Food consumption and its association with nutritional status, physical activity and sociodemographic factors of bariatric surgery candidates.

Consumo alimentar e sua associação com estado nutricional, atividade física e fatores sociodemográficos de candidatos à cirurgia bariátrica.

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A B S T R A C T

Objective: to evaluate the association of food consumption with nutritional status, physical activity and sociodemographic factors in the bariatric surgery period preoperative. **Methods:** we conducted a cross-sectional study from 2018 to 2019, with patients admitted for bariatric surgery at the Oswaldo Cruz University Hospital, Federal University of Pernambuco. We collected data sociodemographic and nutritional data such as body mass index (BMI), waist circumference, highest weight and pre-surgical weight. We evaluated food consumption with the food frequency questionnaire based on the food pyramid adapted for bariatric patients and physical activity. **Results:** the study involved 60 patients, 78.3% were female, mean age was 38.8±9.6 years, 53.3% were married, and 70% had more than 12 years of education. As for physical activity, 31.7% were sedentary. Regarding nutritional status, the mean BMI was 47.3±6.96kg/m^2. Preoperative weight, highest weight reached before surgery and waist circumference were higher in males (p<0.05). There was an association between physical activity and food intake, and sedentary individuals consumed more carbohydrates (p=0.041). On the other hand, sociodemographic data and nutritional status were not associated with food consumption. **Conclusion:** the level of physical activity showed significant association only with carbohydrate consumption.

Keywords: Bariatric Surgery. Obesity. Food Consumption. Nutritional Status. Preoperative Period.

INTRODUCTION

Obesity is a complex and multifactorial disease, growing exponentially in Brazil and worldwide. It is a risk factor for cardiovascular disease, type 2 diabetes *mellitus*, hypertension, dyslipidemia and multiple cancers, being caused by the interaction of genetic, environmental, metabolic, psychological and behavioral factors[1]. Its treatment is complex and involves lifestyle changes and pharmacological treatment. However, they have been ineffective in morbidly obese individuals and are not sustainable in the long term[2]. Bariatric surgery is the most effective method for the treatment and prophylaxis of complications caused by morbid obesity, and it is indicated when conservative treatment is ineffective[3-5].

Among the effects of surgery stands reduction of weight, with improvement of metabolic status, which results in reduction of cardiovascular risk, of insulin resistance, of diabetes, among others[6]. However, deficiencies can occur and are related to reduced food intake, poor adherence to supplements, malabsorption of nutrients in the postoperative period, and also the deficiencies existing before surgery[7,8]. This deficiency can scenario may cause anemia, osteoporosis, neurologic disorders and malnutrition[7].

Regarding the characteristics of macronutrient food intake in obese patients, a high caloric intake from carbohydrates, trans and saturated fats is observed, coupled with a decrease in the consumption of fruits, vegetables and proteins, which results in body weight gain[9].

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To intervene in a timely manner and to avoid more serious clinical and nutritional complications after surgery, it is necessary to promote healthy eating and lifestyle habits[10]. Therefore, the aim of this study was to verify the association of food intake with nutritional status, physical activity and sociodemographic factors of bariatric surgery candidates.

METHODS

This was a cross-sectional study conducted with patients in the preoperative period of bariatric surgery at the Oswaldo Cruz University Hospital of the Federal University of Pernambuco (HUOC-UPE), Recife/PE, from 2018 to 2019. The eligibility criteria were patients from both genders, and age between 18 and 59 years. We excluded from the study those patients with a history of psychic disease, illicit drug use, high surgical risk, physically handicapped due to the impossibility of performing anthropometry, who had previous surgical intervention of the digestive tract, who were hospitalized for reoperation due to weight regain, and those who were illiterate.

We obtained sociodemographic data such as age, gender, education in study years[11], marital state, and anthropometric measures of preoperative weight (kg), highest reached weight (kg), height (m) and preoperative waist circumference (WC) (cm)[12]. We measured WC using a flexible and inelastic measurement tape, divided into centimeters and subdivided into millimeters (accurate to 1mm). For the measurement, we placed the tape measure about 2cm above the umbilical scar due to the difficulty in obtaining the midpoint between the last rib and the iliac crest in these patients[13]. After obtaining weight and height, we calculated the body mass index (BMI), considering the cutoff points recommended by the American Society for Metabolic & Bariatric Surgery[2].

To assess the level of physical activity, we used If the International Physical Activity Questionnaire - IPAQ, in its short version, which classifies individuals as very active, active, irregularly active and sedentary[14]. We estimated food intake by the adapted and directed Food Frequency Questionnaire (FFQ), developed by Soares *et al*.[15], based on the parameters of the food pyramid for bariatric patients proposed by Moizé *et al*.[16]. This pyramid has five levels, and its base is related to water and supplement intake, as well as physical activity. The other four levels deal with the consumption of food groups, being group 1: proteins (legumes, meat, eggs, milk and derivatives); group 2: vegetables, fruits and olive oil; group 3: rice, pasta, roots and tubers; group 4: alcoholic beverages, processed foods, foods high in sugar, saturated and trans fats, and cholesterol.

The FFQ assessment divides the foods distributed into the four food groups of this pyramid according to categorized frequencies of consumption: rare or never, one to three times a month, once a week, two to four times a week, five or more times a week, once a day, two or more times a day. The questionnaire addresses data from the month prior to the interview to avoid overestimated reports and to aid in recalling consumption.

We performed the consumption assessment based on the methodology proposed by Fornés *et al*.[17], in which the general calculation of the frequency of consumption is converted into scores. To transform the frequencies reported in the FFQ of each food into daily frequency, a weight was assigned to each frequency category of consumption, taking as a reference the reported "once a day" consumption equal to 1. Thus, for frequency "rare or never", the daily frequency match was 0; "1 to 3 times a month" was assigned 0.067 (2x/30 days); for "once a week" it was 0.143 (1x/7 days); for "2 to 4 times in the week at", 0.429 (3x/7 days);

for "5 to 6 times a week", 0.786 (5.5x/7 days); for "2 or more times a day", 2. We also evaluated the use of polyvitamin and mineral supplements prior to bariatric surgery and fluid intake.

We performed statistical analyzes using the SPSS version 12.0 statistical package (SPSS Inc., Chicago, IL, USA). Initially, we tested continuous variables for normality by the Kolmogorov-Smirnov test. We described variables with normal distribution by the mean and standard deviation, and those with nonparametric distribution, by the median and the respective interquartile range (IQR). For comparison between the means, was used the Student's t-test (two means). We described the frequency of food consumption score as median and IQR, as it is an ordinal scale variable. We assessed the association between food intake and independent variables with the Mann-Whitney u-test (two medians) and Kruskal-Wallis (more than two medians), and we applied the Mann-Whitney u-test a *posteriori.* In the validation of the investigated associations, we adopted the value of $p<0.05$.

All participants were informed about the work, received a written description of the study and of all procedures they underwent, and signed an Informed Consent Form (ICF). This research was approved by the Ethics in Human Research Committee of the Health Sciences Center (CCS) of the Federal University of Pernambuco, according to Resolution n# 466/12 of the National Health Council, under the opinion CAAE: 67051817.9.0000,5192.

RESULTS

We evaluated 60 patients submitted to bariatric surgery, with an average age of 38.8±9.6 years, 78.3% being female. Table 1 presents data on the patients' sociodemographic profile.

Table 1. *Sociodemographic profile of patients before bariatric surgery (HUOC-UPE).*

Feature	n	%
Gender		
Male	13	21.7
Female	47	78.3
Marital status		
Married	32	53.3
Single	23	22.0
Separated or divorced	5th	6.0
Location		
Recife/RMR*	23	38.3
State Interior	35	58.3
Other states	2	3.4
Schooling		
<4 years of study	4	6.7
4-8 years of study	7th	11.7
9-11 years of study	7th	11.7
≥12 years of study	42	70.0

** RMR= Recife metropolitan region.*

Regarding nutritional status, we found a statistically significant difference between the mean preoperative weight, highest weight reached before surgery and waist circumference between genders, being higher in males (p<0.05). The mean BMI observed was 47.3±6.96kg/m^2 (Table 2).

As for physical activity, we observed that 24 patients (40%) were active, 17 (28.3%) irregularly active, and 19 (31.7%), sedentary. Furthermore, with regard to the use of supplemental vitamins and/or minerals before surgery, 20 (33.3%) used at some time, especially multivitamin and minerals, calcium citrate and vitamin D. As for water intake, most ingested more than two liters of water a day (71.7%) (not shown in tables). We found no significant differences between the food intake scores of bariatric surgery candidates with sociodemographic data (Table 3). However, we observed that sedentary individuals had higher consumption of food belonging to the carbohydrate food group (p=0.041) (Table 4).

Table 2. *Anthropometric variables of patients before bariatric surgery (HUOC-UPE).*

Variables	Women n=47	Men n=13	Total n=60	*p*-value
	Mean±SD*	Mean±SD*	Mean±SD*	
Weight before surgery (kg)	114.98±15.36	148.40±26.03	122.22±22.69	0.001
Highest weight (Kg)	125.48±17.16	159.76±21.72	132.91±22.98	0.000
BMI**(kg/m^2)	46.64±6.57	49.79±8.04	47.3±6.96	0.150
WC***(cm)	122.11±12.69	135.31±14.30	124.97±14.04	0.002

** SD: standard deviation; ** BMI: body mass index; *** WC: waist circumference.*

Table 3. *Medians and interquartile ranges of food consumption scores according to sociodemographic variables of patients before bariatric surgery (HUOC-UPE).*

	Food groups			
Variables	Group 1	Group 2	Group 3	Group 4
	Median (IQR*)	Median (IQR*)	Median (IQR*)	Median (IQR*)
Gender				
Male	0.64 (0.28-0.64)	0.69 (0.35-1.00)	0.89 (0.35-1.01)	0.68 (0.27-1.16)
Female	0.57 (0.44-0.80)	0.75 (0.50-1.00)	0.76 (0.48-1.00)	0.37 (0.09-0.80)
p-value	0.872	0.547	0.971	0.114
Marital status				
Married	0.53 (0.42-0.88)	0.73 (0.47-1.00)	0.76 (0.45-1.00)	0.41 (0.21-0.80)
Single	0.63 (0.48-0.83)	0.74 (0.57-0.97)	0.85 (0.41-1.00)	0.40 (0.09-0.87)
Separated/Divorced	0.51 (0.33-0.60)	0.71 (0.29-1.02)	0.89 (0.49-1.25)	0.24 (0.31-1.04)
p-value**	0.293	0.915	0.633	0.854
Location				
Recife/RMR***	0.63 (0.42-0.80)	0.80 (0.42-1.10)	0.78 (0.44-1.00)	0.42 (0.22-0.95)
State interior	0.57 (0.44-0.83)	0.71 (0.46-1.00)	0.76 (0.51-1.00)	0.40 (0.08-0.80)
p-value	0.793	0.372	0.911	0.171
Schooling				
<4 years of study	0.46 (0.35-0.54)	0.55 (0.28-0.91)	0.57 (0.34-0.81)	0.49 (0.17-0.78)
4-8 years of study	0.70 (0.62-0.98)	0.85 (0.71-1.00)	0.75 (0.53-1.25)	0.40 (0.09-1.00)
9-11 years of study	0.90 (0.56-1.20)	1.00 (0.50-1.00)	1.00 (0.44-1.00)	0.68 (0.60-1.15)
≥12 years of study	0.54 (0.42-0.72)	0.71 (0.45-1.00)	0.77 (0.37-1.00)	0.38 (0.09-0.86)
p-value**	0.096	0.527	0.540	0.355

*Group 1= proteins; Group 2= vegetables, fruits and olive oil; Group 3= rice, pasta, roots and tubers; Group 4= alcoholic beverages, processed foods, foods rich in sugar, saturated and transfats, and cholesterol; * IQR: interquartile range. Mann-Whitney u-test; ** Kruskal-Wallis test. Post-test: Mann-Whitney u; *** RMR: Recife metropolitan region.*

Table 4. *Medians and interquartile ranges of food consumption scores according to anthropometric variables and patients' physical activity before bariatric surgery (HUOC-UPE).*

Variables	Food group			
	Group 1	Group 2	Group 3	Group 4
	Median (IQR*)	Median (IQR*)	Median (IQR*)	Median (IQR*)
Weight before surgery				
<120kg	0.61 (0.44-0.80)	0.71 (0.42-1.00)	0.80 (0.51-1.05)	0.33 (0.09-0.79)
≥120Kg	0.57 (0.41-0.86)	0.75 (0.53-1.00)	0.76 (0.41-1.00)	0.38 (0.17-0.75)
p-value	0.819	0.610	0.051	0.700
Highest weight before surgery				
<130kg	0.58 (0.45-0.78)	0.71 (0.38-1.00)	0.85 (0.58-1.25)	0.33 (0.13-0.75)
≥130Kg	0.57 (0.42-0.83)	0.75 (0.57-1.00)	0.75 (0.32-1.00)	0.35 (0.13-0.83)
p-value	0.790	0.705	0.382	0.564
WC**				
<120cm	0.54 (0.44-0.72)	0.75 (0.33-1.00)	0.75 (0.42-1.00)	0.35 (0.18-0.69)
≥120cm	0.62 (0.43-0.90)	0.73 (0.53-1.00)	0.82 (0.46-1.00)	0.33 (0.11-0.83)
p-value	0.346	0.737	0.664	0.802
BMI***				
35-39.9kg/m^2	0.62 (0.52-0.95)	0.75 (0.43-1.37)	0.85 (0.75-1.12)	0.33 (0.08-0.67)
40-49.9kg/m^2	0.58 (0.46-0.90)	0.74 (0.46-1.02)	0.77 (0.41-1.03)	0.44 (0.12-0.85)
50-59.9kg/m^2	0.49 (0.34-0.66)	0.71 (0.41-1.00)	0.71 (0.41-1.00)	0.29 (0.11-0.64)
p-value*	0.107	0.779	0.369	0.455
Physical activity				
Sedentary	0.57 (0.32-1.10)	0.75 (0.25-1.00)	0.89 (0.75-1.25)a	0.54 (0.20-1.15)
Irregularly active	0.54 (0.44-0.70)	0.69 (0.48-1.05)	0.71 (0.44-0.98)b	0.34 (0.10-0.42)
Active	0.56 (0.45-0.83)	0.80 (0.59-0.98)	0.75 (0.31-1.00)b	0.45 (0.08-0.82)
p-value#	0.912	0.924	0.041	0.205

*Group 1= proteins; Group 2= vegetables, fruits and olive oil; Group 3= rice, pasta, roots and tubers; Group 4= alcoholic beverages, processed foods, foods rich in sugar, saturated and trans fats, and cholesterol; * IQR: interquartile range. Mann-Whitney u; ** WC: waist circumference; *** BMI: body mass index; [a,b]different letters, statistical differences between the categories; # Kruskal-Wallis test. A posteriori:Mann-Whitney u-test.*

DISCUSSION

The growth rate of morbid obesity can be more expressive than obesity in general, and this reflects the increase in the number of bariatric surgeries performed in Brazil[18]. However, the obese patient needs follow-up at all stages of the process, before and after surgery, to identify and correct food intake and/or need for supplementation, to minimize those with common nutritional complications in this population. The most prevalent nutritional complications reported in the literature are alopecia, asthenia, changes in nail texture, all considered predictive of nutritional deficiencies[19,20].

Clinical-nutritional follow-up before surgery allows correction of these deficiencies and may reduce major nutritional complications. In the present study, we observed that 33.3% of patients took preoperative supplements, such as polyvitamins and minerals, calcium citrate and vitamin D. Patients undergoing disabsorptive surgical procedures should use these supplements in a preventive manner because, in addition to anatomical changes and physiological factors that impair food absorption and/or ingestion, their postoperative use is usually scarce and sporadic, implying a decrease in the patient's nutritional status[8,21].

Most patients were female. This corroborates several other works[20,22-24], woman having a strong aesthetic motivation to weight control and greater concern with health[20]. When comparing the nutritional status of men and women, the preoperative weight, highest weight before surgery and WC were significantly higher in men (p<0.005), confirming that women are more concerned with health and seek health care more than men.

Data from the Telephone Survey for Surveillance of Risk Factors and Protection for Chronic Diseases[25] also pointed to higher obesity growth among adults aged 35 to 44 years, confirming our findings, being different from the average age found in one work also conducted in Recife, in which the population ages are between 41 and 50 years (45.2%)[23].

Regarding years of education, patients with 12 years or more predominated, similar to data obtained by Zyger *et al*.[24], which allows to infer that people with more education seek health services more than those with less[26]. Rosa *et al*.[27] and Rolim *et al*.[23] had different findings.

Regarding physical activity, 40% of patients were active, as also observed by Boscatto *et al*.[28]. This predominance of active individuals may have occurred due to the monitoring program of our Service performed with these patients prior to bariatric surgery. However, there are still high sedentary life rates (31.7%). Physical inactivity is one of the lifestyle aspects that most affect the quality of life of the obese, considered a primary and independent risk factor for the development of obesity. Moreover, it is also related to the quality of the food ingested[24]. A sedentary lifestyle, associated with high intake of simple sugars and fatty foods, presents risk effect for obesity and for other chronic diseases. We observed this association in the study by relating physical activity with food intake, sedentary individuals displaying the highest carbohydrate consumption (p=0.041). Carbohydrates, being an easily accepted food and digestion group, are frequently observed in the diet of obese individuals[29,30].

Thus, the level of physical activity is significantly related to carbohydrate consumption, which allows us to reflect on the importance of assessing dietary intake of obese individuals who are candidates for surgery, to identify and correct dietary errors. Further studies are needed to verify the possible association between food intake and body composition of these individuals.

RESUMO

Objetivo: *avaliar a associação do consumo alimentar com estado nutricional, atividade física e fatores sociodemográficos no pré-operatório de cirurgia bariátrica.* **Métodos:** *estudo transversal, realizado no período de 2018 a 2019, com pacientes internados para a cirurgia bariátrica no Hospital Universitário Oswaldo Cruz da Universidade Federal de Pernambuco. Foram obtidos dados sociodemográficos, estado nutricional pelo índice de massa corporal (IMC), circunferência da cintura, maior peso e peso pré-cirúrgico, consumo alimentar obtido pelo questionário de frequência alimentar baseado na pirâmide alimentar adaptada para o paciente bariátrico e atividade física.* **Resultados:** *participaram do estudo 60 pacientes, sendo 78,3% do sexo feminino, com idades de 38,8±9,6 anos, 53,3% casados e 70% dos indivíduos com mais de 12 anos de estudo. Na prática de atividade física, 31,7% eram sedentários. Sobre o estado nutricional, a média de IMC observada foi de 47,3±6,96kg/m^2. O peso pré-operatório, maior peso atingido antes da cirurgia e circunferência da cintura foi maior no sexo masculino (p<0,05). Houve associação entre atividade física e consumo alimentar, sendo que indivíduos sedentários consumiam mais carboidratos (p=0,041). Por outro lado, dados sociodemográficos e estado nutricional não apresentaram associações com o consumo.* **Conclusão:** *o nível de atividade física evidenciou associação significativa apenas com o consumo de carboidratos.*

Descritores: *Cirurgia Bariátrica. Obesidade. Consumo de Alimentos. Estado Nutricional. Período Pré-Operatório.*

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