Correlates of quality of life of pre-obese and obese patients: a pharmacy-based cross-sectional survey

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Abstract

Background: The correlates of quality of life (QOL), as measured by the OSQOL questionnaire were investigated in a convenience sample of overweight patients recruited in pharmacies.

Methods: A convenience sample of patients with a Body Mass Index \( \geq 28 \text{ kg/m}^2 \) were recruited in community-based pharmacies. Baseline characteristics and QOL dimensions (1-Physical state, 2-Vitality-desire to do things, 3-Relations with others, 4-Psychological state) were reported in self-completed questionnaires from which the risk of obtaining a low QOL was assessed for each dimension.

Results: QOL was inadequate for all dimensions in the 494 patients included in the study (median age = 61, 48% women, 21% professional persons/top executives). Older pre-obese and obese patients were more likely to report impaired physical functioning (OR = 2.02, 95%CI = [1.10-3.70]), but were less severely affected socially (OR = 0.32, 95%CI = [0.15-0.69]). Pre-obese and obese professional persons and top executives showed better physical capabilities (OR = 0.35, 95%CI = [0.15-0.81]) and increased vitality (OR = 0.47, 95%CI = [0.23-0.95]). Overall, men's psychological state was better than females' (OR = 0.46, 95%CI = [0.25-0.82]). A body-mass index \( \geq 35 \text{ kg/m}^2 \) was significantly associated with poorer QOL scores on physical, relational and psychological dimensions.

Conclusion: Our data highlighted the influence of the severity of excess weight, gender, age and socioeconomic status on QOL. These factors should be taken into account when interpreting QOL in pre-obese and obese persons.

Background

Studies have suggested an increased prevalence of obesity throughout the world over the past years [1], particularly in Western countries [2-4] including France [5,6]. The consequences of obesity and more generally excess weight on mortality and morbidity [7,8] notably cardiovascular...
Quality of life (QOL) gave rise to an ongoing interest these past years. QOL is a major tool to estimate patients' perceived burden of diseases, for research purposes as well as for medical practice [11]. It has become a common end-point in clinical trials, along with clinical outcomes. In the absence of perspective of recovery, QOL remains a useful criterion in the management of chronic diseases [11].

Obesity may also have detrimental consequences on patients' health-related QOL, particularly their physical functioning [12-14]. In contrast, the impact of obesity on mental components of QOL yielded more controversial conclusions [12-15].

Increasing our existing awareness of factors influencing QOL in this population may be helpful in terms of public health. Indeed the potential identification of sub-groups of patients with poor QOL may be a preliminary step before implementing preventive action for improved management of overweight and obesity. Hence, the impact of personal characteristics, body mass index (BMI), disease-related factors and health habits of pre-obese and obese persons on different QOL dimensions should be better explored. In addition, it is unclear to which extent the relationships between BMI and QOL scores are influenced by other factors.

The aim of the present pharmacy-based study was thus to identify the correlates of a poor quality of life, based on different dimensions, in a population of overweight persons, using a specific QOL questionnaire (OSQOL). We also investigated whether the relationship between OSQOL scores and BMI varied according to patients' other characteristics.

Methods
Study design and population
A survey was conducted in 2005 in 76 French community-based pharmacies of the Rhone-Alpes Region. A convenience sample of patients with probable excess weight visiting the study pharmacies was consecutively recruited. Patients were asked to participate in the study. A prerequisite was to be a regular customer of the pharmacy (at least 12 months of dispensed drugs recorded in the computerized database of the pharmacy). Once the objectives of the study had been explained, patients accepting to participate were asked to complete a self-completed questionnaire. Whenever possible, pharmacies were asked to recruit an equal number of patients over and under 60, to ensure sufficient age variation. The study was approved by the French National Regulatory Body (Commission Nationale Informatique et Libertés -CNIL).

Data collected
Data were obtained from self-completed questionnaires. Self-completed questionnaires consisted of data on baseline characteristics, including socio-professional status: top executives/professional persons (upper-social class), workmen/employees, teachers/artisans/shopkeepers and unemployed/housewives-husbands. Retired patients were asked to report their last professional position. Patients were also asked to state their previous efforts to change their lifestyle (none, minor, substantial, major change) with physical exercise and diet, with the aim of improving their health. Patients reported their height and weight in questionnaires so that their BMI could be computed when data were analysed.

QOL was measured using the Obesity Specific Quality Of Life (OSQOL) questionnaire [16]. This disease-specific questionnaire includes 11 questions grouped into four dimensions: 1- "Physical state" (7 questions), 2- "Vitality, desire to do things" (2 questions), 3- "Relations with other people" (1 question), 4- "Psychological state" (1 question). Each question offered five possible answers (‘absolutely false’, ‘fairly false’, ‘neither true nor false’, ‘fairly true’ and ‘absolutely true’), classified according to reduced QOL. For dimensions 1 and 2, a quantitative score was calculated (0% minimal QOL, 100% maximal QOL) [16].

Co-morbid diagnoses were identified from drug therapies dispensed over the past 12 months and classified according to the Anatomical Therapeutic and Chemical Classification. Co-morbid diagnoses included angina pectoris (C01DA, C07 and C08), diabetes mellitus (A10), hypertension (C02, C03, C07, C08 and C09), heart failure (C01AA, C01B, C03, C07 and C09), dyslipidemia (C10), rheumatic conditions (M01), dysthyroidism (H03), gastrointestinal disease (A02) and asthma/COPD (R03). In case of isolated unspecific therapy, pharmacists were oriented by patient's medical history.

Analyses
Analyses were conducted only on patients with BMI ≥ 28 kg/m² and who had completed all dimensions of their OSQOL questionnaire.

The objective was to compare patients with a poor QOL to the rest of the survey population for each QOL dimension, according to personal and medical characteristics and reported efforts to change lifestyle habits.

Due to skewed distributions, quantitative scores for dimensions 1 and 2 were dichotomized according to their
and relational dimensions was also significant: a notice-
Table 2). The influence of excess weight on psychological
patients or other were commonly reported (Dimension 1,
reported in Table 2. Physical limitations perceived by
Detailed answers to the OSQOL questionnaire are
2- Quality of life scores
as BMI was lower than 28 kg/m^2 (n = 25) or not docu-
mented before analyses (n = 1). Among the 551 remaining patients, 494
completed all OSQOL dimensions. The 57 patients
excluded from the analyses were older (p = 0.02) but
showed no difference from the included population with
regards to BMI (p = 0.50), gender (p = 0.98) and socio-
professional status (p = 0.90).

The median age of the 494 patients was 61 years old
(range 27-86, 25th-75th percentiles: 54-72), almost half of
them were females and the BMI varied from 28 to 51 kg/
m^2 (median value: 32 kg/m^2). About one in five patients
was a top executive or a professional person (Table 1). The
median number of co-morbid diagnoses was three (range
0-7) with the most common co-morbid conditions being
hypertension (72.7%), diabetes (36.4%) and dyslipi-
demia (51.8%). Few patients reported having made sub-
stantial or major changes in dietary habits and physical
activity with the aim of improving their health status
(Table 1).

2- Quality of life scores
Detailed answers to the OSQOL questionnaire are
reported in Table 2. Physical limitations perceived by
patients or other were commonly reported (Dimension 1,
Table 2). The influence of excess weight on psychological
and relational dimensions was also significant: a noticea-
ble proportion of patients reported that they felt ill-at-ease
due to excess weight or obesity (22.3% "absolutely" or
"fairly true"), or attacked when people talked about their
weight (19.6% "absolutely" or "fairly true"). Median values
of quantitative scores for dimensions 1 and 2 were
52.5% (25th-75th percentiles: 39.4%-73.0%) and 57.9% (25th-75th percentiles: 41.0%-81.6%), respectively.

3- Univariate correlates
The study showed that patients' QOL scores significantly
deteriorated with increasing BMI (notably in case of
severe obesity), even though the statistical association was
less marked for Vitality scores (Table 3). Age had no sig-
nificant influence on dimensions 1, 2 and 4. In contrast,
pre-obese and obese patients under 60 were more affected
in their relations with others. On the whole, women
exhibited a worse QOL level than men for physical, rela-
tional and psychological dimensions. Significant differ-
ences were observed according to socio-economic status
for physical state, vitality and psychological state, with top
executives and professional persons achieving better
results for these dimensions compared to other socio-eco-
nomic categories. Differences were less marked for dimen-
sion 3 (Table 3).

Patients who reported previous substantial efforts in exer-
cising to improve health had significantly better QOL
results for dimensions 1 and 2. In contrast, reported
efforts on diet had a limited impact. An association was
observed between alcohol consumption and dimensions
3 and 4 and smoking was found to have a significant effect
on dimensions 2 and 3.

Finally, the number of co-morbid diagnoses had a signif-
icanct impact on physical functioning and vitality dimen-
sions, notably beyond two associated diagnoses (Table 3).
When the category "3 or more co-morbid diagnoses" was
detailed into "3" and "4 or more", these conclusions were
not affected (data not shown).

Statistical relationships between OSQOL scores and BMI according
to other factors
The relationships between BMI and the different OSQOL
dimensions according to the other factors are detailed in
Table 4. Interactions tested between OSQOL scores, BMI
and the different co-factors did not reach signifi-
cance threshold (data not shown), except for vitality score
and BMI according to patient's previous efforts to change
dietary habits (p = 0.02). However, this interaction is dif-
ficult to interpret in practical terms (Table 4).

4- Multivariate models
A BMI of 35 kg/m^2 and over was a major correlate of poor
QOL for dimensions 1, 3 and 4. Older patients were more
likely to experience poorer physical functioning, com-
pared to those under 60. By contrast, these patients
showed better results for dimension 3 (Relations with others). Men had a lower risk of impaired psychological well-being (dimension 4). No significant impact on QOL was observed in multivariate analyses for current smoking, alcohol drinking or co-morbid diagnoses (Table 5). Compared with workmen and employees, top executives and professional persons had a significantly better QOL for dimensions 1 and 2.

**Discussion**

This is one of the few surveys conducted in pharmacies and investigating the quality of life (QOL) of pre-obese and obese patients. Our data suggest that a BMI of 35 kg/m² or over had a significant impact on three domains of the OSQOL questionnaire. A minority of patients reported previous efforts to change substantially their habits regarding diet and/or physical exercise. It was observed that older overweight patients exhibited poorer physical functioning than younger patients, whereas their psychological well-being was better. Women's psychological status was more affected than men's, and overall, a better QOL was observed in persons coming from a higher social class.

The lower physical functioning observed with elevated BMI confirms conclusions of previous surveys [12-15]. This result may be partly explained by the osteo-articular and respiratory consequences of excess weight [15].

### Table 1: Patient characteristics (n = 494)

| Age (years) | n  | %   |
|------------|----|-----|
| < 60       | 217| 43.9|
| 60 - 69.9  | 123| 24.9|
| ≥ 70       | 154| 31.2|

| Gender     | n  | %   |
|------------|----|-----|
| Males      | 259| 52.4|
| Females    | 235| 47.6|

| BMI (kg/m²) | n  | %   |
|-------------|----|-----|
| 28-29.9     | 154| 31.2|
| 30 - 34.9   | 186| 37.6|
| ≥ 35        | 154| 31.2|

| Socio-economic status | n  | %   |
|-----------------------|----|-----|
| Workmen - employees   | 213| 49.1|
| Top executives - Professional persons | 92 | 21.2|
| Teachers - artisans shopkeepers | 63 | 14.5|
| Unemployed - Housewives/husbands | 66 | 15.2|

| Current smoker | n  | %   |
|---------------|----|-----|
| No            | 415| 87.7|
| Yes           | 58 | 12.3|

| Alcohol | n  | %   |
|---------|----|-----|
| None    | 269| 55.3|
| 1-2 glasses per day | 134 | 27.6|
| ≥ 3 glasses per day | 83  | 17.1|

| Number of co-morbid diagnoses | n  | %   |
|-------------------------------|----|-----|
| None or one                   | 78 | 15.8|
| Two                           | 127| 25.7|
| Three or more                 | 289| 58.5|

| Previous efforts for substantial changes in dietary habits | n  | %   |
|-----------------------------------------------------------|----|-----|
| Yes                                                       | 180| 37.7|
| No                                                        | 298| 62.3|

| Previous efforts for substantial changes in physical activities | n  | %   |
|----------------------------------------------------------------|----|-----|
| Yes                                                            | 79 | 17.0|
| No                                                             | 386| 83.0|

Counts that do not add to 494 are due to missing data.
tional or psychological consequences should not be over-
looked either [17] as common mental distress among
obese patients has been observed [18]. Here again, the
QOL linked to relational and psychological dimensions
significantly decreased with increasing BMI, although less
markedly (Table 5). The limited efforts reported by
patients to change dietary habits and more specifically to
increase exercising are consistent with other authors’ con-
clusions [19].

Patients’ QOL significantly decreased with severe obesity
(BMI ≥ 35 kg/m²) for 3 dimensions of the OSQOL ques-
tionnaire (Table 5). Moreover, physical status (dimension
1) was more specifically affected than other dimensions.
This finding is consistent with other authors’ conclusions
[12-14]. However, a significant effect was also retrieved
for the mental dimensions (Table 5). Additionally, our
findings suggest that the relationships identified between
BMI and the different OSQOL dimensions did not sub-
stantially vary according to the other factors (Table 4). The
only significant interaction identified could not be easily
interpreted in concrete terms. Nonetheless, these results
require confirmation in future studies.

Patients aged 70 and over presented an increased risk of a
worse physical state compared to younger pre-obese and
obese patients in multivariate analyses (Table 5). This
result may be due to the natural consequences of ageing
on physical agility and mobility, irrespective of over-
weight severity. Our data suggest that older patients are
less affected in their relationships by their excess weight.
Physical appearance might play a more important role in
the social life among younger patients. Indeed, excess
weight may be a barrier to developing social activities in
younger patients. In contrast, older overweight patients
may have become accustomed to their appearance mean-
ing that the impact on their social life is much less impor-
tant. However, these hypotheses require confirmation
and, more generally a better understanding of the effects
of age on relationship domain and other QOL dimen-
sions is desirable.

Overall, pre-obese and obese women had a lower QOL
than men, notably for relational and psychological
dimensions, which is consistent with conclusions of pre-
vious studies [13,14,20] with differences being significant
only for psychological state in our data (Table 5). The
importance of physical appearance for women may
explain these results and could account for their lower
psychological well-being. In a previous study, obese
women ranked their dissatisfaction with physical appear-
ance higher than men [17].

The QOL of professional persons and top executives
tended to be better compared to the rest of the study pop-
ulation, although no significant difference was found in
the multivariate analysis for relational and psychological
dimensions (Table 5). The beneficial impact on QOL of a

| Table 2: Patients’ quality of life (OSQOL questionnaire, n = 494) |
|---------------------------------|----------------|----------------|----------------|----------------|
| Dimension 1: Physical state     | Absolutely true % | Fairly true % | Neither true, nor false % | Fairly false % | Absolutely false % |
| 1- I have trouble squatting     | 30.2            | 32.2           | 9.9             | 10.7           | 17.0             |
| 2- I cannot sit down in a very low armchair | 21.7 | 26.3 | 11.3 | 11.9 | 28.7 |
| 3- I walk as little as possible | 9.3             | 14.2           | 10.9            | 25.9           | 39.7             |
| 4- I have to stop to catch my breath after walking several hundred meters | 11.7 | 14.4 | 9.5 | 22.3 | 42.1 |
| 5- I have trouble climbing stairs | 16.2          | 30.4           | 9.3             | 21.0           | 23.1             |
| 6- People say I am not very athletic | 32.6          | 25.9           | 18.4            | 9.7            | 13.4             |
| 7- People often say that I am not agile | 12.7          | 21.9           | 24.9            | 20.8           | 19.6             |
| Dimension 2: Vitality desire to do things |
| 8- I often lack energy | 8.9 | 29.1 | 14.8 | 22.9 | 24.3 |
| 9- I do not move around very much | 9.7 | 21.3 | 12.7 | 25.9 | 30.4 |
| Dimension 3: Relations with others |
| 10- I feel I am being attacked when people talk about my weight | 7.3 | 12.3 | 17.2 | 21.5 | 41.7 |
| Dimension 4: Psychological state |
| 11- I feel very ill-at-ease | 7.7 | 14.6 | 16.4 | 18.8 | 42.5 |
Table 3: OSQOL Univariate results

| Variables                                      | Dimension 1: Physical state | Dimension 2: Vitality desire to do things | Dimension 3: Relations with others * | Dimension 4: Psychological state ** |
|------------------------------------------------|-----------------------------|------------------------------------------|--------------------------------------|-------------------------------------|
| Variables                                      | n                           | % patients ≤ Q25% score (1) p             | % patients ≤ Q25% score (1) p         | % 'Fairly true' or 'absolutely true' | % 'Fairly true' or 'absolutely true' p |
| Overall                                        | 494                         | 25.1                                     | 27.9                                 | 19.6                                | 22.3                               |
| Age (years)                                    |                             |                                          |                                      |                                      |                                    |
| < 60                                           | 217                         | 21.7                                     | 29.0                                 | 26.3                                | 26.7                               |
| 60 - 69.9                                      | 123                         | 30.9                                     | 26.0                                 | 17.9                                | 18.7                               |
| ≥ 70                                           | 154                         | 25.3                                     | 27.9                                 | 11.7                                | 18.8                               |
| Gender                                         |                             |                                          |                                      |                                      |                                    |
| Males                                          | 259                         | 20.1                                     | 25.5                                 | 14.3                                | 13.9                               |
| Females                                        | 235                         | 30.6                                     | 30.6                                 | 25.5                                | 31.5                               |
| Body Mass Index (kg/m²)                        |                             | <.0001                                   | 0.028                                | <.0001                              | <.0001                              |
| 28-29.9                                        | 154                         | 12.3                                     | 22.7                                 | 13.6                                | 13.0                               |
| 30 - 34.9                                      | 186                         | 21.5                                     | 25.8                                 | 15.1                                | 19.3                               |
| ≥ 35                                           | 154                         | 42.2                                     | 35.7                                 | 31.2                                | 35.1                               |
| Socio-economic status                          |                             |                                          |                                      |                                      |                                    |
| Workmen - employees                            | 213                         | 27.2                                     | 31.9                                 | 20.2                                | 25.3                               |
| Top executives - Professional persons           | 92                          | 9.8                                      | 15.2                                 | 13.0                                | 8.7                                |
| Teachers - artisans - shopkeeper               | 63                          | 27.0                                     | 28.6                                 | 15.9                                | 17.5                               |
| Unemployed/housewives-husbands                 | 66                          | 33.3                                     | 28.8                                 | 28.8                                | 31.8                               |
| Current smoking                                |                             |                                          |                                      |                                      |                                    |
| No                                             | 415                         | 24.6                                     | 26.7                                 | 17.8                                | 22.2                               |
| Yes                                            | 58                          | 27.6                                     | 39.7                                 | 29.3                                | 27.6                               |
| Alcohol                                        |                             |                                          |                                      |                                      |                                    |
| None                                           | 269                         | 28.2                                     | 26.8                                 | 24.2                                | 27.1                               |
| 1-2 glasses per day                            | 134                         | 21.6                                     | 29.1                                 | 14.2                                | 18.7                               |
| ≥ 3 glasses per day                            | 83                          | 21.7                                     | 30.1                                 | 13.2                                | 10.8                               |
| Number of associated co-morbid diagnoses       |                             |                                          |                                      |                                      |                                    |
| None or one                                     | 78                          | 17.9                                     | 24.4                                 | 16.7                                | 21.8                               |
| Two                                            | 127                         | 18.9                                     | 19.7                                 | 17.3                                | 21.3                               |
| Three or more                                  | 289                         | 29.8                                     | 32.5                                 | 21.4                                | 22.8                               |
| Previous efforts for substantial changes       |                             |                                          |                                      |                                      |                                    |
| in dietary habits                              |                             |                                          |                                      |                                      |                                    |
| No                                             | 298                         | 26.2                                     | 30.5                                 | 18.1                                | 22.5                               |
| Yes                                            | 180                         | 23.3                                     | 23.9                                 | 22.8                                | 22.2                               |
| Previous efforts for substantial changes in    |                             |                                          |                                      |                                      |                                    |
| physical activities                            |                             |                                          |                                      |                                      |                                    |
| No                                             | 386                         | 26.9                                     | 30.8                                 | 19.7                                | 23.1                               |
| Yes                                            | 79                          | 15.2                                     | 17.7                                 | 24.0                                | 22.8                               |

(1) Q25% = first quartile- A score ≤ Q25% indicates a poor QOL, and a high QOL otherwise. Chi-squared tests were used for all statistical comparisons.
Table 4: Relationship between OSQOL dimensions and BMI according to the other variables

|                      | Dimension 1 | Dimension 2 | Dimension 3 | Dimension 4 |
|----------------------|-------------|-------------|-------------|-------------|
|                      | Physical state | Vitality desire to do things | Relations with others (1) | Psychological state (2) |
|                      | n ≤ Q25% score (3) | p | % ≤ Q25% score (3) | p | % 'Fairly true' or 'absolutely true' | p | % 'Fairly true' or 'absolutely true' | p |
| **BMI (kg/m^2) OVERALL** |             |             |             |             |
| 28-29.9              | 154         | 12.3        | 22.7        | 13.6        | 13.0        | 0.0481       | 0.009       |
| 30 - 34.9            | 186         | 21.5        | 25.8        | 15.1        | 19.3        |             |             |
| ≥ 35                 | 154         | 42.2        | 35.7        | 31.2        | 35.1        |             |             |
| **Age (years)**< 60 |             |             |             |             |
| 28-29.9 kg/m^2      | 53          | 3.8         | 20.8        | 20.8        | 13.2        |             |             |
| 30 - 34.9 kg/m^2    | 83          | 19.3        | 28.9        | 20.5        | 25.3        |             |             |
| ≥ 35 kg/m^2         | 81          | 35.8        | 34.6        | 35.8        | 37.0        |             |             |
| 60 - 69.9           |             |             |             |             |
| 28-29.9 kg/m^2      | 38          | 7.9         | 21.1        | 13.2        | 5.3         |             |             |
| 30 - 34.9 kg/m^2    | 47          | 27.7        | 17.0        | 10.6        | 17.0        |             |             |
| ≥ 35 kg/m^2         | 38          | 57.9        | 42.1        | 31.6        | 34.2        |             |             |
| ≥ 70                |             |             |             |             |
| 28-29.9 kg/m^2      | 63          | 22.2        | 25.4        | 7.9         | 17.5        |             |             |
| 30 - 34.9 kg/m^2    | 56          | 19.6        | 28.6        | 10.7        | 12.5        |             |             |
| ≥ 35 kg/m^2         | 35          | 40.0        | 31.4        | 20.0        | 31.4        |             |             |
| **Gender** Males    |             |             |             |             |
| 28-29.9 kg/m^2      | 84          | 8.3         | 22.6        | 9.5         | 7.1         |             |             |
| 30 - 34.9 kg/m^2    | 111         | 15.3        | 23.4        | 13.5        | 13.5        |             |             |
| ≥ 35 kg/m^2         | 64          | 43.8        | 32.8        | 21.9        | 23.4        |             |             |
| Females             |             |             |             |             |
| 28-29.9 kg/m^2      | 70          | 17.1        | 22.9        | 18.6        | 20.0        |             |             |
| 30 - 34.9 kg/m^2    | 75          | 30.7        | 29.3        | 17.3        | 28.0        |             |             |
| ≥ 35 kg/m^2         | 90          | 41.1        | 37.8        | 37.8        | 43.3        |             |             |
| **Socio-economic status** Top executives - Professional persons |             |             |             |             |
| 28-29.9 kg/m^2      | 36          | 0.0         | 11.1        | 5.6         | 5.6         |             |             |
| 30 - 34.9 kg/m^2    | 38          | 5.3         | 13.2        | 10.5        | 5.3         |             |             |
| ≥ 35 kg/m^2         | 18          | 38.9        | 27.8        | 33.3        | 22.2        |             |             |
| Other classes       |             |             |             |             |
| 28-29.9 kg/m^2      | 98          | 17.4        | 26.5        | 14.3        | 14.3        |             |             |
| 30 - 34.9 kg/m^2    | 126         | 25.4        | 30.2        | 16.7        | 23.8        |             |             |
| ≥ 35 kg/m^2         | 118         | 40.7        | 34.8        | 31.4        | 35.6        |             |             |
| **Current smoking** No |             |             |             |             |
| 28-29.9 kg/m^2      | 134         | 13.4        | 22.4        | 9.7         | 14.2        |             |             |
| 30 - 34.9 kg/m^2    | 156         | 21.2        | 25.0        | 15.4        | 19.9        |             |             |
| ≥ 35 kg/m^2         | 125         | 40.8        | 33.6        | 29.6        | 33.6        |             |             |
| Yes                 |             |             |             |             |
| 28-29.9 kg/m^2      | 16          | 0.0         | 18.8        | 31.3        | 6.3         |             |             |
| 30 - 34.9 kg/m^2    | 19          | 21.1        | 42.1        | 10.5        | 21.1        |             |             |
| ≥ 35 kg/m^2         | 23          | 52.2        | 52.2        | 43.5        | 47.8        |             |             |
| **Alcohol** No      |             |             |             |             |
| 28-29.9 kg/m^2      | 77          | 15.6        | 20.8        | 18.2        | 15.6        |             |             |
| 30 - 34.9 kg/m^2    | 96          | 24.0        | 26.0        | 17.7        | 22.9        |             |             |
| ≥ 35 kg/m^2         | 96          | 42.7        | 32.3        | 35.4        | 40.6        |             |             |
high social level has been previously described [20]. QOL could be partly influenced by the ability to maintain a healthier lifestyle, whether these patients already had a healthy lifestyle or changed their habits due to their excess weight. The links between a lower socioeconomic level, unhealthy eating [21,22] and physical inactivity [23] have also been established.

The beneficial consequences of physical activity on QOL in the context of obesity are well established [14,24]. Regular exercising provides physical and psychological well-being to patients regardless of the severity of their excess weight [24]. This was confirmed by our results where patients who reported efforts to increase physical activity presented significantly improved physical functioning. By contrast, patients with an advanced deteriorated physical state are generally less likely to take on physical activities.

Although the influence of co-morbid diagnoses on QOL has been reported in patients with severe obesity [25], no significant effect on QOL could be observed in our study in multivariate analyses.

The impact of smoking habits on QOL was not confirmed (Table 5). The consequences of smoking on physical state are however well established. Our findings should not be over-interpreted, especially as detailed smoking history and smoking years were not documented. Additionally, some patients with significantly impaired QOL may have quit smoking as there were few smokers included in our survey. Likewise, interpretation in our data of the influence on QOL of alcohol requires most caution as the reliability of reported alcohol drinking habits may be questionable, even in an anonymous self-completed-questionnaire.
### Table 5: Risks of poorer QOL (logistic regression models)

|                        | Dimension 1 - Physical state (n = 411) | Dimension 2 - Vitality, desire to do things (n = 395) | Dimension 3 - Relations with others (n = 412) | Dimension 4 - Psychological state (n = 428) |
|------------------------|----------------------------------------|------------------------------------------------------|------------------------------------------------|---------------------------------------------|
| **Age (years)**        |                                        |                                                      |                                                |                                             |
| < 60                   | 1.00                                   | 1.00                                                 | 1.00                                           | 1.00                                        |
| 60 - 69.9              | 1.80                                   | 1.04                                                 | 0.72                                           | 0.38-1.37                                   |
| ≥ 70                   | 2.02                                   | 1.15                                                 | 0.32                                           | 0.15-0.69                                   |
| **Male vs. female**    |                                        |                                                      |                                                |                                             |
| Body Mass Index (Kg/m²) |                                        |                                                      |                                                |                                             |
| < 29.9                 | 1.00                                   | 1.00                                                 | 1.00                                           | 1.00                                        |
| 30 - 34.9              | 1.95                                   | 1.34                                                 | 0.75-2.38                                      | 1.75                                        |
| ≥ 35                   | 5.37                                   | 1.66                                                 | 0.92-3.01                                      | 1.54-5.85                                   |
| **Socio-economic status** |                                        |                                                      |                                                |                                             |
| Workmen/employees      | 1.00                                   | 1.00                                                 | 1.00                                           | 1.00                                        |
| Top executives - Professional persons | 0.35                              | 0.47                                                 | 0.23-0.95                                      | 0.49                                        |
| Teachers/Artisans/shopkeeper | 1.00                              | 1.06                                                 | 0.54-2.10                                      | 0.93                                        |
| Unemployed/husbands    | 1.43                                   | 0.89                                                 | 0.47-1.68                                      | 0.43-2.01                                   |
| **Number of associated co-morbid diagnoses** |                                        |                                                      |                                                |                                             |
| None or one            | 1.00                                   | 1.00                                                 | 1.00                                           | 1.00                                        |
| Two                    | 1.32                                   | 0.85                                                 | 0.40-1.81                                      | 1.32                                        |
| Three or more          | 1.69                                   | 1.42                                                 | 0.74-2.75                                      | 1.32                                        |
| **Previous efforts for substantial changes in physical activities** |                                        |                                                      |                                                |                                             |
| Current Smoking (yes/no) |                                        |                                                      |                                                |                                             |
| Alcohol                |                                        |                                                      |                                                |                                             |
| None                   | -                                      | -                                                    | 1.76                                           | 1.31                                        |
| 1-2 glasses per day    | -                                      | -                                                    | 0.91-3.37                                      | 0.63-2.74                                   |
| ≥ 3 glasses per day    | -                                      | -                                                    | 1.00                                           | 1.00                                        |
|                         | -                                      | -                                                    | 1.05                                           | 0.53-2.08                                   |
|                         | -                                      | -                                                    | 0.89                                           | 0.39-2.11                                   |
|                         | -                                      | -                                                    | 0.53                                           | 0.21-1.33                                   |
This study had some limitations. Firstly, we used a convenience sample, which may not be representative of the overall population of pre-obese and obese subjects. Only patients presenting a probable excess weight according to the pharmacist’s judgement were asked to participate, meaning that some patients who may have actually met the inclusion criteria were not offered the study. Additionally, our study population recruited in community-pharmacies may present more associated diseases than a more representative sample of pre-obese and obese patients may. Nonetheless, we believe that such a selection bias may not substantially affect our findings: no significant influence of the number of co-morbid diagnoses was noted for physical and vitality scores in multivariate analysis (Table 5) and for the other dimensions in univariate analyses (Table 3).

All data collected on questionnaires about the patients were purely self-reported and the data obtained for reported physical activity and dietary habits should therefore be interpreted cautiously. Further investigations with more accurate assessments of patients' lifestyle should be needed for more conclusive results. In addition, co-morbid diagnoses were identified from drugs dispensed before inclusion and not using specific clinical criteria. As a consequence, diseases not treated by the studied drugs classes (Methods) were not identified and psychiatric co-morbid diagnoses were not evaluated either. Socioeconomic level was assessed on occupational status and it may therefore have been of interest to have complementary data on education or income level. The survey only evaluated a small number of the consequences of excess weight on QOL, and several outcomes of interest in obesity such as sexual life [17,26], detailed eating habits [17], medical supervision, perception of weight status and history of weight loss [27] were not explored. Domains referring to relations with others, psychological distress were only partially studied as only a single item was dedicated to these dimensions in the OSQOL. Given the prominent role of psychological welfare in QOL [13], further studies, with more elaborated instruments are needed to investigate these topics more accurately. Lastly, refusals were not documented. However, as a prerequisite to participate was to be a regular customer of the pharmacy, refusal rate may be assumed to be low.

An originality of the PRICARDO pharmacy-based study was its design. Studies on chronic diseases have been successfully conducted in pharmacies. Pharmacists with whom patients have often built a relationship of confidence are ideally positioned to conduct such studies, notably in case of regular or chronic therapy. Our results proved the feasibility of such a study in the context of pre-obesity and obesity although patients needing a regular treatment are more likely to be easily captured in pharmacies.

The results of this study do have practical implications. Firstly, our findings highlight the clear influence BMI of 35 kg/m² or over, age, gender and socioeconomic status on QOL of pre-obese and obese patients. These factors should be better considered before investigating and interpreting the QOL in this population. In addition to patients’ physical health, consequences on psychological well-being and social life should not be overlooked. Descriptive findings have suggested that the lifestyle of these patients could be improved: educational actions should be implemented to encourage overweight adults to take up physical activities. It will also be important to further understand the dietary habits and patients’ reluctance to change their lifestyle. Several interventional studies have actually highlighted the beneficial impact of educational training based on physical activity and an improved compliance to diets in obese patients [28].

**Conclusion**

In conclusion, this survey has proved that the consequences of excess weight on patients’ lives can be evaluated by studies performed in community-based pharmacies, as already experimented for chronic diseases. Factors such as age, gender, dietary habits, physical activity or socioeconomic level should be more taken into account by care-givers before interpreting QOL in overweight and obese patients.

**Competing interests**

The authors declare that they have no competing interests.

**Authors’ contributions**

GC conceived of the study, its design including questionnaires. She was responsible for pharmacists’ recruitment in the study and its global coordination, notably the collection of data. She also participated in the draft. EVG actively participated in the design of the study and in the draft of the manuscript. LLa directed the statistical analyses and drafted the manuscript in the close collaboration of other authors.

CR performed the statistical analyses and participated in the drafting of the manuscript. LLe GD and AM actively participated to the draft with helpful suggestions, both in interpretation of the data, and in suggestions of references

SR read the draft and made significant corrections of English. HM participated to the draft. All authors have read and approved the manuscript

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