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Evolution of anthropometric data and quality of life in active bariatric individuals

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SUMMARY

Obesity is a disease characterized by the accumulation of abnormal or excessive fat that can damage health. Bariatric surgery, an effective and safe way to treat this disease, requires multidisciplinary monitoring with an educational nature to change lifestyle. Adherence to routine physical activity can be a part of adopting a healthier lifestyle and can assist in the treatment of this disease and its related comorbidities.

OBJECTIVE: Thus, the aim of this study was to analyze the correlation between the evolution of anthropometric variables and the domains of quality of life at different times, including at one year after bariatric surgery in very active and irregularly active individuals.

METHODS: This was a longitudinal, observational, prospective, and analytical study. The collected data included anamnesis, level of physical activity (International Physical Activity Questionnaire Short Form), height, weight, body mass index (BMI), average waist circumference, percentage of fat, and the World Health Organization Quality of Life Assessment Bref.

RESULTS: Seven female individuals were evaluated and divided into two groups: a very active group and an irregularly active group. In the very active individuals, significant results were found in the evolutionary variables: weight ($p<0.001$); body mass index ($p<0.001$); average waist circumference ($p<0.001$); percentage of fat ($p<0.001$); and quality of life general ($p=0.001$). In the irregularly active individuals, a significant result was found only in one evolutionary variable: body mass index ($p<0.001$).

CONCLUSION: Thus, it is evident that the improvement and maintenance of good health is more effective in bariatric individuals who maintain a routine with regular physical activity.

KEYWORDS: Anthropometry. Motor activity. Quality of life. Bariatric surgery.

INTRODUCTION

Obesity is a disease characterized by the accumulation of abnormal or excessive fat that affects health[1]. Its etiology may involve several factors, such as genetic, endocrine, behavioral, social, economic, psychological, and environmental imbalances[2].

In 2014, there were 1.9 billion overweight or obese adults worldwide. Most of the global populations live in countries where the number of deaths from obesity exceeds the number of deaths caused by low weight[3]. According to the Brazilian Association for the Study of Obesity and Metabolic Syndrome[4], about 82 million people were overweight or obese in Brazil in 2014.

The World Health Organization estimates that obesity will have involved 700 million adults and 75 million children by 2025[3].

Along with obesity, the rates of cardiovascular diseases, diabetes, musculoskeletal disorders, infertility, and endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and colon neoplasms have also increased[2,5].

Obesity and its related diseases are considered preventable and treatable[2]. Bariatric surgery is an effective and safe

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way to treat severe and refractory forms of this disease and requires multidisciplinary follow-up with a focus on educational lifestyle changes[6].

In the long term, bariatric surgery can provide benefits such as significant and lasting body mass index (BMI) reduction[7], decreased glucose, total cholesterol (LDL-c and VLDL-c), and triglyceride indices, increased HDL-c[8], decreased prevalence of obstructive sleep apnea syndrome, dyslipidemia, and systemic arterial hypertension, increased adherence to physical activity, and improved quality-of-life (QoL) domains[9-11].

Adherence to physical activities can be a part of a healthier lifestyle and help in the treatment of this disease and its related comorbidities[12,13]. Physical activity can be defined as any movement performed by the contraction of the musculoskeletal system increasing energy expenditure, when compared to rest[14].

These activities can intensify energy expenditure, improve body composition, increase the ability to mobilize/oxidize fat, stimulate a thermogenic response, increase insulin sensitivity, decrease blood pressure, improve physical conditioning, improve psychosocial factors and self-esteem, and reduce anxiety[12], in addition to improving the recovery of patients undergoing bariatric surgery and reducing mortality and existing chronic diseases[2].

The relationship between bariatric patients and physical activity over a year after the surgical procedure is not clear in the specific literature. Thus, the objective of this study was to analyze the correlation between the progression of anthropometric variables and QoL domains at different times up to 1 year after bariatric surgery in very active and irregularly active patients treated at the bariatric surgery outpatient clinic, Hospital de Clínicas, State University of Campinas (UNICAMP).

METHODS

Study design and ethical aspects

This was a prospective and analytical, longitudinal, and observational study approved by the Research Ethics Committee of our institution, under opinion No. 2,038,341. All volunteers signed the Informed Consent Form (ICF).

Data collection

The data collection was performed at the bariatric surgery outpatient clinic, Hospital de Clínicas, UNICAMP, with grade II and III obese patients (at first participation) at four different times (i.e., first participation in the group, T0; after 10% total weight loss, T1; immediate postsurgery, T2; and 1 year after surgery, T3) in a preoperative multidisciplinary bariatric surgery group, individually.

Inclusion criteria

- Grades II and III of obesity at T0;
- Age 18–59 years;
- Female sex;
- Consent to participate in all four evaluations.

Exclusion criteria

- Physical and/or intellectual disability and/or functional limitation;
- Vulnerable groups.

Outcome measurements

Physical activity

The physical activity level of participants was assessed using the International Physical Activity Questionnaire Short Form (IPAQ SF)[15], which classifies the person as VERY ACTIVE, ACTIVE, IRREGULARLY ACTIVE A, IRREGULARLY ACTIVE B, and SEDENTARY. The classification was established by the score achieved, ranging from 0–4, with 0=sedentary and 4=very active.

Anthropometric measurements

The measurements collected were height, weight, BMI, and mean waist circumference (WC).

Fat percentage

The "Prediction Equation for Obese Individuals – Women" was used[16] at times 0, 1, and 2 to characterize the participants' fat percentage (%F). This equation uses height (in cm), weight (in kg), and WC (in cm): WC=[(W1+W2)/2], where W1 is the waist circumference in centimeters measured at the midpoint between the sternum and the umbilicus (front) and the midpoint between the last rib and the iliac crest (lateral) and W2 is the waist circumference in centimeters measured at the level of the umbilical scar.

The "Prediction Equations for Normal Weight People" were used[17] at time 3 to characterize the fat percentage (%F) of participants, using WC (in cm), hip circumference (in cm), height (in cm), and age (in years) measurements.

Quality of life

The QoL was assessed by the World Health Organization Quality of Life Assessment Bref (WHOQOL BREF) questionnaire with two general questions and 24 facets divided into four domains (i.e., Physical, Psychological, Social Relations, and Environment)[18] and determined whether the QoL was very poor=1, poor=2, fair=3, good=4, or very good=5.

Statistical analysis

The data obtained were transcribed into the BioEstat software version 5.3, and a descriptive analysis of the variables was performed. The Shapiro–Wilk test was used to verify the normality of the data. The ANOVA test (one criterion) was used to analyze the progression of the same variables at different times. The significance level was 0.1% ($p \leq 0.001$).

RESULTS

Seven women were evaluated, after being divided into two groups: a very active group and an irregularly active group. Four patients were classified as very active (because they achieved a score of 4 on the IPAQ), and three were classified as irregularly active (because they had a mean score between 1 and 2 on the IPAQ).

Table 1 presents a descriptive analysis of the data, with the mean and standard deviation of each variable.

Table 2 shows the p significance of all variables analyzed at the four times.

At T0, all patients weighed between 100 kg and 130 kg, with a median of 110 kg. The median was slightly above 100 kg at T1 and approximately 90 kg at T2. Notably, 1 year after the surgical procedure, the patients weighed between 60 kg and 70 kg, with a median in the range of 65 kg. Therefore, weight reduction between T0 and T3 was strongly significant, with $p<0.001$.

As for BMI, at T0, the values were between 41 kg/m^2 and 46 kg/m^2, and the median was close to 44 kg/m^2. The median was 40 kg/m^2 at T1 and approximately 35 kg/m^2 at T2. Of note, 1 year after the surgical procedure, the patients had BMI values below 30 kg/m^2, with a median in the range of 25 kg/m^2, which is considered normal. Therefore, BMI reduction between T0 and T3 was also strongly significant, with $p<0.001$.

The WC measurements at T0 were between 120 cm and 130 cm, as well as the median. At T1 and T2, the median was close to 110 cm and 100 cm, respectively. At 1 year after bariatric surgery, the patients had a WC between 80 cm and 90 cm, with a median in the range of 85 cm. Therefore, this variable also showed a strongly significant reduction between T0 and T3, with $p<0.001$.

The medians of %F were approximately 55, 50, 45, and 35% at T0, T1, T2, and T3, respectively. These results also presented a $p<0.001$, with a significantly decreased percentage of fat.

The general QoL (QoLG) score presented a highly significant result ($p=0.001$). At T0, QoLG was between 2 and approximately >3, with a median below 3; at T1, it was between almost 3 and approximately 3.5; at T2, it was between 4 and 5; and at T3, it was between 4.5 and 5, with a median close to 4.7 and 4.8.

Table 3 shows the p significance of all variables analyzed at the four times.

The only highly significant result in the irregularly active patients was the BMI ($p<0.001$). At T0, the BMI was between 45 kg/m^2 and 50 kg/m^2, with a median close to 50 kg/m^2. At T1, the BMI was between 40 kg/m^2 and 45 kg/m^2; at T2, it was between 38 kg/m^2 and 40 kg/m^2; and at T3, the BMI reduced to between 26 kg/m^2 and 30 kg/m^2, with a median close to 29 kg/m^2.

Table 1. Descriptive analysis of the sample of seven patients evaluated.

	T0	T1	T2	T3
Weight (kg)	121.4 (±16.1)	110.2 (±14.3)	97.3 (±11.7)	73.4 (±9.5)
BMI (kg/m^2)	45.4 (±2.7)	41.3 (±2.3)	36.4 (±2.1)	21.5 (±2.5)
WC (cm)	121.6 (±6.6)	116.6 (±9.6)	105.5 (±9.2)	85.3 (±7.4)
%F	53.1 (±1.9)	50.9 (±2)	47.9 (±1.7)	36.3 (±4.7)
QoLG	2.6 (±0.5)	3.3 (±0.6)	4.2 (±0.6)	4.8 (±0.3)
Physical QoL	3 (±0.6)	3.5 (±0.4)	3.3 (±0.5)	4.1 (±0.3)
Psychological QoL	3.2 (±0.5)	3.7 (±0.6)	3.8 (±0.3)	4.1 (±0.3)
Social relationships QoL	3.6 (±0.8)	4.1 (±0.8)	4 (±0.4)	4.3 (±0.7)
Environment QoL	3.3 (±0.6)	3.7 (±0.4)	3.7 (±0.5)	3.7 (±0.5)

WC: waist circumference; %F: percentage of fat; QoL: quality of life.

Table 2. The p-values depicting the significance of the progression analysis in very active individuals.

Weight	BMI	WC	%F	QoLG	QoLPh	QoLPs	QoLSR	QoLE
<0.001	<0.001	<0.001	<0.001	0.001	0.028	0.068	0.283	0.857

WC: mean waist circumference; %F: percentage of fat; QoLG: general quality of life; QoLPh: quality of life physical domain; QoLPs: quality of life psychological domain; QoLSR: quality of life social relationships; QoLE: quality of life environmental.

Table 3. The p-values depicting the significance of the progression analysis in irregularly active individuals.

Weight	BMI	WC	%F	QoLG	QoLPh	QoLPs	QoLSR	QoLE
0.014	<0.001	0.014	0.003	0.003	0.068	0.125	0.579	0.012

WC: waist circumference; %F: percentage of fat; QoLG: general quality of life; QoLPh: quality of life physical domain; QoLPs: quality of life psychological domain; QoLSR: quality of life social relationships; QoLE: quality of life environmental.

DISCUSSION

Bariatric surgery indicates a permanent change in the life of patients undergoing this procedure. Continuous professional follow-up and permanent changes to healthier lifestyle habits are needed[19].

Failure to follow-up on treatment after surgery can lead to numerous problems[20-22]. However, routine physical activity in association with postsurgical treatment may lead to more satisfactory long-term results than expected[12,23,24].

The results found in this study corroborate this statement, as strongly significant reductions were found in all anthropometric measures and in the QoLG in the group of very active patients[7,10,11,13,23].

These results may also be related to a lower rate of postsurgical complications and weight relapse and to a good maintenance of the respiratory system[20,21].

Physical activity can improve physical and psychosocial factors[11] as well as muscle strength and functionality in patients undergoing the Roux-en-Y gastric bypass[24], strengthening the results found in this study.

Severe malnutrition and infections can also be minimized with the combination of physical activity and a regular and balanced diet for bariatric patients, with indications and specialized professional monitoring[22].

The patients classified as irregularly active showed a significantly reduced BMI.

Despite the significant BMI reduction in the irregularly active group, these values were lower than those found in the very active group.

The lack of more significant results is possibly due to the irregular physical activity and a minimally active routine, demonstrating that the irregular physical activity can be harmful after bariatric surgery[13,20-23].

Despite the great improvement in the scores of the QoL domains assessed by the WHOQOL BREF at the four points of evaluation (Table 1), the statistical results did not show strong significance in any QoL domain (Tables 2 and 3). However, the patients report evident improvements in QoL domains 1 year after bariatric surgery[9,20,21].

CONCLUSION

This study evidenced that the long-term treatment of obesity with surgical intervention combined with routine physical activity remarkably improved the anthropometric variables and QoL of the patients undergoing this treatment. It is worth emphasizing that further studies on this subject with a larger sample are needed.

AUTHORS' CONTRIBUTIONS

JEP: Conceptualization, Formal Analysis, Data Curation, Writing – original draft, Writing – review & editing. **DTR:** Conceptualization, Data curation. Formal Analysis. **AMNA:** Data Curation. **ECC:** Data Curation. **EC:** Writing – review & editing. **ÉAC:** Writing – review & editing.

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