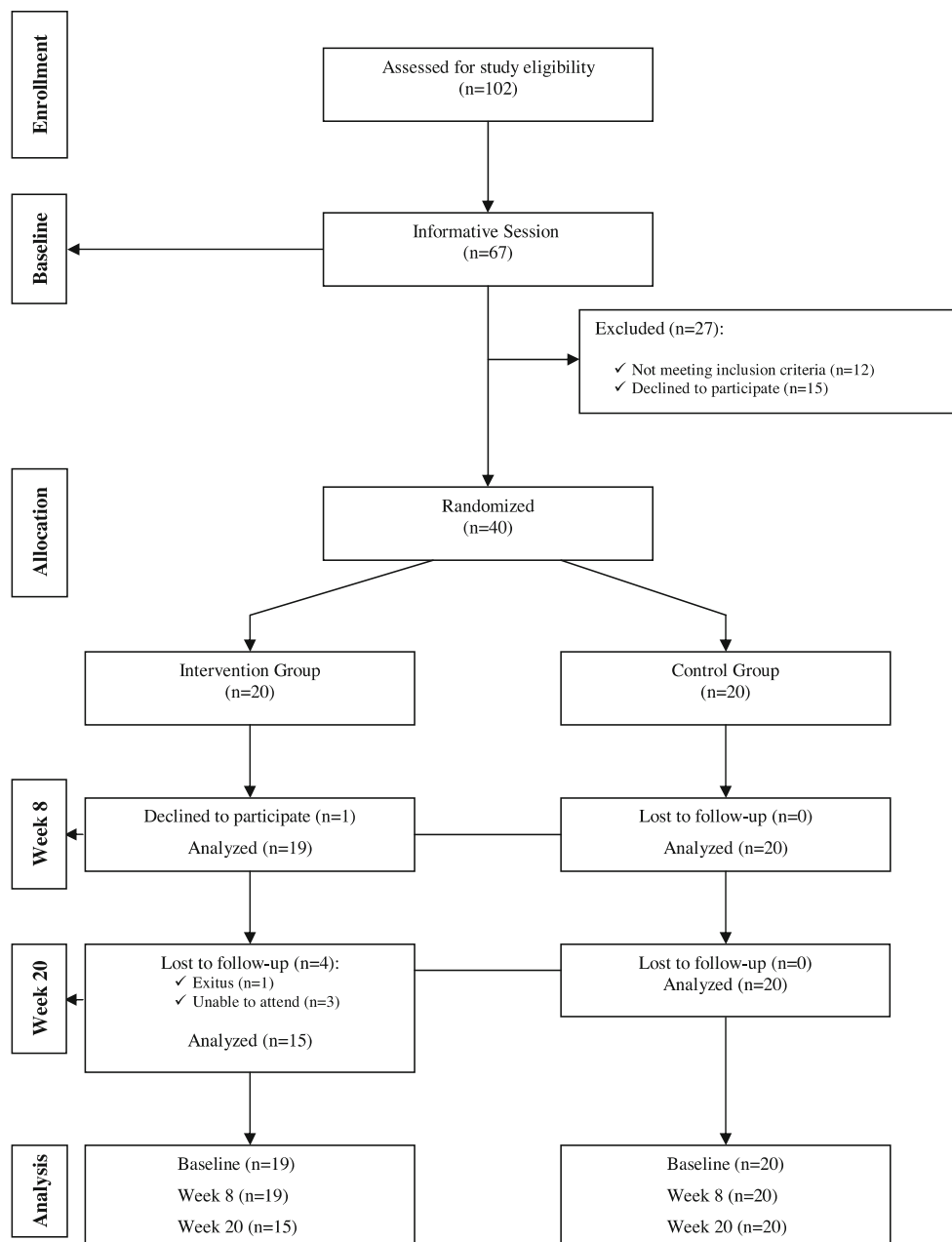at the HIV Unit of Germans Trias i Pujol University

Fig. 1 Study participant flow diagram

Hospital, Badalona (Barcelona), Spain. To qualify for the study, participants had to be diagnosed with HIV infection at least 15 years earlier (pre-HAART era) and have been on cART for at least 5 years, a criterion used elsewhere to define long-term treated patients [6]. Participants were excluded if they were following any other psychotherapeutic intervention at study entry or had a concomitant psychiatric disorder (bipolar disorder, psychotic and/or epileptic episode).

Patients fulfilling the inclusion criteria were randomized 1:1 by a computer-generated list to follow the MBCT program or to continue with routine visits (control group).

Randomization was stratified by gender. A nurse of the study team enrolled participants and assigned them to the study groups.

The study was conducted in accordance with the 1964 Declaration of Helsinki (1996 revision) and Good Clinical Practice guidelines. The Institutional Review Board of our center approved the study (AC-11-064). All patients provided their written informed consent.

A total of 102 candidates who fulfilled the inclusion criteria were preselected from the database. Candidates were invited by telephone to attend an information session. Of the 67 patients who attended the meeting, 40 formed the

final sample. Figure 1 shows the flow of participants through the study.

MBCT Program

MBCT is a skill-training program in reduced group format [27]. The aims are to teach patients to recognize and disengage from a depressive mode of mind, which is characterized by negative and ruminative behavior, and to develop a different mode of mind that is characterized by stability of attention and a more accepting attitude toward one's own mental states. The intervention implemented in this study followed the MBCT program described by the original developers [27]. After an initial individual interview, participants attended the MBCT classes (20 participants per class meeting for 2.5 h per week over 8 weeks). Participants were provided with homework comprising notes and compact discs containing guided mindfulness instructions to complete meditation, yoga, and cognitive exercises including body scan, sitting meditation, and mindful stretching and movements. They were encouraged to practice a minimum of 45 min/day and 6 days/week. The MBCT intervention was supervised by a psychologist with extensive experience in mindfulness techniques in healthcare settings. Two experts on application of mindfulness therapies in clinical settings were consulted to ensure that the treatment protocol delivered the essential elements of mindfulness-based therapies.

To calculate the withdrawal rate, we adopted the criterion of the original authors, namely, that having attended four or more sessions represents a "minimum effective dose" [41].

Assessments

Data on patients' characteristics and their HIV infection were collected from medical records. Participants completed the questionnaires used to assess the study variables at baseline (before randomization), at week 8 (after the intervention), and at week 20 (3 months after the end of the intervention).

The clinical variables collected were CD4 cell count (4 mL of blood in 1 EDTA tube) and HIV-RNA viral load (VL) (10 mL of blood in 1 EDTA tube). The samples were analyzed at Germans Trias i Pujol University Hospital.

Behavioral Variables

Data on adherence to cART, healthy diet, and smoking (number of cigarettes) were recorded. Self-reported adherence was assessed with the use of one item. This measurement has shown strong correlation with other methods such as virologic markers and drug levels in plasma [42, 43]. Appropriate adherence was defined as the consumption of at least 95 % of the medication prescribed [44].

Diet was assessed using 3-day food records [45]. In view of our cultural setting (Spain), we defined a "healthy diet" as a Mediterranean diet, which has widely reported benefits [46]. The principal aspects of this diet include high consumption of olive oil, legumes, unrefined cereals, fruits, and vegetables, moderate to high consumption of fish, moderate consumption of dairy products, moderate wine consumption, and low consumption of meat products.

Smoking was evaluated using the Framingham index [47].

Psychological Variables

QoL was evaluated using the Nottingham Health Profile (NHP) [48, 49], which is a questionnaire comprising two sections, one providing quantitative information and the other qualitative. For the purposes of this study, we used only section 1, which consists of 38 items that are used to assess health on 6 dimensions (physical mobility, pain, social isolation, emotional reactions, energy, and sleep). The score in each dimension ranges from 0 (minimum involvement) to 100 (maximum involvement). The total score is obtained from the mean of all the dimensions. The Spanish version of the NHP has been validated in several groups of patients [50–52].

Perceived stress was evaluated using the Perceived Stress Scale (PSS-10) [53, 54], a 10-item self-administered instrument that measures the degree to which situations in one's life are considered stressful. Scores range from 0 to 72. The Spanish version of the PSS-10 has adequate reliability (internal consistency, $\alpha = 0.82$, and test–retest, $r = 0.77$), concurrent validity, and sensitivity [54].

Emotional status was determined by evaluating depression and anxiety symptoms. Depression was evaluated using the 1996 revision of the Beck Depression Inventory (BDI-II) [55, 56]; anxiety was evaluated using the Beck Anxiety Inventory (BAI) [57, 58]. Both are 21-item multiple-choice self-reported inventories. Scores range from 0 to 63 for both questionnaires. Given its reliability (internal consistency, $\alpha = 0.89$) and convergent, discriminant, and criterion validities, the Spanish adaptation of the BDI-II has been shown to be a psychometrically adequate instrument for screening depression and for quantifying depressive symptoms [56]. The Spanish adaptation of the BAI also shows high internal consistency ($\alpha = 0.90$), as well as psychometric properties of validity similar to those observed in the original version of the questionnaire [59].

Table 1 Characteristics of the study sample

Variables	Total $n = 39$	MBCT $n = 19$	Control $n = 20$	Chi square or t statistic	p
Sociodemographic and clinical					
Age (years)	49.4 (5.1)	49.2 (5.7)	49.7 (4.7)	−0.293	.77
Male, n (%)	20 (51.3)	10 (52.6)	10 (50)	0.027	.87
Occupational status, n (%)					
Unemployed	8 (20.5)	4 (21)	4 (20)	0.099	.75
Active	11 (28.2)	6 (31.5)	5 (25)	0.208	.65
Retired	20 (51.3)	9 (47.3)	11 (55)	0.227	.63
Route of transmission, n (%)					
Homosexual	14 (35.8)	7 (36.8)	7 (35)	2.70	.90
Heterosexual	13 (33.3)	6 (31.5)	7 (35)	1.798	.82
Injection drug use	12 (30.7)	6 (31.5)	6 (30)	2.874	.91
Time since HIV diagnosis (years)	19.6 (3.9)	19.8 (4)	19.5 (4)	0.305	.73
Time on cART (years)	14.9 (5.4)	15.1 (5.2)	14.8 (5.8)	1.509	.93
Nadir CD4 cell count (cells/mL)	172 (125)	192 (127)	153 (124)	0.949	.34
CD4 cell count (cells/mL)	523 (211)	555 (198)	493 (223)	0.916	.36
HIV-RNA viral load <25 copies/mL, n (%)	38 (97.4)	19 (100)	19 (95)	0.483	.51
Behavioral					
Adherence to cART ≥95 %, n (%)	35 (89.7)	17 (89.4)	18 (90)	0.804	.63
Smoking, n (%)	23 (58.9)	12 (63.1)	11 (55)	2.178	86
Number of cigarettes/day	15.3 (10.1)	16.6 (11.3)	16.1 (10.3)	0.816	.91
Healthy diet, n (%)	31 (79.4)	17 (89.4)	14 (70)	1.229	.27
Psychological					
NHP-total	46.2 (24.4)	47.5 (22.8)	44.9 (26.3)	0.327	.75
PSS-10	22.7 (6.2)	24.11 (5.7)	21.5 (6.5)	1.296	.20
BDI-II	23.1 (12.5)	25.1 (12.4)	21.3 (12.6)	0.945	.35
BAI	23.9 (11.3)	26.5 (12)	21.5 (10.3)	1.396	.17

Data expressed as mean (SD), unless otherwise specified

cART Combined Antiretroviral Treatment, *NHP* Nottingham Health Profile, *PSS* Perceived Stress Scale, *BDI* Beck Depression Inventory, *BAI* Beck Anxiety Inventory

Statistical Analysis

The statistical analyses were performed using SPSS 15.0 (SPSS Inc., Chicago, IL, USA), assuming a 95 % level of confidence and two-sided tests. Data analyses were conducted according to a prespecified plan and were not exploratory.

Continuous variables were analyzed using the Kolmogorov–Smirnov test to assess for normal distribution. Because they followed a normal distribution, variables were expressed as mean and standard deviation. Proportions (number of patients) were given for the discrete variables. Variables were compared between groups using the Chi squared or Fisher exact and t tests. Linear regression was performed to assess the group effect on the outcome variables after adjusting for other relevant variables selected based on the literature and clinical plausibility (coefficients and p values are shown). The models were fitted avoiding multicollinearity and using ordinary least squares. The adjusting variables were kept in the model even when they were nonsignificant. The measure of effect size for the outcome of the two groups was estimated using Cohen's d, which was computed by dividing the mean difference between groups by the pooled standard deviation. Effect size was categorized according to Cohen's original proposal as follows: large (>0.8), medium (>0.5), and small (>0.3) [60].

Results

Characteristics of the Study Sample

The final sample was composed of 40 patients. Participants had a mean (SD) age of 49.4 (5.15) years and had been infected with HIV for 19.6 (3.9) years. Nadir CD4 cell count and CD4 cell count at study entry were 172 (125) and 523 (211) cells/mL, respectively. Adherence to cART (≥95 % of antiretroviral medication intake) was reported by 89.7 % of patients, and 97 % had an undetectable VL (HIV-RNA VL <25 copies/mL). The route of transmission
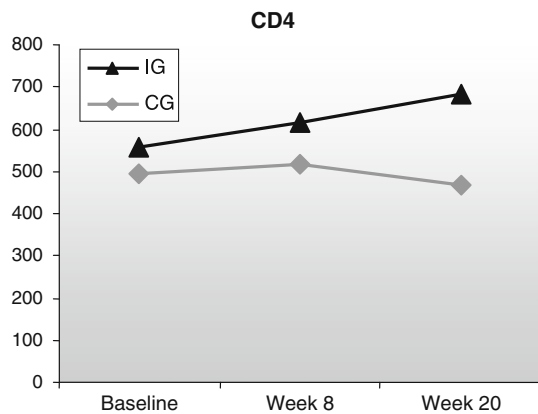
Fig. 2 CD4 cell count levels (cells/mL^3) during follow-up in both study groups

was unprotected intercourse between men who have sex with men (35.8 %), heterosexual relations (33.3 %), and injection drug use (30.7 %). At study entry, both groups had similar demographic, clinical, and behavioral characteristics (Table 1). The average number of classes attended in the MBCT group was 8 (range 5–8).

Clinical Variables

We observed a statistically significant difference in CD4 cell count between the MBCT and the control group at week 20 (Coef. 135.8; $p < 0.001$). The difference between baseline and week 8 was not significant between groups (Coef. 36.4; $p = 0.09$). Figure 2 shows the evolution of CD4 cell count in both study groups during the follow-up. In the MBCT group, the CD4 cell count improved from 555 (198) cells/mL at baseline to 614 (183) cells/mL at week 8 and to 681 (196) cells/mL at week 20. Cohen's d was 0.5 for the difference in CD4 cell count between baseline and week 8 and 1.3 between baseline and week 20, thus indicating a moderate and large effect size. CD4 cell count in the control group remained similar (Table 2).

We did not find differences in the percentage of patients with undetectable HIV-RNA VL (<25 copies/mL) between groups [baseline, 100 % MBCT group vs 95 % control group ($p = 0.51$); week 8, 94.7 % MBCT group vs 95 % control group ($p = 0.94$); week 20, 100 % MBCT group vs 95 % ($p = 0.95$)].

Behavioral Variables

No significant differences were detected between groups regarding adherence to cART, healthy diet, or smoking at baseline, weeks 8, and 20 (all p values >0.10).

Psychological Variables

Quality of Life

The regression analysis showed that QoL improved significantly after the program in the MBCT group (NHP-total: Coef. −25.8; $p < 0.001$); this improvement was maintained at week 20 (Coef. −30.9; $p < 0.001$). The improvement in all health dimensions was statistically significant at weeks 8 and 20 (Table 2). Cohen's d was −1.4 for the difference in QoL between baseline and week 8 and −1.9 between baseline and week 20, thus indicating a large effect size. Regarding dimensions, the comparison between baseline and week 8 and baseline and week 20 revealed a medium effect size (>0.5) for pain and sleep and a large effect size (>0.8) for energy, emotional reactions, social isolation, and physical mobility (Table 2).

Perceived Stress

After the intervention levels of perceived stress were significantly lower in the MBCT group than in the control group (PSS-10: Coef. −10.1; $p < 0.001$); this decrease was maintained at week 20 (Coef. −12.1; $p < 0.001$). Cohen's d was −1.6 for the difference in levels of perceived stress between baseline and week 8 and −2.1 for the difference between baseline and week 20, thus indicating a large effect size.

Emotional Status

Depressive symptoms improved significantly after the intervention in the MBCT group when compared with the control group (BDI-II: Coef. −13.6; $p = 0.000$); this improvement was maintained at week 20 (Coef. −14.2; $p = 0.000$). Before the program, 15 patients (79 %) had BDI-II scores ≥13, indicating a high level of depressive symptoms [30]. At weeks 8 and 20, scores ≥13 were detected in 6 (32 %) and 3 (20 %) patients. Figure 3 shows how severity of depressive symptoms evolved during the follow-up. Cohen's d was −1.3 for the difference in levels of depressive symptoms between baseline and week 8 and −1.4 for the difference between baseline and week 20, again indicating a large effect size (Table 2).

The MBCT intervention was also effective in reducing anxiety symptoms in MBCT group when compared with the control group (BAI: Coef. −10.4; $p = 0.001$), and this effect was maintained at week 20 (Coef. −13.3; $p = 0.000$). Cohen's d indicated a large effect size for the difference in anxiety symptoms between baseline and week 8 (−1.1) and also at week 20 (−1.3) (Table 2).

Table 2 Evolution of study variables during follow-up

Variables	Baseline		Week 8					Week 20				
	MBCT (n = 19)	Control (n = 20)	MBCT (n = 19)	Control (n = 20)	Statistics Chi square or t statistic	p	d	MBCT (n = 15)	Control (n = 20)	Statistics Chi square or t statistic	p	d
NHP-total	47.5 (22.8)	44.9 (26.3)	19.8 (18)	43.1 (27.1)	−3.170	<.01	−1.4	18.8 (17.2)	51.5 (24.5)	−4.372	<.01	−1.9
NHP-energy	65.2 (47.5)	67.6 (40.9)	28.2 (37.2)	61.8 (42.5)	−2.617	.01	−.85	18.7 (26.3)	65.7 (40.7)	−2.445	.01	−.99
NHP-pain	47.5 (38.4)	42.4 (36.3)	21.3 (26.4)	35.5 (35.2)	−1.801	.04	−.69	29.5 (34.1)	47.8 (35.2)	−1.806	.04	−.62
NHP-emotional	56.4 (30.8)	47.3 (34.1)	13 (20)	48.4 (39.5)	−3.555	<.01	−1.4	8.4 (14.8)	47.7 (32.8)	−2.823	<.01	−1.8
NHP-sleep	49.5 (35.9)	52.5 (34.9)	28.6 (33.3)	49.6 (33.4)	−1.942	.03	−.74	24.3 (33.3)	52.3 (32.4)	−1.692	.05	−.60
NHP-social isolation	44.8 (30.9)	38.7 (27.8)	13.6 (18.6)	37.7 (30.4)	−3.005	<.01	−1.1	14.8 (28.5)	44.6 (33.9)	−2.733	<.01	−1.2
NHP-mobility	25.5 (19.6)	20.9 (16)	16.8 (12.9)	24 (17.6)	−2.434	.01	−.90	17.1 (17)	30.2 (25.7)	−2.816	.01	−.88
PSS-10	24.1 (5.7)	21.5 (6.5)	13.4 (7.4)	21 (5.1)	−3.726	<.01	−1.6	10.9 (5.5)	21.6 (5)	−5.903	<.01	−2.1
BDI-II	25.1(12.4)	21.3 (12.6)	10.1 (9.3)	19.9 (13.9)	−3.733	<.01	−1.3	7.8 (6.2)	19 (13.1)	−3.355	<.01	−1.4
BAI	26.5 (12)	21.5 (10.3)	14.4 (13.1)	19.8 (11.2)	−2.920	<.01	−1.1	13.1 (11)	22.4 (13.2)	−2.874	<.01	−1.3
CD4 cell count, cells/mL³	555 (198)	493 (223)	614 (183)	516 (238)	−1.367	.09	.56	681 (196)	467 (248)	−2.818	<.01	1.3

Data expressed as mean (SD), p value and d = effect size

NHP Nottingham Health Profile, PSS Perceived Stress Scale, BDI Beck Depression Inventory, BAI Beck Anxiety Inventory
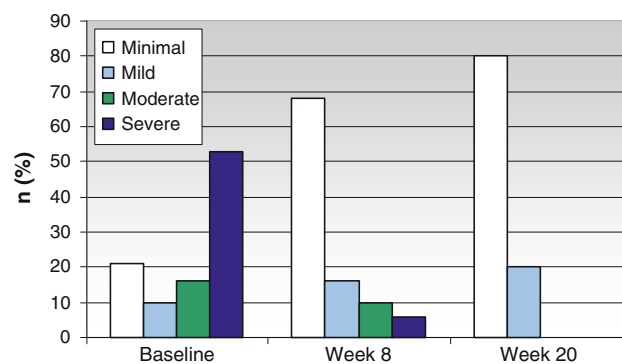
Fig. 3 Severity of depressive symptoms in MBCT group during follow-up according to BDI-II scores

Discussion

Our study shows that the MBCT program was effective at improving QoL and emotional status for a group of patients diagnosed with HIV infection nearly 20 years ago. The positive effects of the program were even seen to increase 3 months after the end of the intervention.

The QoL of the participants at baseline was much worse than that observed in studies with noninfected populations of the same age [49] and in elderly patients with other chronic conditions [61]. In the study by Oztürk et al. [62], the mean value for QoL was 24 in patients aged 72 years. By contrast, in our study, the mean value for QoL reached 46.2 in patients aged only 49 years. Moreover, before the intervention, 79 and 95 % of patients, respectively, reported symptoms of depression and anxiety.

The improvement in QoL found in the study is consistent with the results of other works on the efficacy of MBCT in healthy individuals [63, 64] and in clinical populations [27, 28]. Regarding benefits in emotional status (determined by perceived stress, depression, and anxiety), previous studies showed that MBCT is effective at reducing stress in older people [65] and in patients with cancer [30]. The utility of MBCT in reducing stress was somehow expected, since this program shares many similarities with MBSR, which was specifically designed to reduce psychological stress [66]. MBCT was originally developed to prevent depressive relapse [22], and the improvements found in our study are similar to those reported in studies about MBCT and depressive symptoms in the general population [67, 68] and in HIV-infected patients [41]. Our findings also support published evidence suggesting the utility of MBCT in reducing anxiety symptoms [41, 67].

Remarkably, 3 months after the end of the intervention, participants in the MBCT program had a significantly increased CD4 cell count. Nearly all the patients had undetectable VL during the study, and no changes were observed in the cART prescribed or in the behavioral

variables evaluated. Although baseline CD4 cell count was slightly higher in the MBCT group, this difference did not reach statistical significance ($p = 0.36$). The increase in CD4 cell count is consistent with previous research [36–38]. Mindfulness may impact CD4 cell count through two main mechanisms. The first involves changes in behavioral variables, such as diet, smoking, or adherence to cART. We observed no changes in these variables. The second mechanism involves emotional benefits such as decrease in stress, depression, and anxiety. These variables have been associated with inflammatory markers such as the cytokine interleukin-6 (IL-6) [69], high-sensitivity C-reactive protein, and D-dimer [39] in the HIV-infected population. There is also evidence that MBSR can induce a reduction in IL-6 levels in women diagnosed with breast cancer [70]. Our findings, together with previous research, highlight an important pathway that should be examined in future studies with larger samples.

As for the lack of changes in the behavioral variables, it is noteworthy that most patients had adequate adherence to antiretroviral therapy and a healthy diet before the study was performed. Thus, these already adequate behaviors remained unchanged. However, the rate of smoking was high and remained unaffected by the MBCT intervention, despite the decrease in anxiety symptoms. An RCT using mindfulness training for smoking cessation in HIV-negative individuals showed the positive effects of MBCT [71]. The lack of benefits in our patients might be due to the fact that this was not the objective of our study; consequently, patients did not feel motivated in this regard. However, the implications of smoking cessation for health care mean that such interventions merit further research.

The strengths of this study are the fact that it is an RCT, the novelty of the sample characteristics, the gender stratification, and the withdrawal rate, which was only 5 %. The only other study developed using the MBCT program in HIV-infected patients had a withdrawal rate of 77.7 % [40]. Studies with MBSR in the HIV-infected population report withdrawal rates of around 40–50 % [34–36]. We believe that the excellent adherence to the program in our study might be due to the marked emotional involvement of these patients, which may have increased their motivation to participate. In addition, the information session may have acted as a filter that allowed only the most highly motivated patients to participate.

Our study is subject to a series of limitations. First, our sample was small owing to the MBCT format, which requires implementation in small groups. Second, our results are short-term, and we do not know whether the benefits observed could be maintained in the long term. Third, our control group was passive, thus preventing us from establishing whether the benefits observed are related to MBCT or to mere group contact over 8 weeks and the

subsequent social support derived. However, the randomized nature of our study strengthens our results. Further research should evaluate the mechanisms through which mindfulness can contribute to immune competence, thereby paving the way for possible complementary therapeutic strategies.

In summary, our study shows that MBCT improved QoL, emotional status, and CD4 cell count in a group of patients diagnosed with HIV infection nearly 20 years ago. The benefits of this program may help to promote successful aging in these patients.

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