

# Long-term quality of life in patients with bariatric surgery evaluated with BAROS

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Calidad de vida a largo plazo en pacientes con cirugía bariátrica evaluados con BAROS

## ABSTRACT

Quality of life (QoL) significantly improves in the short term after bariatric surgery (BS). However, evidence on the long-term QoL of patients with BS is limited. **Aim:** To analyze the long-term QoL of patients who underwent Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG). **Methods:** We evaluated 257 patients from three private clinics in Santiago, Chile, with ~10-y since surgery. The Bariatric Analysis and Reporting Outcome System (BAROS) was used. **Results:** Median values for the BAROS score indicated good results of treatment: 4.3 (2.3-6.0) and 4.1 (2.1-6.4) for RYGB and SG patients, respectively. The Moorehead-Ardelt Quality of Life (MAQoL) score was higher in patients with SG compared to RYGB (1.5 vs. 1.3,  $p = 0.047$ ). A moderate, positive, and significant correlation was observed between the percentage excess weight loss and MAQoL score ( $\rho = 0.48$ ,  $p < 0.001$ ). **Conclusions:** Patients undergoing BS showed a good QoL even in the long term (~10 y).

**Keywords:** Bariatric surgery; Quality of life; Weight loss.

## RESUMEN

La calidad de vida (CV) mejora significativamente a corto plazo después de la cirugía bariátrica (CB). Sin embargo, la evidencia sobre la calidad de vida a largo plazo de los pacientes sometidos a CB es limitada. **Objetivo:** Analizar la calidad de vida a largo plazo de los pacientes que se sometieron a bypass gástrico en Y de Roux (BPG) y gastrectomía en manga (GM). **Material y métodos:** Evaluamos 257

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pacientes de cuatro clínicas privadas en Santiago, Chile, con ~10 años desde la cirugía. Se utilizó *Bariatric Analysis and Reporting Outcome System (BAROS)*. **Resultados:** Las puntuaciones de BAROS indicaron buenos resultados del tratamiento: 4,3 (2,3-6,0) y 4,1 (2,1-6,4) para pacientes con BPG y GM, respectivamente. La puntuación de calidad de vida de Moorehead-Ardelt (MAQoL) entre los pacientes con GM fue mayor que la de los pacientes con BPG (1,5 frente a 1,3,  $p=0,047$ ). Se observó una correlación moderada, positiva y significativa entre el porcentaje de pérdida de exceso de peso y la puntuación MAQoL ( $\rho=0,48$ ,  $p<0,001$ ). **Conclusiones:** Los pacientes sometidos a CB muestran una buena calidad de vida incluso a largo plazo (~10 años). **Palabras clave:** Calidad de vida; Cirugía bariátrica; Pérdida de peso.

Success in Bariatric Surgery (BS) is usually measured by the loss of excess weight and/or resolution or improvement in comorbidities<sup>1,2</sup>. However, little attention has been provided to the quality of life (QoL). QoL refers to an individual's subjective experiences of psychological, social, and physical health. QoL is adversely influenced by disease and psychological aspects such as personal experiences, expectations, and perceptions<sup>3</sup>.

Although generic instruments for measuring health-related QoL, such as the Medical Outcome Survey-Short Form 36, provide useful information, they are not designed to measure the specific range of health-related problems experienced by people with obesity<sup>4,5</sup>. The Bariatric Analysis and Reporting Outcome System (BAROS) includes five domains of QoL (self-esteem, physical activity, social life, ability to work, and sexual life) and other data relevant to BS, including the percentage of excess weight loss (%EWL) and improvement and complications in comorbid conditions, to produce a valid and reliable assessment of outcomes after weight loss surgery<sup>5,6</sup>.

It is well documented that there is a significant improvement in QoL in the short- and medium-term (<5 years) after BS<sup>7,8,9,10</sup> while long-term (>10 years) results are limited<sup>11,12</sup>.

To our knowledge, in Chile there are no studies that have examined QoL in patients with BS in the long term. Thus, this study aimed to analyze

the long-term QoL after Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG). Additionally, we explored the association between excess weight loss and QoL.

## Methods

We conducted a cross-sectional observational study using a clinical database of patients who underwent RYGB and SG. Between August and October 2021, patients older than 18 years from three private clinics in the Metropolitan Region of Chile were invited to participate via email. We used a database of 1,450 email addresses. Of these, 27.6% ( $n=400$ ) were incorrect email accounts. Of those who received emails, 28.4% ( $n=298$ ) agreed to participate in the study. A link to access the "Google Forms" platform hosting the BAROS questionnaire was sent via emails. For the recent study we only analyzed patients who completed more than 3 years of surgery. ( $n=257$ ). Patients who underwent bariatric revision surgery were excluded.

Participants self-reported data on weight (before surgery, minimum achieved and current), height and comorbidities (before and after surgery).

## Outcomes of the bariatric surgery with BAROS

Although BAROS has not been validated in Chile, it has been translated into Spanish and used in other Chilean studies<sup>13,14</sup>.

The BAROS system analyzes three domains: weight loss, medical conditions, and complications, each with a score ranging from -1 to 3 points. In addition, five aspects were considered (self-esteem, physical activity, social life, ability to work, and sexual life).

The percentage of excess weight loss (%EWL) was calculated as follows:  $(\text{initial weight} - \text{current weight} / \text{initial weight} - \text{ideal weight}) \times 100$ . Ideal weight was estimated by considering a body mass index (BMI) of 25 kg/m<sup>2</sup>. If the patient showed weight gain above the minimum weight achieved<sup>1</sup> point was deducted; if the %EWL was 0-24%, 25-49%, 50-74%, or > 75%; this item was scored as 0, 1, 2, or 3, respectively.

For medical condition, we included the following comorbidities before and post-surgery: diabetes type 2, hypertension, dyslipidemia, sleep apnea, osteoarthritis (of the knee, hip, and back), and gastroesophageal reflux disease (GERD). Comorbidities evolution was self-reported, and improvement was defined as the absence of disease. Changes in co-morbidities were scored as aggravation (minus one), unchanged (no points), improvement (one point), one major comorbidity resolved, others improved (two points), and all major comorbidities resolved (three points). All comorbidities were considered major, except GERD<sup>15</sup>.

Complications were asked directly to the patients: did you have any type of medical complication due to the bariatric surgery? Which? Complications were classified according to the standardized outcomes reported for metabolic and BS<sup>15</sup>. Major complications, that is, intestinal obstruction, deducted one point from the final score, while minor complications, that is, dumping, deducted 0.2 points.

To determine QoL outcomes, BAROS includes the Moorehead-Ardelt questionnaire (MAQoL), which incorporates five domains: self-esteem, physical activity, social life, ability to work, and sexual life<sup>6</sup>. Each domain contained one question, each with five response alternatives, representing a gradual level of satisfaction (ranging from much worse to much better). Self-esteem scores ranged from -1 to +1, and physical activity, social life,

ability to work, and sexual life from -0.5 to +0.5, giving a total score between -3 and +3 points.

The BAROS final score was classified as excellent (more than seven points), very good (five–seven points), good (three–five points), fair (one–three points), or failure (one point or less)<sup>5</sup>.

### Statistical analysis

Categorical variables were expressed as absolute and relative frequencies, and numeric variables were expressed as median and interquartile ranges because they were not normally distributed according to the Shapiro-Wilk test. We used the chi-square and Mann-Whitney U tests to compare the subjects' characteristics according to the type of surgery. Comparative analysis between the BAROS score and type of surgery was conducted using the Mann-Whitney U test. Spearman's rank correlation coefficient was used to correlate %EWL and MAQoL scores. Statistical analysis was performed using STATA v17.0, with statistical significance set at p-value <0.05.

### Ethics

This study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the Pontificia Universidad Católica de Chile (ID 210714001). All participants signed informed consent.

### Results

Table 1 shows the characteristics of the patients (n= 257) according to surgical technique (45.5% RYGB, 54.5% SG). The highest percentage of the sample was female (83.8% RYGB and 76.4% SG), and the median time since surgery was 10 years. A statistically significant difference was observed in the preoperative BMI according to surgical technique (p<0.001). No significant differences were observed in the nadir or current BMI according to the surgical technique used. A higher frequency of diabetes and osteoarthritis was observed in the RYGB group.

The BAROS score was 4.3 (2.3-6.0) for RYGB and 4.1 (2.1-6.4) for SG (p= 0.897) (Table 2). The BAROS component with the highest sco-

re was %EWL, followed by MAQoL. We did not find differences in %EWL or resolution of comorbidities according to the type of surgery. However, the MAQoL score of SG patients was higher than that of RYGB patients (1.5 vs 1.3,  $p=0.047$ ). Regarding MAQoL domains, we did not find differences by to the type of surgery, except for the sexual domains in favor of patients with SG ( $p=0.008$ ) (Table 2).

According to the BAROS score classifica-

tion, 75.5% of the patients were categorized as having good, very good or excellent outcomes after BS in the long term (Figure 1). In addition, most participants (59.2%) evaluated their QoL positively (better and much better) according to their total MAQoL score (Figure 2).

Figure 3 shows the results of the correlational analysis of %EWL and MAQoL scores. Moderate positive significant correlations were observed ( $\rho = 0.48$ ,  $p<0.001$ ).

**Table 1.** Characteristics of the study population (n= 257).

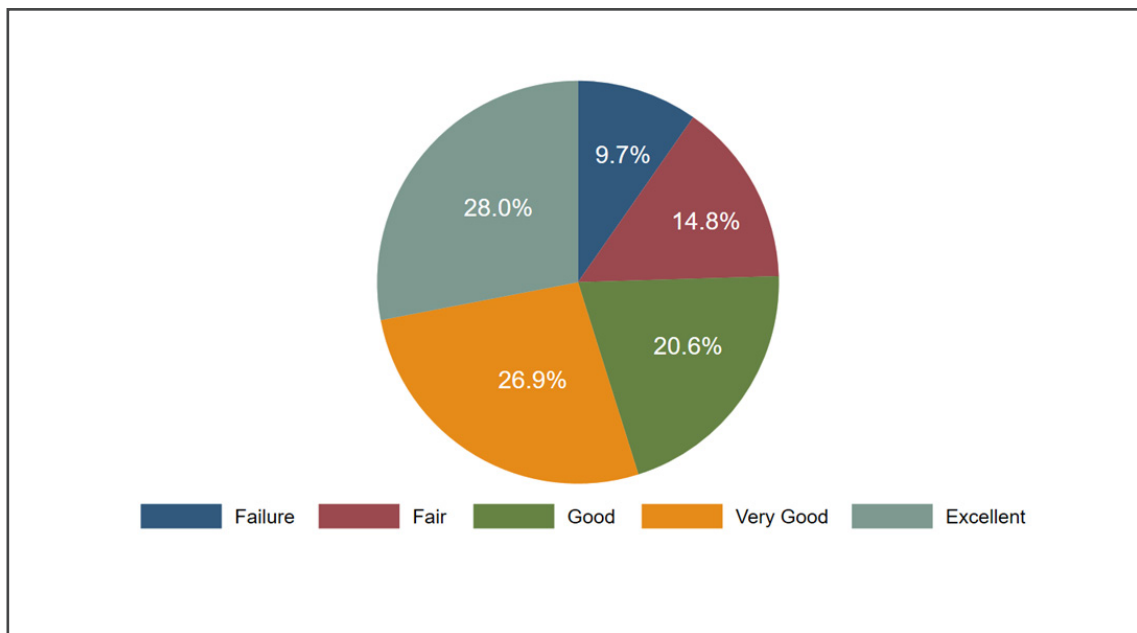
| Characteristics                           | RYGB (n= 117)    | SG (n= 140)      | p value             |
|---|------------------|------------------|---------------------|
| Female, n (%)                             | 98 (83.8)        | 107 (76.4)       | 0.145 <sup>a</sup>  |
| Age in years, median (IQR)                | 49 (42-56)       | 45 (37-52)       | 0.001 <sup>b</sup>  |
| Time since surgery in years, median (IQR) | 10.9 (10.1-11.7) | 10.3 (6.8-11.3)  | 0.007 <sup>b</sup>  |
| BMI preoperative, median (IQR)            | 40.3 (36.1-44.8) | 36.6 (34.0-40.0) | <0.001 <sup>b</sup> |
| BMI nadir, median (IQR)                   | 24.9 (22.3-27.9) | 24.2 (22.0-27.6) | 0.157 <sup>b</sup>  |
| BMI current, median (IQR)                 | 29.8 (25.8-34.2) | 28.9 (25.8-32.4) | 0.173 <sup>b</sup>  |
| Comorbidities preoperative, n (%)         |                  |                  |                     |
| Diabetes                                  | 28 (23.9)        | 16 (11.4)        | 0.008 <sup>a</sup>  |
| Hypertension                              | 36 (30.8)        | 32 (22.9)        | 0.152 <sup>a</sup>  |
| Dyslipidemia                              | 45 (38.5)        | 55 (39.3)        | 0.893 <sup>a</sup>  |
| Sleep apnea                               | 12 (10.3)        | 17 (12.1)        | 0.634               |
| Osteoarthritis                            | 18 (15.4)        | 10 (7.1)         | 0.035 <sup>a</sup>  |
| Gastroesophageal reflux                   | 19 (16.2)        | 15 (10.7)        | 0.193               |

BMI: Body Mass Index, expressed in  $\text{kg}/\text{m}^2$ ; IQR: interquartile range; a. Chi-square test; b. Mann-Whitney U test.

**Table 2.** Median and interquartile (IQR) BAROS score according to type of bariatric surgery.

| BAROS domain       | Total (n= 257)   | RYGB (n= 117)    | SG (n= 140)      | p-value |
|--------------------|------------------|------------------|------------------|---------|
| Excess weight loss | 2.0 (1.0-3.0)    | 2.0 (1.0-3.0)    | 2.0 (1.0-3.0)    | 0.912   |
| Comorbidities      | 0.0 (0.0-3.0)    | 1.0 (0.0-3.0)    | 0.0 (-1.0-3.0)   | 0.216   |
| Quality of life    | 1.5 (0.5-2.3)    | 1.3 (0.5-2.0)    | 1.5 (0.8-2.5)    | 0.047   |
| Self esteem        | 1.00 (0.50-1.00) | 0.50 (0.50-1.00) | 1.00 (0.50-1.00) | 0.102   |
| Physical activity  | 0.25 (0.00-0.50) | 0.25 (0.00-0.50) | 0.25 (0.00-0.50) | 0.208   |
| Social life        | 0.00 (0.00-0.05) | 0.00 (0.00-0.25) | 0.25 (0.00-0.50) | 0.147   |
| Work activity      | 0.00 (0.00-0.25) | 0.00 (0.00-0.25) | 0.00 (0.00-0.50) | 0.484   |
| Sexual activity    | 0.25 (0.00-0.50) | 0.00 (0.00-0.25) | 0.00 (0.00-0.50) | 0.008   |
| BAROS total score  | 4.3 (2.3-6.3)    | 4.3 (2.3-6.0)    | 4.1 (2.1-6.4)    | 0.897   |

p value from Mann Whitney U Test. Bold indicates statistically significant differences.

**Figure 1:** Percentage of patients according to the categories of the BAROS.

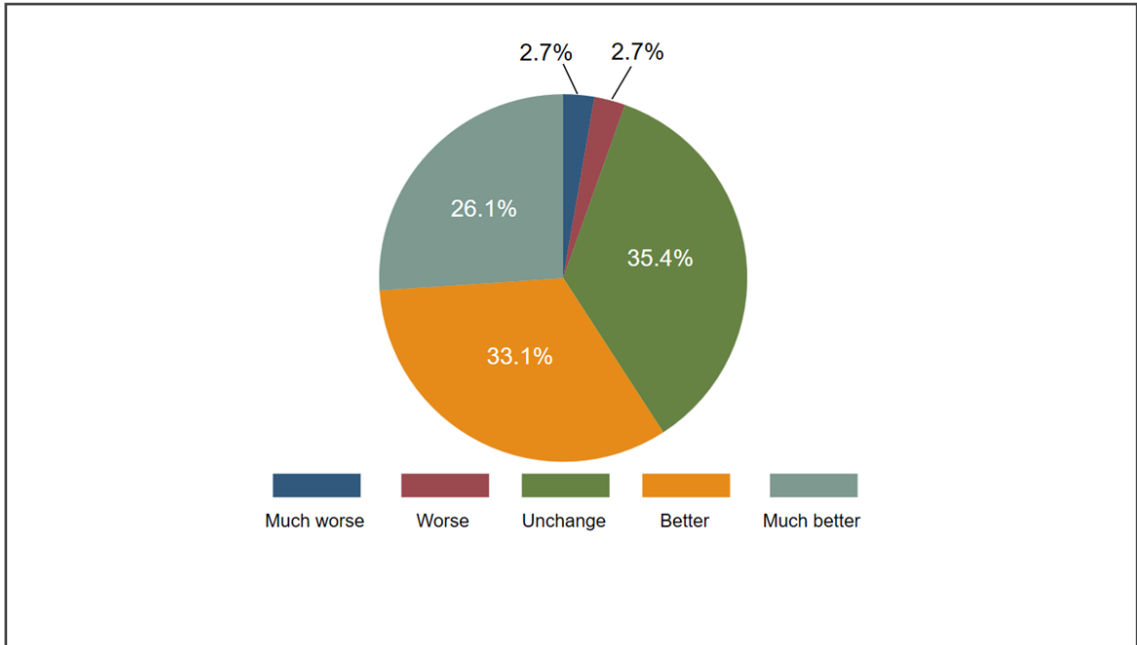


Figure 2: Percentage of patients according to the categories of the Moorehead-Ardelt questionnaire.

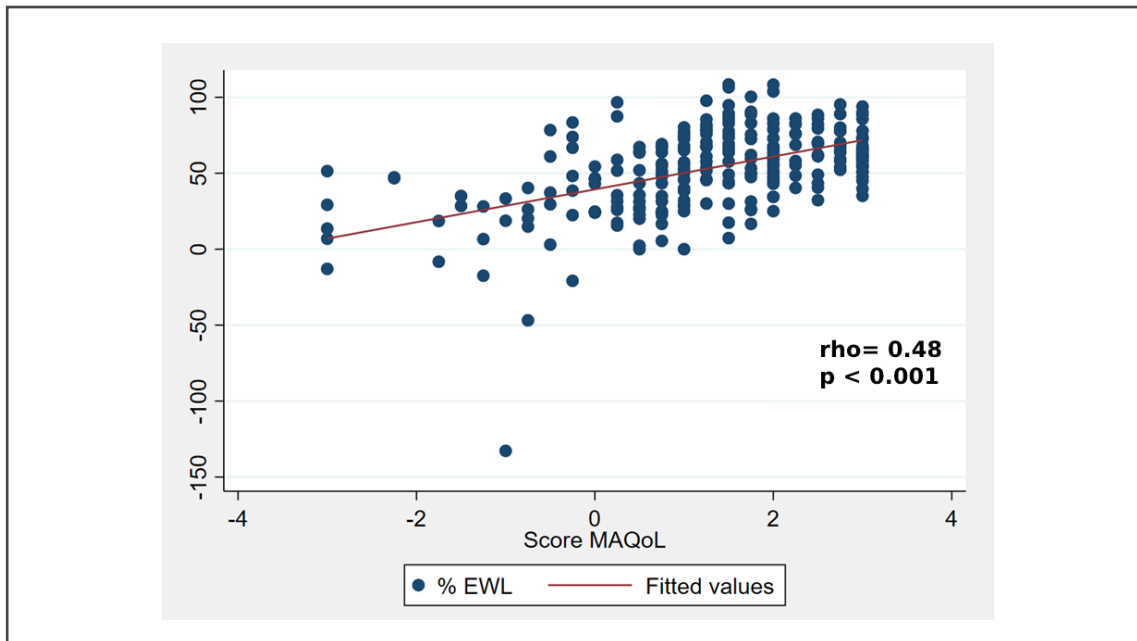


Figure 3: Correlation between percentage of excess weight loss (%EWL) and score of Moorehead-Ardelt Quality of Life (MAQoL).

## Discussion

The main finding of this study was a positive evaluation (much better and better) in QoL, measured by MAQoL, ~10-y after RYGB and SG, with significant differences between surgical techniques in favor of patients with SG. In addition, we found a moderate, positive, and significant correlation between %EWL and MAQoL.

Although evidence shows an improvement in the QoL of patients after BS, most data are short-term. Castanha et al. showed that 94.1% of patients evaluated their QoL positively four months after BS<sup>16</sup>. Alkassis, et al. observed good and very good QoL in all evaluated aspects of QoL after 1-y post SG<sup>17</sup>. Similarly, Vogel, et al. observed a higher score in all domains of QoL after 1-y of BS versus preoperative period<sup>18</sup>. However, data on the long-term QoL are scarce. Askari et al. observed an improvement in QoL after 10-y of RYGB<sup>12</sup>.

Concerning QoL improvement according to surgical technique, contrary to our results, most authors did not observe significant differences between techniques<sup>19,20,21</sup>. A possible explanation for the difference in QoL based on surgical technique is that patients undergoing RYGB were older than those undergoing SG and reported more comorbidities. In addition, problems related to excess skin, which are generally greater in RYGB patients, cannot be fully resolved by lifestyle modifications, dietary adjustments, or physical exercise<sup>22</sup>.

Regarding MAQoL domains, we observed that participants evaluated their self-esteem as much better, while the domains of physical activity and sexual activity were evaluated as better. The social life and work activity domains were evaluated unaltered. The improvement in self-esteem could be because patients are more secure or self-confident when they achieve an "optimal" body image. This becomes relevant in the follow-up of patients, considering that even ~10-y after BS, it is the best evaluated domain. Nevertheless, it is important to highlight that most QoL domains were evaluated positively, highlighting the Optimal clinical response of BS beyond weight loss.

The median BAROS score in our sample was 4.3, which represents a good result for BS, but lower than that found by other authors. Among a sample of patients evaluated 2 years after RYGB, Queiroz, et al.<sup>23</sup> reported a score of 6.4, and Khaitan, et al.<sup>21</sup> reported a score of 5.8. The difference between the scores could be attributed to the time after surgery (2-y versus 10-y). Moreover, in the present study, we did not observe differences in the total BAROS score according to surgical technique. These results are consistent with a systematic review<sup>24</sup>.

Evidence associating %EWL and QoL in the short and long term is scarce. A prospective cohort study indicates that QoL was positively correlated with weight loss and resolution of comorbidities, in a period of 2-y post SG<sup>25</sup>. In contrast, a multicenter clinical trial with 7-y of follow-up demonstrated that a greater %EWL was significantly associated with better QoL<sup>26</sup>. In our study, the positive and significant correlation between %EWL and QoL agrees with the literature. It is noteworthy that even 10-y after BS, patients continue to perceive good QoL. It should be considered that these results represent a third of the patients contacted and could potentially be those patients who complied better post-BS treatment. However, the results are still relevant considering long-term follow-up.

Our study has some limitations. The study sampling type does not allow extrapolation of the results to the bariatric population. In addition, recall bias could have affected the self-reported weight (initial and nadir). On the other hand, the BAROS system has some methodological limitations. For example, in patients with diseases not assessed by the BAROS, postoperative weight loss could lead to considerable improvement in these comorbidities. This could interfere with the final BAROS score, and therefore, QoL<sup>27</sup>. However, to date, it is the only tool available to assess BS outcomes.

## Conclusion

Patients undergoing BS maintain a good QoL even in the long term (~10y). We recommend that a multidisciplinary team involved in the

follow-up of post-BS patients should consider, in addition to %EWL, the improvement in QoL as a result of treatment, as this continues to be a relevant aspect, even in the long term.

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### Conflict of interest

The authors declare that they have no conflict of interest.

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