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ORIGINAL ARTICLE

Psychopathological and psychiatric evaluation of patients affected by lipodystrophy

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Abstract

Purpose Lipodystrophy is a collection of rare disorders defined by complete or partial loss of adipose tissue, due to abnormal adipocyte production, function, or distribution; it shares the main metabolic complications with obesity. Aims of the present study were to investigate the psychopathological characteristics of non-HIV lipodystrophic patients in comparison with a group of obese patients, a group of patients affected by oncologic chronic illness, and a control group of healthy subjects.

Methods All participants were female: 16 non-HIV lipodystrophic women (mean age 42 ± 12 years), 20 women with breast cancer (adenocarcinoma with a positive sentinel lymph node in outpatients awaiting chemotherapy, mean age 44 ± 5 years), 20 obese women (mean age 40 ± 3 years), and 20 healthy women (mean age 40 ± 2 years). Each lipodystrophic patient received a psychiatric assessment, following the diagnostic criteria for DSM-5. Patients and controls received a battery of self-report instruments measuring general psychopathology, body image concerns, eating habits and food craving, and pain concerns. The following psychopathological rating scales were used: SCL-90-R (Symptom Check List) for general psychopathology, BUT (Body Uneasiness Test) for body image, FCQ-T (Food Cravings Questionnaire Trait) for food craving, and WHYMPI (West Haven Yale Multidimensional Pain Inventory) for multidimensional pain inventory.

Results The psychiatric assessment of the 16 lipodystrophic patients revealed: three lifetime mood disorder, six current mood disorder, six lifetime anxiety disorder, five current anxiety disorder, four current somatic symptom disorder with predominant pain, six current binge eating disorder, 11 eating disorder not otherwise specified, two borderline personality disorder, one obsessive–compulsive personality disorder, one avoidant personality disorder, and five personality disorder not otherwise specified. In SCL-90-R scale, the subscale sensitivity showed a significantly higher score in the lipodystrophic and oncologic groups compared to healthy subjects. The subscale paranoid ideation showed a significantly higher score in the lipodystrophic group vs all the other groups. The total score of BUT scale was significantly higher in the lipodystrophic compared to healthy subjects. In WHYMPI scale, the scores of pain interference and family support were significantly higher in the lipodystrophic group. The scores of negative responses were significantly higher in the lipodystrophic group vs healthy subjects. In FCQ-T scale, the score of Cues dimension in lipodystrophic patients was significantly lower as compared with all the other groups.

Conclusions Our findings suggest that lipodystrophic patients have an increased prevalence of mood, anxiety, pain, and eating disorders.

Level of evidence Level III. Evidence obtained from case-control analytic study.

Keywords Lipodystrophy · Chronic illness · Psychopathology · Pain · Body image · Food craving

Introduction

Lipodystrophy is a collection of rare disorders defined by complete or partial loss of adipose tissue, due to abnormal adipocyte production, function, and/or distribution. The reduction in adipose tissue is largely subcutaneous and results in reduced levels of serum leptin. Metabolic complications of this condition include insulin resistance and type II diabetes,

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dyslipidemia particularly hypertriglyceridemia, and hepatic steatosis with hepatomegaly [1, 2]. Many patients develop lipodystrophy because of genetic mutations, others due to acquired conditions.

Lipodystrophies have been reported in the medical literature for more than 100 years [2]. Acquired partial lipodystrophy was the first one to be reported 133 years ago [3], followed by the acquired generalized variety [4] and then by the first genetic variety of congenital generalized lipodystrophy [5].

In recent years, a new lipodystrophic syndrome was recognized in HIV-infected patients treated with highly active antiretroviral therapy [6], which has become the most prevalent type among all lipodystrophies.

There is considerable heterogeneity related to the pattern and extent of fat loss among various types of lipodystrophies. The diagnosis is mainly clinical, although genetic and metabolic tests may be required to confirm the diagnosis. Loss of adipose tissue results in decreased circulating leptin, a hormone secreted by adipocytes, and a pivotal regulator of body weight homeostasis [7], which affects neuroendocrine functions, food intake, and locomotor activity [8]. Leptin acts on the sense of hunger and its reduction induces hyperphagia.

Patients with lipodystrophy should be differentiated from those with anorexia nervosa, cachexia, starvation, acromegaly, Cushing's syndrome, generalized and truncal obesity, multiple symmetric lipomatosis, and other rare progeroid syndromes and disorders affecting growth and development.

Lipodystrophic syndromes are classified into genetic and acquired types and sub-classified into generalized and partial types.

Although these patients frequently report to the physician about psychological distress due to a lower quality of life, to a loss of control on food, to their physical appearance, and to chronic pain symptomatology, few systematic studies about the psychiatric aspects associated with non-HIV lipodystrophy are so far available [9].

On the other hand, morbid obesity, which is often associated with metabolic complications, also presents comorbid aspects with dysfunctional eating behaviours and psychiatric disorders [10–12].

Aims of the present study were to investigate the psychiatric comorbidities and to evaluate the psychopathological rating scales of non-HIV lipodystrophic patients in comparison with a group of obese patients, a group of patients affected by oncologic illness, and a control group of healthy subjects.

Methods

Data were available from patients recruited at the Obesity and Lipodystrophy Research Center of the Endocrinology Unit at the University Hospital of Pisa.

Each lipodystrophic patient received a careful psychiatric assessment by two psychiatrists trained to the use of the interviews during daily clinical practice, with a long-standing experience in making these assessments and with high levels (>0.90) of inter-rater reliability of their diagnoses.

Exclusion criteria were: the presence of HIV-related lipodystrophic syndrome, age under 18 years, mental retardation, illiteracy, or poor knowledge of Italian language.

The psychiatric diagnostic assessment of lipodystrophic patients has been conducted following the diagnostic criteria for DSM-5 and specific diagnostic criteria for the night eating syndrome, reviewed by the First International Night Eating Symposium on April 2008 [13–15].

The study sample consisted of four groups (Table 1). All participants were female: lipodystrophic women ($N=16$, mean age 42 ± 12 years), women with breast cancer (adenocarcinoma with a positive sentinel lymph node in outpatients awaiting chemotherapy, $N=20$, mean age 44 ± 5 years), obese women ($N=20$, mean age 40 ± 3 years), and healthy women ($N=20$, mean age 40 ± 2 years).

Although women with recently diagnosed breast cancer and awaiting for chemotherapy cannot be considered a fully comparable control group, the diagnosis of cancer and the time lag for treatments is a condition producing a prolonged stress to affected women, which derives from concerns on the health status.

The diagnostic classification of the 16 lipodystrophic patients allowed to recognize the following types of lipodystrophy: nine familial partial, one acquired generalized, four acquired partial, and two congenital generalized.

Type of comorbidities associated with the lipodystrophic disease, type 2 diabetes duration, number of patients under oral antidiabetic drugs, number of antidiabetic drugs or requiring insulin, prevalence of patients with dyslipidemia, and under antidyslipidemia drugs are described in Tables 2, 3, and 4.

Patients from all four groups received a battery of self-report instruments measuring general psychopathology, body image concerns, eating habits and food craving, pain concerns.

The following psychopathological rating scales were used:

– SCL-90-R (Symptom Check List) for general psychopathology [16, 17].

Table 1 Mean age and BMI in various study groups

	Lipodystrophic ($n=16$)	Oncologic ($n=20$)	Obese ($n=20$)	Healthy Lean ($n=20$)
Mean age in years	42	44	40	40
Mean BMI (range)	22	(20–25)	41	(20–25)

Table 2 Comorbidities associated with lipodystrophy, in the study group

Comorbidities	Number of lipodystrophic patients (%)
Type 2 diabetes/insulin resistance	14/16 (87%)
Dyslipidemia	13/16 (81%)
Hepatic steatosis	8/16 (50%)
Cholelithiasis	3/16 (19%)
Nephropathy	4/16 (25%)
OSAS	1/16 (6%)
PCOS	3/16 (19%)
Hypovitaminosis D	10/16 (62%)
Nodular goiter	3/16 (19%)
Thyroid cancer	2/16 (12%)
Sarcoma	1/16 (6.25%)
Breast cancer	2/16 (12%)
Pancreatic IPMN	1/16 (6.25%)
MGUS	1/16 (6.25%)

OSAS obstructive sleep apnea syndrome, *PCOS* polycystic ovary syndrome, *IPMN* intraductal papillary mucinous neoplasm, *MGUS* monoclonal gammopathy of undetermined significance

- BUT (Body Uneasiness Test) for body image [18, 19].
- FCQ-T (Food Cravings Questionnaire Trait) for food craving [20, 21].
- WHYMPI (West Haven Yale Multidimensional Pain Inventory) for multidimensional pain inventory [22, 23].

The questionnaires and the diagnostic interviews were carried out during daily clinical practice and after obtaining the informed consent by the patients and respecting the confidentiality criteria commonly adopted in clinical research.

Psychopathological instruments

SCL-90-R (Symptom Check List)

SCL-90-R is a scale for the self-assessment of psychiatric symptomatology in general. It consists of 90 items that reflect the nine dimensions that underlie most of the symptoms observed in psychiatric patients.

The scale measures the symptoms of the previous week up to the time of evaluation. The SCL-90-R consists of 90 items, which go to make up nine dimensions: (i)—somatization: it expresses the suffering deriving from the perception of somatic dysfunctions; (ii)—obsessiveness–compulsiveness: it reflects the behaviour that characterizes the clinical disorder which has the same name; (iii)—sensitivity: it expresses the feelings of personal inadequacy and inferiority, especially in comparison with others; (iv)—depression: it expresses a wide spectrum of disorders that characterizes this mood alteration; (v)—anxiety: it reflects a set of symptoms and experiences that are generally associated at a fair level of manifest anxiety; (vi)—anger–hostility: it takes into account verbal hostility, hostile thoughts and behaviour; (vii)—phobic anxiety: it takes into account the symptoms that are observed in the states of phobic anxiety and agoraphobia; (viii)—paranoid ideation: it refers to the concept that paranoid behaviour is an expression of a way of thinking; and (ix)—psychoticism: it represents the psychotic behaviour through some indirect indicators.

The nine dimensions have been widely validated on a large patient population.

BUT (Body Uneasiness Test)

The psychopathological evaluation of body image disorders is a multidimensional concept that includes cognitive, emotional, and behavioural elements, and the uneasiness compared to the image of one's body can certainly be expressed as specific dissatisfaction linked to parts or characteristics or well-defined functions of the body.

This scale explores different areas: dissatisfaction with body and weight, behaviour of avoidance and compulsive control, experiences of detachment and estrangement from one's own body, and specific concerns for certain parts, features, or bodily functions.

Table 3 Duration and treatment of type 2 diabetes associated with lipodystrophy, in the study group

Type 2 diabetes	Mean
Mean duration in years	12
Mean number of antidiabetic drugs	1.35
	Number (%)
Patients requiring insulin	6/16 (37%)
Patients under oral antidiabetic drugs	13/16 (81%)

Table 4 Treatment of dyslipidemia associated with lipodystrophy, in the study group

Antidyslipidemia drugs	Number of lipodystrophic patients (%)
Omega3 fatty acids	12/16 (75%)
Cholestyramine	1/16 (6%)
Fibrates	2/16 (12%)
Statins	5/16 (31%)
Ezetimibe	1/16 (6%)

FCQ-T (Food Cravings Questionnaire Trait)

The FCQ–T is a multidimensional questionnaire composed of 39 items selected from the literature on addiction and eating disorders.

The FCQ–T measures nine dimensions of food craving: (a) anticipation of positive reinforcement from eating (Ant +); (b) anticipation of relief from negative states and feelings from eating (Ant −); (c) intentions and plans to consume food (intent); (d) cues that might trigger food cravings (cues); (e) thoughts or preoccupation with food (thoughts); (f) craving as hunger (hunger); (g) lack of control over eating (control); (h) emotions that might be experienced before or during food cravings or eating (emotions); and (i) guilt from cravings and for giving into them (guilt).

The FCQ–T is a 39-item questionnaire, with items rated on a six-point Likert-type scale ranging from 1 (never) to 6 (always).

WHYMPI (West Haven Yale Multidimensional Pain Inventory)

WHYMPI is a scale that has its roots in the cognitive–behavioural perspective of chronic pain and health assessment. It was developed for the wide-ranging evaluation of psychosocial variables relevant in the experience of chronic pain. It emphasizes sensations and subjective evaluations of pain related issues, their impact on life and on life answers from others. From this perspective, it provides a quick, complete, and psychometrically correct assessment of the different components of pain. The scale evaluates the characteristics of pain at the time of the interview, and the impact of pain on psychological conditions and on the performance of the subject.

The WHYMPI consists of 52 items divided into three parts, each of them composed from a different number of scales:

- The first part includes five subscales exploring the impact of chronic pain on the subject's life: interference of pain on professional, social, and recreational activity and on the family function; support of family members; pain severity; life control, with particular regard to everyday life and daily problems; and affective distress.
- The second part consists of three subscales and evaluates the subject's perception when he/she complains to the others about pain: negative responses, solicitous responses, and distracting responses.
- The third part, composed of four subscales, evaluates the extent to which the subject with pain participates in the activities of daily life: household chores; outdoor work; activities away from home (extra-domestic activities); and social activities. There is also an additional scale, the general activity, obtained from the combination of the four previous scales.

Statistical analysis

Study variables were expressed in ordinal ranks. Among groups, differences were evaluated by non-parametric ANOVA (Kruskal–Wallis test), and in the presence of a statistically significant difference, between-group differences tested by a multi-comparison procedure (Dunnett test). Descriptive statistics were reported as mean scores. Statistical significance was considered for $p < 0.05$.

Results

Categorical diagnosis of lipodystrophic patients

The psychiatric assessment of the 16 lipodystrophic patients was performed according to the diagnostic criteria of the DSM-5 and the following categories were recognized: three lifetime mood disorders (cyclothymic disorder), six current mood disorders (depressive disorder due to medical condition), three lifetime anxiety disorders (specifically: 1 panic disorder, 1 generalized anxiety disorder, 1 social anxiety disorder, and 3 specific phobias), five current anxiety disorders (due to medical condition), four current somatic symptom disorders with predominant pain, six current binge eating disorders, and 11 eating disorders not otherwise specified (more in detail: 1 lifetime night eating syndrome, 5 dysfunctional eating behaviour known as emotional eating, 1 lifetime Bulimia Nervosa, 1 lifetime Atypical Anorexia Nervosa, 3 sub-threshold Binge eating disorder), 2 Borderline personality disorders, one obsessive–compulsive personality disorder, one avoidant personality disorder, five personality disorders not otherwise specified.

Dimensional comparison among the four groups with psychopathological scales

The results of comparison among the four groups with psychopathological scales are reported in Tables 5, 6, 7, and 8.

In the psychopathological scale SCL-90-R, the subscale sensitivity showed a significantly higher score in the lipodystrophic and oncologic groups vs healthy subjects. The scores of subscales depression and anxiety were significantly higher in the oncologic and obese groups vs healthy subjects. The subscale Phobic anxiety showed a significantly higher score in the obese group compared to healthy subjects. The scores of these three dimensions were higher also in lipodystrophic patients as compared to healthy subjects, although theses values did not reach a statistical significance.

Table 5 Mean scores of SCL-90-R scale in various study groups

Subscale	Lipodystrophic	Oncologic	Obese	Healthy
Somatization	8	9.2	10.1	6.1
Obsessive–compulsive	7.2	8.2	9.3	5.8
Sensitivity	5.5*	5.2*	3.8	2.3
Depression	8.5	10.9*	11.1*	4.7
Anxiety	5.6	7.5*	6.8*	3.7
Hostility	1.9	2.8	4.6	3.2
Phobic anxiety	1.5	1.8	2.7*	1.1
Paranoid	3.9*, ^, §	2.4	1.9 *	1.4
Psychoticism	2.8	3.9*, §	2.3^	1.5

Multiple comparisons by Dunnett test (two-sided)

*$p < 0.05$ vs healthy

^$p < 0.05$ vs oncologic

§$p < 0.05$ vs obese

Table 6 Mean scores of BUT scale in various study groups

Scale	Lipodystrophic	Oncologic	Obese	Healthy
BUT	42.3*, ^, §	18.9	82.0*, ^	11.9

Multiple comparisons by Dunnett test (two-sided)

*$p < 0.05$ vs healthy

^$p < 0.05$ vs oncologic

§$p < 0.05$ vs obese

The subscale paranoid ideation showed a significantly higher score in the lipodystrophic group vs all the other groups. The score of subscale psychoticism was significantly higher in the oncologic group vs the obese and the healthy subjects (Table 5).

The total score of BUT scale was significantly higher in the lipodystrophic and in the obese groups vs healthy subjects. Furthermore, it was higher in obese subjects than in lipodystrophic patients (Table 6).

With regard to WHYMPI scale, the following subscales showed a significant difference: the scores of pain interference and family support were significantly higher in the lipodystrophic group compared to healthy subjects, similar to the oncologic group and obese subjects.

Pain severity showed a significantly higher score in the obese group as compared to healthy and to oncologic group.

The scores of negative responses (to subject's perception when complaining to the others about her pain) were significantly higher in the lipodystrophic group vs healthy subjects.

The scores of solicitous responses were significantly lower in the lipodystrophic and healthy groups vs obese subjects (Table 7).

Table 7 Mean scores of WHYMPI scale in various study groups

Subscale	Lipodystrophic	Oncologic	Obese	Healthy
Interference	1.6*	1.4*	1.4*	0.5
Support	3.9*	3.4*	3.3*	1.7
Pain severity	1.6	1.1	2.1*, ^	0.7
Life control	4.3	3.8	4.2	4
Affective distress	2.1	2.4	2.6	2.6
Negative responses	1.3*	0.7	0.8	0.4
Solicitous responses	2.6§	3.2	3.7*	2.5
Distracting responses	3.3	3.5	3.8	3.3
Household chores	3.9	4.5	3.1^	4
Outdoor work	1.6	1.8	1	1.8
Extra-domestic activities	2.8	2.8	2.6	3.2
Social activities	2.3	2.7	2.7	2.7
General activities	2.7	2.9	2.6	2.9

Multiple comparisons by Dunnett test (two-sided)

*$p < 0.05$ vs healthy

^$p < 0.05$ vs oncologic

§$p < 0.05$ vs obese

Table 8 Mean scores of FCQ-T scale in various study groups

Subscale	Lipodystrophic	Oncologic	Obese	Healthy
Anticipation +	8.9	9.4	9.2	11.2
Anticipation −	5.2	5.4	6.1	6.8
Intent	5.2	5.8	6.5	6.2
Cues	6.4*, ^, §	8.9	9.1	10.8
Thoughts	7.4	9.6	9.3	9.6
Hunger	9.1	7.7	8	8.8
Control	10.1	10.8	8.5	10.4
Emotions	6.9	6.4	6.4	6.6
Guilt	5.4	5.3	6.7	5.2

Multiple comparisons by Dunnett test (two-sided). Anticipation of positive reinforcement from eating (Anticipation +). Anticipation of relief from negative states and feelings from eating (Anticipation −)

*$p < 0.05$ vs healthy

^$p < 0.05$ vs oncologic

§$p < 0.05$ vs obese

In FCQ-T scale, the score of cues dimension in lipodystrophic patients was significantly lower as compared with all the other groups (Table 8).

Discussion

In a few anecdotal publications of the early decades of the twentieth century, the association of progressive lipodystrophy with mental disorder has been reported [24–28].

Furthermore, in a report published in 1967 [29], the cases of three siblings with the syndrome of lipoatrophic diabetes, who developed paranoid psychoses, were described. Their parents and the other five siblings in the family were also studied. None of the other five siblings was psychotic and none of them had diabetes mellitus or lipoatrophy. Overall, these findings may suggest that lipodystrophy can predispose, in some yet undefined manner, to the development of mental illness.

Much more recently, in a study published in 2017, [9] mood disorders requiring medication were identified in 12 patients (52.2%). Depression was the most common psychiatric condition, occurring in ten patients (43.5%). Six had anxiety (26.1%), one patient had bipolar disorder, and one had an unidentified psychiatric condition for which he previously used an antipsychotic agent. Chronic pain was also very common among those patients, with eighteen patients (78.3%) having some type of painful condition.

In our study, 16 lipodystrophic patients were evaluated using a standardized diagnostic assessment. The prevalence of mood (56.25%) and anxiety (50%) disorders was even higher when compared with that described by Ajluni et al. [9].

In the present study, about 25% of lipodystrophic patients showed a current somatic symptom disorder with predominant pain (former named pain disorder). Patients suffering from this disorder typically have multiple, somatic symptoms resulting in significant disruption of daily life, although sometimes only one severe symptom, most commonly pain, is present [13]. The exact prevalence of the somatic symptom disorder is unknown, but women tend to report more somatic symptoms than men do, the association with anxiety or depression is common and may exacerbate the symptoms and the functional impairment.

Analyzing the results of the pain evaluation by WHYMPI scale, the subscales pain interference and family support were significantly higher in the lipodystrophic group as compared to healthy subjects. Based on our results we hypothesize that the interference of pain on personal and social activity, emerging from WHYMPI subscales, is markedly disabling in lipodystrophic subjects, as much as in oncologic and in obese subjects. Interestingly, although a good family support was reported, lipodystrophic subjects refer more negative and less thoughtful responses from those to whom they communicate their own pain, compared to oncologic and obese patients.

In the psychopathological scale SCL-90-R, the dimension sensitivity showed a significantly higher score in the lipodystrophic and oncologic groups compared to healthy subjects, while the dimension paranoid ideation showed a significantly higher score in the lipodystrophic group compared to all the other groups. Since sensitivity dimension expresses the feelings of personal inadequacy, we can speculate that paranoid ideation is expression of discomfort for a chronic, disabling, and impelling disease as lipodystrophy is, and for being observed and misjudged by others.

In BUT scale, the total score was significantly higher in the lipodystrophic and in the obese groups compared to healthy subjects, suggesting that patients from both groups are disturbed by the body image concerns. Regarding this aspect, we agree with Adams et al. [30] that changes of body shape due to abnormal distribution of adipose tissue are very distressing, because they may have a major impact on physical appearance.

In our lipodystrophic cohort, 37.5% of patients showed a current binge eating disorder and 68.75% an eating disorder not otherwise specified. Although many lipodystrophic patients met the diagnostic criteria for an eating disorder, it is difficult to dissect the confounding factor due to low levels of plasma leptin, which represent an important drive to overeating. Leptin is a hormone secreted by the adipose tissue and a reduction of its plasma level, especially when levels are below normality, greatly stimulates appetite. On this basis, we expected the scores from FCQ-T scales, which investigate food-related cues, to be qualitatively and/or quantitatively different from our control reference groups.

The mean score of (external food) cues dimension, in lipodystrophic patients, was indeed significantly lower compared to the other control groups. These findings suggest that, in lipodystrophic patients, the external food cues (environment, company, etc.) triggering food craving have a lower influence in determining the voracious appetite about which they often complain. Since lipodystrophic patients are hypoleptinemic due to the severe and permanent adipose tissue loss, they are likely to have chronically increased hunger, independently from external cues. According to Innamorati et al. [21], between external and internal stimuli, the latter are more important than external food cues in eliciting food craving in subjects with disordered eating behaviours.

As expected, in lipodystrophic patients, hunger score was higher (Table 4), although not yet statistically significant, than in the other three control categories. Interestingly enough, lipodystrophic patients display a trend towards reduced scores of the Intent and Thoughts food cues (Table 8). These findings indicate that overall our patients spent less time in plans and fantasies related to food acquisition, preparation and consumption. Finally, lipodystrophic patients display a trend towards reduced scores of the positive anticipation food cues (Table 8). If confirmed, these findings may indicate that our patients have reduced anticipatory rewards from food consumption.

Further studies will be necessary to determine if, in the context of lipodystrophy, FCQ-T scales lack sensitivity or if the low number of patients did not allow us to achieve, for most items, a statistical difference compared to healthy controls. Unfortunately, a meaningful sub-analysis taking into

account the differences on genotype/phenotypes, duration of comorbidities and therapeutic regimens was not possible due to the small number of patients. Yet, we believe that the results obtained by the current study provide a strong background for future research, using larger patients' populations. A further limitation of our study was the heterogeneous composition of the group of lipodystrophic patients and the predominance of partial forms that may display milder phenotypes.

Available data indicate that several comorbidities associated with lipodystrophy improve by the therapeutic administration of recombinant human leptin. Indeed, chronic treatment with leptin ameliorates not only the metabolic abnormalities [31], but also the altered eating behaviour decreasing hunger feelings and the incentive value of food [32–35].

We believe that this treatment, now part of the therapeutic armamentarium available for the contrast to the disease, should be investigated also for its therapeutic potential on the sphere of psychiatric comorbidity.

Conclusions

To our knowledge, this is the first study in which a psychiatric diagnostic assessment of non-HIV lipodystrophic patients has been conducted following the diagnostic criteria for DSM-5, and in which a comparison of dimensional psychometric scales has been performed in lipodystrophic patients compared to obese, oncologic and healthy subjects. Our findings suggest that lipodystrophic patients have an increased prevalence of mood, anxiety, pain, and eating disorders, compared to literature data. Based on these results, we believe that lipodystrophic patients suffer from a chronic, disabling, and impelling disease and that they need a careful psychiatric evaluation and related long-term support.

Funding This study received no funding.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The local ethical committee (Comitato Etico Area Vasta Nord Ovest, CEAVNO) approved the publication of this study.

Informed consent Informed consent was obtained from all individual participants included in the study.

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