

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/6185873>

Metabolic syndrome, psychological status and quality of life in obesity: The QUOVADIS Study

Article in *International journal of obesity* (2005) · February 2008

DOI: 10.1038/sj.ijo.0803687 · Source: PubMed

CITATIONS

75

READS

93

8 authors, including:



Francesco Corica

Università degli Studi di Messina

159 PUBLICATIONS 3,337 CITATIONS

[SEE PROFILE](#)



Andrea Corsonello

INRCA Istituto Nazionale di Ricovero e Cura per Anziani

252 PUBLICATIONS 4,442 CITATIONS

[SEE PROFILE](#)



Edoardo Mannucci

University of Florence

451 PUBLICATIONS 15,632 CITATIONS

[SEE PROFILE](#)



Giulio Marchesini

University of Bologna

558 PUBLICATIONS 30,192 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



Obesity [View project](#)



Metabolism in liver transplantation [View project](#)

ORIGINAL ARTICLE

Metabolic syndrome, psychological status and quality of life in obesity: the QUOVADIS Study

F Corica¹, A Corsonello^{2,3}, G Apolone⁴, E Mannucci⁵, M Lucchetti², C Bonfiglio¹, N Melchionda⁶, G Marchesini⁷ and the QUOVADIS Study Group

¹Department of Internal Medicine, University of Messina, Messina, Italy; ²Italian National Research Center on Aging (INRCA), Ancona and Cosenza, Italy; ³Fondazione San Raffaele, Cittadella della Carità, Taranto, Italy; ⁴Clinical Research Laboratory, Institute of Pharmacological Research Mario Negri, Milan, Italy; ⁵Unit of Gerontology and Geriatrics, Department of Critical Care Medicine and Surgery, University of Florence, Florence, Italy; ⁶Metabolic Unit 'Alma Mater Studiorum' University, Bologna, Italy and ⁷Unit of Clinical Dietetics, 'Alma Mater Studiorum' University, Bologna, Italy

Objective: We aimed to investigate the association of the clinical variables of the metabolic syndrome (MS) and psychological parameters on health-related quality of life (HRQL) in obesity. In particular, our aim was to investigate the relative impact of physical symptoms, somatic diseases and psychological distress on both the physical and the mental domains of HRQL.

Design: Cross-sectional study.

Subjects: A cohort of 1822 obese outpatients seeking treatment in medical centers.

Measurements: HRQL was measured by the standardized summary scores for physical (PCS) and mental (MCS) components of the Short Form 36 Health Survey (SF-36). Patients were grouped according to tertiles of PCS and MCS. Metabolic and psychological profiles of PCS and MCS tertiles were compared by discriminant analysis.

Results: The profile of metabolic and psychological variables was tertile-specific in 62.4 and 68.3% of patients in the lowest and highest tertiles of PCS, respectively, while concordance was low in the mid-tertile (32.8%). Concordance was very high in the lowest (74.4%) and in the highest (75.5%) tertiles of MCS, and was fair in the mid-tertile (53.2%). The main correlates of PCS were obesity-specific and general psychological well-being, BMI, body uneasiness, binge eating, gender and psychiatric distress. Only hypertension and hyperglycemia qualified as correlates among the components of MS. The components of MS did not define MCS.

Conclusions: Psychological well-being is the most important correlate of HRQL in obesity, both in the physical and in the mental domains, whereas the features of MS correlate only to some extent with the physical domain of HRQL.

International Journal of Obesity (2008) 32, 185–191; doi:10.1038/sj.ijo.0803687; published online 24 July 2007

Keywords: metabolic syndrome; well-being; psychological status; health-related quality of life; observational study

Introduction

Obesity is a complex, multifactorial disease,¹ having a significant impact on morbidity and mortality, as well as on psychosocial well-being and quality of life.² These features make the measurement of health-related quality of life (HRQL) a key issue in obesity studies.² HRQL progressively deteriorates across the whole spectrum of obesity classes among obese individuals, both seeking and not

seeking medical treatment for weight loss.³ The physical domain of HRQL is greatly affected by physical symptoms and somatic diseases^{4,5} and pain is a leading symptom associated with poor HRQL.⁶ Unexpectedly, also psychological distress⁷ and binge eating⁸ contribute to poor HRQL in obesity not only in the mental domain, but also in the physical domains. Therefore, an extensive assessment of both somatic and psychological variables is needed for a comprehensive profile of HRQL in obese subjects.

The metabolic syndrome (MS) is a cluster of inter-related risk factors for atherosclerosis and cardiovascular disease.^{9,10} While acute cardiovascular events, such as myocardial infarction and stroke, have obvious consequences on the HRQL, the impact of MS on HRQL is less predictable and has not been clearly defined. Selected components of MS, such as abdominal obesity, hypertension and hyperglycemia,

Correspondence: Dr A Corsonello, Italian National Research Centres on Aging (INRCA), Contrada Muoio Piccolo, Viale della Resistenza, Pal. Alfa Scala H, I-87036 Rende (CS), Cosenza, Italy.

E-mail: andrea_corsonello@tin.it

Received 27 February 2007; revised 22 May 2007; accepted 25 May 2007; published online 24 July 2007

have been reported to impair HRQL in post-menopausal Ecuadorian women,¹¹ while insulin resistance was associated with poor HRQL in the physical domain, but not in the mental domain, in a large elderly population from the United Kingdom.¹²

The QUOVADIS program is an observational, multicentered study specifically aimed at measuring the burden of obesity and its complications on HRQL.¹³ The study also collected extensive information on the individual components of MS as well as several data on psychological distress.¹⁴ Thus, it represents a valuable opportunity to investigate the relationship between MS, psychological distress and HRQL in a large population sample of obese subjects seeking medical treatment. The aim of the present study was to verify the relative impact of the individual components of MS and of variables of psychological distress on both the physical and the mental domains of HRQL in obese outpatients.

Methods

Patients

The present report uses data from the QUOVADIS study, which has been described in detail elsewhere.^{13,14} Briefly, during the years 1999–2000, 25 Italian centers with a specific interest in clinical obesity research consecutively enrolled treatment-seeking obese patients (BMI > 30 kg/m²) into the study. The enrollment period was preceded by two meetings of the steering committee and by a general investigators' meeting to decide selection criteria and to agree on data collection and management of patients. All obese subjects seeking treatment were eligible for the study, provided that they were not on active treatment for obesity at the time of enrollment. All patients enrolled were in the age range between 20 and 65 years, and agreed to fill out a package of self-administered questionnaires.

Clinical data were collected by means of a structured questionnaire (Case Report Form) predefined at the time of the general investigators' meeting. Recorded data included information on civil and educational status, personal and family history of metabolic and cardiovascular diseases, and previous and current pharmacological treatment. To expedite handling of data, the study was totally web-based through an extranet system provided by CINECA (Casalechio di Reno, Italy), using the Advanced Multicenter Research methodology developed by CINECA as a result of an extensive cooperation between clinicians, statisticians and experts in information technology. The management of all the data was performed by standard web browsers, and the quality level was guaranteed by upfront quality controls (on the client side) and consistency checks (on the server side). On enrollment, all subjects signed an informed consent to take part in the study, which was approved by the Ethical Committee of the coordinating center (Bologna; reference no. Sper65/99/U; 9 July 1999) and by the Institutional Review Boards of individual local centers.

Definition of the outcomes

The main outcome of the study was HRQL, as measured by the Short Form 36 Health Survey (SF-36) questionnaire.^{15,16} SF-36 is a 36-item questionnaire measuring subjective health status in eight domains: physical functioning, role limitations (because of physical problems), bodily pain, general health, vitality, social functioning, role limitations (because of emotional problems) and mental health. The SF-36 questionnaire has been recently proved to maintain a robust internal structure also in obese outpatients.¹⁷ The standardized summary scores for physical (PCS) and mental (MCS) components were computed as previously reported,¹⁸ and separately used as outcome measures.

Measurements

Body weight was measured in light clothing and without shoes to the nearest 0.5 kg. Height was measured to the nearest 0.5 cm. BMI was calculated as weight (in kilograms) divided by squared height (in meters). Waist circumference was measured midway between the lower rib margin and the iliac crest. Diagnostic criteria for metabolic syndrome were those suggested by the US National Cholesterol Education Program—Adult Treatment Panel III (NCEP ATP-III): waist circumference > 102 cm for men or > 88 cm for women; plasma triglycerides \geq 150 mg/dl; high-density lipoprotein (HDL) cholesterol < 40 mg/dl for men and < 50 mg/dl for women; blood pressure \geq 130/85 mm Hg; fasting plasma glucose \geq 110 mg/dl.¹⁰ Subjects treated for diabetes and hypertension were classified as positive, independent of glucose and blood pressure. Other variables specifically considered in the analysis were age, gender and education.

All patients underwent a comprehensive assessment exploring psychological well-being, including the following:

1. Obesity-Related Well-Being (ORWELL) 97:¹⁹ an 18-item instrument exploring obesity-specific quality of life, and measuring intensity and subjective relevance of obesity-related physical and psychosocial distress. All items are computed in a single score.
2. Symptom Check List (SCL):²⁰ a 90-item instrument exploring psychiatric distress in 9 areas: somatization, obsessive-compulsive thoughts, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid conceiving and psychotic behavior. For the purpose of the present study, we used the global score (sum of the scores of the 90 items).
3. Psychological General Well-Being (PGWB) scale:²¹ a 22-item instrument exploring subjective well-being in six affective states (anxiety, depressed mood, positive well-being, self-control, general health and vitality) and a general index used in the present study.
4. Binge Eating Scale (BES):²² a 16-item tool measuring the severity of binge eating. It examines both behavioral manifestations (eating large amounts of food) and

feeling/cognition during a binge episode (loss of control, guilt and fear of being unable to stop eating).

5. Body Uneasiness Test (BUT):²³ a 71-item instrument specifically developed to evaluate concern for physical appearance, body image awareness and body parts that most severely contribute to body dissatisfaction. For the purpose of the present analysis, we used the scores of Part A, combined in a single global index (Global Severity Index).

All the scores obtained in the above tests were considered as potential correlates of HRQL and were tested in the analysis.

Statistical analyses

PCS and MCS scores were separately considered in the analysis. Patients were aggregated in tertiles of standardized scores, and the relationships between age, gender, education and MS risk factors with tertiles were initially evaluated by the χ^2 test for categorical variables and by the analysis of variance (ANOVA) one-way test for continuous variables. Two-tailed *P*-values less than 0.05 were considered statistically significant.

A discriminant analysis of metabolic and psychological profiles of tertiles was performed to identify tertile-specific patterns of study variables, that is, the most common combinations of metabolic and psychological variables within each tertile, and, then, to cross-tabulate individual patterns vs tertile-specific patterns. The higher the concordance between the actual tertile membership, resulting from tertile aggregation, and the predicted tertile membership, resulting from discriminant analysis, the greater the specificity of the metabolic and the psychological profiles of the corresponding tertile. We computed Wilk's λ coefficient to test the null hypothesis, that is, that groups did not differ in the means of the discriminating functions. Box's *M* coefficient was computed to assess the risk of misclassification by the discriminant function. We identified the items that were most useful for characterizing and discriminating tertiles on the basis of their standardized coefficients.²⁴ All analyses were performed using SPSS V10.0 (SPSS Inc., Chicago, IL, USA).

Results

During the study period, 1944 obese patients were enrolled, but complete data for the present study were available in 1822 cases. The crude relationship between tertiles of PCS and study variables is reported in Table 1 (upper panel). Patients in the lowest tertile had the highest prevalence of women and the lowest educational level. Severe obesity was more prevalent among patients in the lower tertile of PCS, as were high blood pressure, hyperglycemia, hypertriglyceridemia and abdominal adiposity. Psychological and behavioral

variables were more commonly altered among patients in the lowest PCS tertile. At variance, when tertiles of MCS were considered, only gender, psychological and behavioral variables were significantly associated with the outcome in univariate analysis (Table 1, lower panel).

The results of discriminant analyses are reported in Tables 2–4. The analyses identified two discriminant functions for both SF-36 components, and the former was highly significant (Table 2).

A good concordance between actual and predicted tertiles membership was observed in the lowest and the highest tertiles of PCS (Table 3, upper panel). Concordance between actual and predicted tertile membership was very high in the lowest and the highest tertile of MCS, and was fair in the mid-tertile (Table 3, lower panel). The highly significant Box's *M* coefficients indicated that the discriminant functions achieved a highly reliable definition of individual profiles of metabolic and psychological status. When psychological and behavioral variables were removed from the discriminant model, the classificatory capacity was significantly reduced, and only 48.8% of cases were correctly classified in the PCS analysis. The corresponding figure for MCS was 39.1%.

The contribution of individual study variables to the discriminant function 1 for PCS is reported in Table 4 (upper panel). ORWELL, PGWB and BMI were the main determinants of function 1 for the physical component, and also BUT, BES, gender and SCL contributed to define the clinical profile of the discriminant function. Among the individual components of MS, only blood pressure and plasma glucose qualified as significant correlates of PCS.

ORWELL and PGWB were the main determinants of discriminant function 1 for MCS, with a minor contribution of BUT, BES and gender (Table 4, lower panel), whereas the individual components of MS did not correlate significantly with MCS.

The results did not change significantly when we considered the contemporary presence of three or more components of MS instead of the single individual items. Indeed, the tertiles of PCS and MCS were correctly classified in 52.3 and 67.5% of cases, respectively. The presence of three or more components of MS was significantly correlated with PCS (standardized discriminant coefficient = 0.306), but not with MCS (standardized discriminant coefficient = 0.159).

Discussion

Our study shows that the presence of individual components of MS and poor HRQL parallel each other only to some extent. Although a higher prevalence of clinical variables constituting the MS characterized patients with a poorer HRQL in the physical domain, only BMI, blood pressure and fasting plasma glucose qualified as significant correlates of PCS in discriminant analysis, and none entered the discriminant analysis of MCS.

Table 1 Sociodemographic, clinical and psychological characteristics of patients divided according to the tertiles of the PCS (upper panel) or the MCS (lower panel)

	PCS tertiles			P
	< 39.5 N = 608	39.5–49.5 N = 607	> 49.5 N = 607	
Age, years	45.1 ± 11.0	44.2 ± 11.1	44.9 ± 10.8	0.300
Gender, females	524 (86.2)	478 (78.7)	418 (68.9)	0.001
Education				
Illiterate	12 (2.0)	10 (1.6)	9 (1.5)	0.001
Primary school	162 (26.6)	108 (17.8)	44 (7.2)	
Secondary school	226 (37.2)	195 (32.1)	182 (30.0)	
Commercial or vocational school	186 (30.6)	237 (39.0)	307 (50.6)	
Academic degree	22 (3.6)	57 (9.4)	65 (10.7)	
Body mass index, kg/m ²				
30–34.9	145 (23.8)	241 (39.7)	318 (52.4)	0.001
35–39.9	152 (25.0)	182 (30.0)	180 (29.7)	
40–44.9	176 (28.9)	117 (19.3)	67 (11.0)	
≥45	135 (22.2)	67 (11.0)	42 (6.9)	
Blood pressure ≥130/85 mm Hg	448 (73.7)	410 (67.5)	362 (59.6)	0.001
Waist circumference > 102 cm for men or > 88 cm for women	586 (96.4)	581 (95.7)	557 (91.8)	0.001
HDL cholesterol < 40 mg/dl for men or < 50 mg/dl for women	314 (51.6)	290 (47.8)	286 (47.1)	0.233
Triglycerides ≥ 150 mg/dl	214 (35.2)	173 (28.5)	173 (28.5)	0.014
Fasting plasma glucose ≥ 110 mg/dl	157 (25.8)	122 (20.1)	84 (13.8)	0.001
Metabolic syndrome (three or more criteria)	377 (62.0)	315 (51.9)	273 (45.0)	0.001
Obesity-related well-being	62.9 ± 29.8	48.8 ± 26.0	36.9 ± 24.1	0.001
Symptom checklist	90.0 ± 54.8	73.7 ± 50.6	67.0 ± 38	0.001
Psychological general well-being	60.9 ± 17.5	67.8 ± 18.1	77.4 ± 16.2	0.001
Binge eating scale	17.1 ± 9.9	14.6 ± 8.9	12.6 ± 8.9	0.001
Body uneasiness test	1.8 ± 1.0	1.5 ± 0.9	1.3 ± 0.9	0.001

	MCS tertiles			P
	< 38.0 N = 618	38.0–50.0 N = 589	> 50 N = 615	
Age, years ± s.d.	45.0 ± 10.7	44.7 ± 10.8	44.4 ± 11.3	0.575
Gender, females	524 (84.8)	461 (78.3)	435 (70.7)	0.001
Education				
Illiterate	11 (1.8)	9 (1.5)	11 (1.8)	0.293
Primary school	116 (18.8)	90 (15.3)	108 (17.6)	
Secondary school	203 (32.8)	189 (32.1)	211 (34.3)	
Commercial or vocational school	245 (39.6)	240 (40.7)	245 (39.8)	
Academic degree	43 (7.0)	61 (10.4)	40 (6.5)	
Body mass index, kg/m ²				
30–34.9	212 (34.3)	251 (42.6)	241 (39.2)	0.060
35–39.9	180 (29.1)	164 (27.8)	170 (27.6)	
40–44.9	140 (22.7)	106 (18.0)	114 (18.5)	
≥45	86 (13.9)	68 (11.5)	90 (14.6)	
Blood pressure ≥130/85 mm Hg	415 (67.2)	383 (65.0)	422 (68.6)	0.413
Waist circumference > 102 cm for men or > 88 cm for women	593 (96.0)	550 (93.4)	581 (94.5)	0.137
HDL cholesterol < 40 mg/dl for men or < 50 mg/dl for women	291 (47.1)	298 (50.6)	301 (48.9)	0.475
Triglycerides ≥ 150 mg/dl	183 (29.6)	184 (31.2)	193 (31.4)	0.757
Fasting plasma glucose ≥ 110 mg/dl	131 (21.2)	101 (17.1)	131 (21.3)	0.122
Metabolic syndrome (three or more criteria)	333 (53.9)	296 (50.3)	336 (54.6)	0.268
Obesity-related well-being	68.9 ± 28.2	46.3 ± 24.1	33.0 ± 20.9	0.001
Symptom checklist	112.8 ± 55.6	61.9 ± 36.7	55.0 ± 35.3	0.001
Psychological general well-being	51.5 ± 14.3	70.2 ± 11.9	84.5 ± 11.3	0.001
Binge eating scale	19.5 ± 9.8	14.4 ± 8.5	10.3 ± 7.4	0.001
Body uneasiness test	2.1 ± 1.1	1.5 ± 0.9	1.1 ± 0.8	0.001

Abbreviations: HDL, high-density lipoprotein; MCS, mental component summary; PCS, physical component summary. Data are number of cases (percentage) or mean ± s.d.

Table 2 Canonical discriminant functions

Function	Eigenvalue	% of variance	Wilks's λ	P
<i>Components of metabolic syndrome vs PCS</i>				
1	0.374	98.3	0.723	<0.001
2	0.007	1.7	0.994	0.613
<i>Components of metabolic syndrome vs MCS</i>				
1	1.241	98.7	0.439	<0.001
2	0.004	1.3	0.997	0.113

Abbreviations: MCS, mental component summary; PCS, physical component summary.

Table 3 Cross-tabulation of actual tertiles membership vs functional tertiles membership

Actual PCS tertiles membership	Functional PCS tertiles membership ^a		
	< 39.5	39.5–49.5	> 49.5
< 39.5	62.4	20.9	16.7
39.5–49.5	30.9	32.8	36.3
> 49.5	11.6	20.1	68.3
	Functional MCS tertiles membership ^b		
	< 38.0	38.0–50.0	> 50.0
< 38.0	75.5	21.9	2.6
38.0–50	20.0	53.2	26.7
> 50	2.8	22.7	74.4

Abbreviations: MCS, mental component summary; PCS, physical component summary. ^aData are in percentages. Box's $M = 1878.704$; $P < 0.001$; 54.7% of original grouped cases correctly classified. ^bData are in percentages. Box's $M = 1820.720$; $P < 0.001$; 67.8% of original grouped cases correctly classified.

The impact of BMI on physical domain of HRQL is well known.^{4,5,17,25} Yancy *et al.*⁴ showed that increasing BMI mainly affected the domains of physical activity and bodily pain, and, similarly, Doll *et al.*⁵ reported that obesity had a particularly negative impact on physical well-being. BMI can significantly affect the internal structure of the SF-36 items exploring physical activity by affecting two main components, one related to vigorous activities and complex movements, and another related to all other physical activities.¹⁷ This particular clustering of physical abilities with increasing BMI and poor HRQL in the physical domain may have important implications for the management of obese patients. Indeed, specific physical activity programs may be tailored to regain or maintain highly demanding physical functions or to approach wider defects of mild and moderate physical activities.²⁶ Furthermore, identifying patients with a greater impairment in mild and moderate physical activities could have some prognostic relevance, considering the importance of a regular physical exercise in the treatment of obesity and in weight loss maintenance.²⁷

Table 4 Variables significantly contributing to discriminant functions

	Function	
	1	2
<i>Individual components of metabolic syndrome and clinical/psychological variables vs PCS</i>		
Obesity-related well-being	0.667	—
Psychological general well-being	–0.624	—
Body mass index	0.515	—
Body uneasiness test	0.385	—
Binge eating scale	0.320	—
Gender	0.281	—
Symptom checklist	0.240	—
Blood pressure	0.188	—
Plasma glucose	0.180	—
Waist circumference	—	–0.424
Plasma triglycerides	—	0.372
Plasma HDL cholesterol	—	–0.211
Education	—	–0.199
Age	—	0.108
<i>Individual components of metabolic syndrome and clinical/psychological variables vs MCS</i>		
Psychological general well-being	0.964	—
Obesity-related well-being	–0.537	—
Body uneasiness test	–0.424	—
Binge eating scale	–0.376	—
Gender	–0.114	—
Education	—	–0.622
Body mass index	—	0.536
Symptom checklist	—	0.505
Plasma glucose	—	0.288
Waist circumference	—	0.233
Blood pressure	—	0.201
Plasma HDL cholesterol	—	–0.171
Plasma triglycerides	—	0.126
Age	—	0.101

Abbreviations: HDL, high-density lipoprotein; MCS, mental component summary; PCS, physical component summary.

Conflicting results have been reported on the association between high blood pressure and HRQL, a few studies reporting a low influence,^{28,29} others supporting a relevant effect on physical functioning.^{30–32} Furthermore, the sole awareness of hypertension could contribute to worsen HRQL, and such a negative effect may be at least partially ascribed to the prescription of antihypertensive drugs.²⁸ On the contrary, the association between diabetes and poor HRQL is well known, with macrovascular complications, especially coronary heart disease, and non-vascular diseases as the strongest and the most commonly found predictors.³³ More recently, it has been demonstrated that also the early stage of the disease, that is impaired glucose tolerance, is associated with a reduced ability to perform physical activities.³⁴ Finally, diabetes has a greater impact on the scales of SF-36 measuring physical health as against the mental components, and the presence of coexisting hypertension in subjects with diabetes resulted in a further significant decrease of HRQL, with an additive effect.³⁵

The most surprising finding of our study is the highly relevant role of measures of psychological well-being in

explaining PCS. Indeed, ORWELL and PGWB scores were the main correlate of PCS, and also BUT, BES and SCL contributed to define the discriminant function. Previous findings suggest that psychological disturbances can contribute significantly to poorly perceived health status. The presence of depressed mood and/or anxiety, which are the most common psychological disturbances observed in clinical samples of obese patients,³⁶ can increase subjective distress induced by disease-related physical symptoms and functional impairment.¹⁹ It is worth noting that also binge eating behavior, as estimated by BES, contributes to define the clinical profile of obese patients with poor HRQL in the physical domain. Binge eating disorder is known to worsen HRQL measured by disease-specific questionnaires,^{19,37} and it is possible that the association we observed between binge eating and PCS can be partly mediated by the higher BMI.³⁸

Our results are partly in contrast with a previous survey in a small sample of obese patients undergoing bariatric surgery, where mental disorders appeared to affect psychosocial, but not physical, domains of SF-36.³⁹ However, the different sample size or type of referral could also account for this apparent discrepancy. Furthermore, the use of specific instruments for measuring psychological distress make our results more reliable than those obtained using only the formal diagnosis of mental disorders in previous studies. In general, these findings confirm how difficult it is to disentangle the effects of obesity on physical function from those on mental function in treatment-seeking patients,¹⁷ reinforcing the need for a comprehensive approach.

Only gender and measures of psychological well-being qualified as significant correlates of MCS. This association could be related to the higher prevalence of psychological disorders among women,^{19,40,41} or to a greater cultural drive for thinness of women in Western societies,⁴² and confirms previous reports in clinic-based samples,^{2,19,41,43} among patients with chronic disease⁴⁴ and in population studies.⁴⁵ Additionally, the lack of association between BMI and MCS tertiles suggests that the perception of the disease, more than its severity, could be important in determining psychological distress in obese outpatients.

This study has limitations too. First, waist circumference did not contribute to any discriminant function, in disagreement with recent findings in post-menopausal women.¹¹ Possibly, the high prevalence of abdominal adiposity in our study population did not allow a more precise evaluation of the relationship between abdominal adiposity and HRQL, and this issue deserves further investigation. Second, the results were obtained in a large outpatient population of obese individuals seeking medical treatment, and their external validity in the general population of obese patients and in different settings needs to be determined. Finally, the cross-sectional design did not allow us to investigate the directionality of the correlation between study variables and HRQL.

In conclusion, psychological well-being is the most important correlate of HRQL in obesity, both in the physical

and in the mental domains, whereas the features of MS correlate only to some extent. Since HRQL is a primary treatment outcome in chronic diseases,⁴⁶ psychiatric and psychological support becomes mandatory in weight management programs. Only a multidisciplinary approach addressing both mental and somatic disorders is likely to reduce the burden of obesity in individual patients.

Acknowledgements

The QUOVADIS study is supported by an unrestricted grant from BRACCO Imaging Spa, Milan, Italy (Grant OBES002-QUOVADIS-99). A complete list of the QUOVADIS investigators has been previously published.¹⁴

References

- 1 National Institutes of Health. *The Practical Guide: Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: Publication No. 00-4084*. NIH: Bethesda, MD, 2000.
- 2 Kolotkin RL, Meter K, Williams GR. Quality of life and obesity. *Obes Rev* 2001; 2: 219–229.
- 3 Fontaine KR, Bartlett SJ, Barofsky I. Health-related quality of life among obese persons seeking and not currently seeking treatment. *Int J Eat Disord* 2000; 27: 101–105.
- 4 Yancy WS, Olsen MK, Westman EC, Bosworth HB, Edelman B. Relationship between obesity and health-related quality of life in men. *Obes Res* 2002; 10: 1057–1064.
- 5 Doll HA, Petersen SEK, Stewart-Brown SL. Obesity and physical and emotional well-being: associations between body mass index, chronic illness, and the physical and mental components of the SF-36 Questionnaire. *Obes Res* 2000; 8: 160–170.
- 6 Barofsky I, Fontaine KR, Cheskin LJ. Pain in the obese: impact on health-related-quality-of-life. *Ann Behav Med* 1998; 19: 408–410.
- 7 Marchesini G, Bellini M, Natale S, Belsito C, Isacco S, Nuccitelli C *et al*. Psychiatric distress and health-related quality of life in obesity. *Diabetes Nutr Metab* 2003; 16: 145–154.
- 8 Marchesini G, Solaroli E, Baraldi L, Natale S, Migliorini S, Visani F *et al*. Health-related quality of life in obesity: the role of eating behaviour. *Diabetes Nutr Metab* 2000; 13: 156–164.
- 9 Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA *et al*. Diagnosis and management of the metabolic syndrome. An American Heart Association/National Heart, Lung, and Blood Institute scientific statement. *Circulation* 2005; 112: 2735–2752.
- 10 National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. *Circulation* 2002; 106: 3413–3421.
- 11 Chedraui P, Hidalgo L, Chavez D, Morocho M, Alvarado M, Huc A. Quality of life among post-menopausal Ecuadorian women participating in a metabolic syndrome screening program. *Maturitas* 2007; 56: 45–53.
- 12 Schlotz W, Ambery P, Syddall HE, Crozier SR, Sayer AA, Cooper C *et al*. Specific association of insulin resistance with impaired health-related quality of life in the Hertfordshire Cohort Study. *Qual Life Res* 2007; 16: 429–436.
- 13 Melchionda N, Marchesini G, Apolone G, Cuzzolaro M, Mannucci E, Grossi E, The QUOVADIS Study Group. The

- QUOVADIS study: features of obese Italian patients seeking treatment at specialist centers. *Diabetes Nutr Metab* 2003; **16**: 115–124.
- 14 Marchesini G, Melchionda N, Apolone G, Cuzzolaro M, Mannucci E, Corica F *et al*. The metabolic syndrome in treatment-seeking obese persons. *Metabolism* 2004; **53**: 435–440.
- 15 Ware Jr JE, Snow KK, Kosinski M, Gandek B. *SF-36 Health Survey: Manual and Interpretation Guide*. The Health Institute of New England Medical Center: Boston, MA, 1993.
- 16 Ware JE, Sherbourne CD. The MOS 36-item Short-Form Health Survey (SF-36): I. Conceptual framework and item selection. *Med Care* 1992; **30**: 473–483.
- 17 Corica F, Corsonello A, Apolone G, Lucchetti M, Melchionda N, Marchesini G. Construct validity of the Short Form-36 Health Survey and its relationship with BMI in obese outpatients. *Obesity* 2006; **14**: 1429–1437.
- 18 Ware Jr JE, Gandek B, Kosinski M, Aaronson NK, Apolone G, Brazier J *et al*. The equivalence of SF-36 summary health scores estimated using standard and country-specific algorithms in 10 countries: results from the IQOLA Project. International Quality of Life Assessment. *J Clin Epidemiol* 1998; **51**: 1167–1170.
- 19 Mannucci E, Ricca V, Barciulli E, Di Bernardo M, Travaglini R, Cabras PL *et al*. Quality of life and overweight: the obesity related well-being (Orwell 97) questionnaire. *Addict Behav* 1999; **24**: 345–357.
- 20 Derogatis LR, Rickels K, Rock AF. The SCL-90 and the MMPI: a step in the validation of a new self-report scale. *Br J Psychiatry* 1976; **128**: 280–289.
- 21 Dupuy HJ. The psychological general well-being (PGWB) inventory. In: Wenger NK (ed). *Assessment of Quality of Life in Clinical Trials of Cardiovascular Therapies*. Le Jacq Publications: New York, 1984. pp 170–183.
- 22 Gormally J, Block S, Daston S, Rardin D. The assessment of binge eating severity among obese persons. *Addict Behav* 1982; **7**: 47–55.
- 23 Cuzzolaro M, Vetrone G, Marano G, Garfinkel PE. The Body Uneasiness Test (BUT): development and validation of a new body image assessment scale. *Eat Weight Disord* 2006; **11**: 1–13.
- 24 Norusis MJ. Predicting cure and credit: discriminant analysis. In: SPSS/PC+ Advanced Statistics V2.0. SPSS Inc.: Chicago, IL, 1988. pp B1–B39.
- 25 Sach TH, Barton GR, Doherty M, Muir KR, Jenkinson C, Avery AJ. The relationship between body mass index and health-related quality of life: comparing the EQ-5D, EuroQol VAS and SF-6D. *Int J Obes (Lond)* 2007; **31**: 189–196.
- 26 Blair SN, LaMonte MJ, Nichaman MZ. The evolution of physical activity recommendations: how much is enough? *Am J Clin Nutr* 2004; **79**: 913–920.
- 27 Hill JO, Wyatt HR. Role of physical activity in preventing and treating obesity. *J Appl Physiol* 2005; **99**: 765–770.
- 28 Banegas JR, Guallar-Castillon P, Rodriguez-Artalejo F, Graciani A, Lopez-Garcia E, Ruilope LM. Association between awareness, treatment, and control of hypertension, and quality of life among older adults in Spain. *Am J Hypertens* 2006; **19**: 686–693.
- 29 Alonso J, Ferrer M, Gandek B, Ware Jr JE, Aaronson NK, Mosconi P *et al*. Health-related quality of life associated with chronic conditions in eight countries: results from the International Quality of Life Assessment (IQOLA) Project. *Qual Life Res* 2004; **13**: 283–298.
- 30 Lalonde L, O'Connor A, Joseph L, Grover SA, Canadian Collaborative Cardiac Assessment Group. Health-related quality of life in cardiac patients with dyslipidemia and hypertension. *Qual Life Res* 2004; **13**: 793–804.
- 31 Bardage C, Isacson D. Hypertension and health-related quality of life: an epidemiological study in Sweden. *J Clin Epidemiol* 2001; **54**: 172–181.
- 32 Lawrence WF, Fryback DG, Martin PA, Klein R, Klein BEK. Health status and hypertension: a population-based study. *J Clin Epidemiol* 1996; **49**: 1239–1245.
- 33 Wandell PE. Quality of life of patients with diabetes mellitus. An overview of research in primary health care in the Nordic countries. *Scand J Prim Health Care* 2005; **23**: 68–74.
- 34 Tapp RJ, Dunstan DW, Phillips P, Tonkin A, Zimmet PZ, Shaw JE. Association between impaired glucose metabolism and quality of life: results from the Australian diabetes obesity and lifestyle study. *Diabetes Res Clin Pract* 2006; **74**: 154–161.
- 35 Wee HL, Cheung YB, Li SC, Fong KY, Thumboo J. The impact of diabetes mellitus and other chronic medical conditions on health-related Quality of Life: is the whole greater than the sum of its parts? *Health Qual Life Outcomes* 2005; **3**: 2.
- 36 Ricca V, Mannucci E, Moretti S, Di Bernardo M, Zucchi T, Cabras PL *et al*. Screening for binge eating disorder in obese outpatients. *Compr Psychiatry* 2000; **41**: 111–115.
- 37 Rieger E, Wilfley DE, Stein RI, Marino V, Crow SJ. A comparison of quality of life in obese individuals with and without binge eating disorder. *Int J Eat Disord* 2005; **37**: 234–240.
- 38 Marcus MD. Introduction—binge eating: clinical and research directions. *Addict Behav* 1995; **20**: 691–693.
- 39 Callegari A, Michelini I, Sguazzin C, Catona A, Klersy C. Efficacy of the SF-36 questionnaire in identifying obese patients with psychological discomfort. *Obes Surg* 2005; **15**: 254–260.
- 40 Weissman MM, Klerman GL. Sex differences and the epidemiology of depression. *Arch Gen Psychiatry* 1977; **34**: 98–111.
- 41 Sullivan M, Karlsson J, Sjostrom L, Backman L, Bengtsson C, Bouchard C *et al*. Swedish obese subjects (SOS)—an intervention study of obesity. Baseline evaluation of health and psychosocial functioning in the first 1743 subjects examined. *Int J Obes Relat Metab Disord* 1993; **17**: 503–512.
- 42 Matz PE, Foster GD, Faith MS, Wadden TA. Correlates of body image dissatisfaction among overweight women seeking weight loss. *J Consult Clin Psychol* 2002; **70**: 1040–1044.
- 43 White MA, O'Neil PM, Kolotkin RL, Byrne TK. Gender, race, and obesity-related quality of life at extreme levels of obesity. *Obes Res* 2004; **12**: 949–955.
- 44 Katz DA, McHorney CA, Atkinson RL. Impact of obesity on health-related quality of life in patients with chronic illness. *J Gen Intern Med* 2000; **15**: 789–796.
- 45 Burns CM, Tijhuis MA, Seidell JC. The relationship between quality of life and perceived body weight and dieting history in Dutch men and women. *Int J Obes Relat Metab Disord* 2001; **25**: 1386–1392.
- 46 Apolone G, De Carli G, Brunetti M, Garattini S. Health-related quality of life (HR-QOL) and regulatory issues. An assessment of the European Agency for the Evaluation of Medicinal Products (EMA) recommendations on the use of HR-QOL measures in drug approval. *Pharmacoeconomics* 2001; **19**: 187–195.