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Original

Sugar intake is correlated with adiposity and obesity indicators and sedentary lifestyle in Brazilian individuals with morbid obesity

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Abstract

Obesity is a chronic disease characterized by increased accumulation of body fat. We evaluated the socioeconomic aspects, body composition, risk of metabolic complications associated with obesity, eating habits and lifestyle in both women and men adults and elderly with body mass index (BMI) ≥ 40 kg/m². Among the subjects studied, 79% (n = 32) are female, 5% (n = 2) smokers, 39% (n = 16) use alcohol and only 24% (n = 10) are practitioners of physical exercise. The higher food intake was breads, followed by rice. The daily intake of fruits and vegetables is low. Positive correlation between consumption of sugar and BMI and abdominal circumference (AC) was observed. In summary, was found that morbidly obese patients that looking for nutritional counseling presents increased body fat, poor eating habits and sedentary lifestyle.

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Key words: *Obesity. Food intake. Body composition. Consumption of sugar.*

LA INGESTA DE AZÚCAR SE CORRELACIONA CON INDICADORES DE ADIPOSIDAD Y EL SEDENTARISMO EN LOS INDIVIDUOS BRASILEÑOS CON OBESIDAD MÓRBIDA

Resumen

La obesidad es una enfermedad crónica caracterizada por una acumulación aumentada de grasa corporal. Evaluamos los aspectos socioeconómicos, la composición corporal, el riesgo de complicaciones metabólicas asociadas con la obesidad, los hábitos dietéticos y el estilo de vida en mujeres y hombres adultos y ancianos con un índice de masa corporal (IMC) ≥ 40 kg/m². De entre los sujetos estudiados, el 79% (n = 32) eran mujeres, el 5% (n = 2) fumadores, el 39% (n = 16) consumía alcohol y sólo el 24% (n = 10) practicaba algún ejercicio físico. El mayor consumo de alimentos fue de pan seguido de arroz. El consumo diario de frutas y verduras fue bajo. Se observó una correlación positiva entre el consumo de azúcar y el IMC y la circunferencia abdominal (CA). En resumen, se halló que los pacientes con obesidad mórbida que buscan consejo nutricional presentan un aumento de la grasa corporal, hábitos alimenticios deficientes y un estilo de vida sedentario.

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Palabras clave: *Obesidad. Consumo de alimentos. Composición corporal. Consumo de azúcar.*

Introduction

Obesity is a chronic disease characterized by the excessive accumulation of body fat, which is considered to be one of the biggest public health problems.[1,2] Recently, 1.6 billion adults in the world are overweight and 400 million are obese. In 2015 is estimated that will have 2.3 billion overweight people and 700 million obese.[3]

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The positive energetic balance can be seen as one of the possible obesity causes. Some aspects as compulsive eating, resistance to clinical treatment (insufficient or non-sustained weight loss) and frequent association with interrelated diseases, contribute to weight gain.[4-7]

Obesity represents the highest nutritional problem noticed in the last years, contributing considerably to the increase of Chronic Non-Communicable Diseases (CNCD),[8] which presents high mortality rate. Poor eating habits and sedentary lifestyle, which lead to overweight, were appointed as the second most common cause of death in the United States of America, which stands only behind tobacco smoking.[9-12]

Some studies about evolution of food availability in Latin America point to increasing tendencies of fat and sugar participation in diets.[13-16] There are evidences that

sugar intake influences negatively general characteristics of diet, which may contribute to increase intake of calories[17] leading to metabolic syndrome.[18,19] Therefore, this study aims at evaluating socio-economic aspects, body composition, eating habits and lifestyle in individuals with morbid obesity (body mass index (BMI) ≥ 40 kg/m^2).

Methods

Individuals and methods

Cross-sectional and retrospective study was performed with patients from Nutrition Clinic, named Santa Paulina, at the Catholic University of Santos, located in the city of Santos, Brazil, during the months of March until July 2010. The only criterion used was the inclusion of adult individuals of both genders with BMI ≥ 40 kg/m^2 classified as morbid obesity.

Evaluation of socio-economic and lifestyle characteristics

Socio-economic characteristics were obtained from each patient's record, specifically from the diet anamnesis applied on their first visit day with Nutritionist (complete nutritional evaluation). In this anamnesis, other data were obtained, such as family income, school background, types of occupation, reason for attendance, alcoholism, smoking habits, physical activity (type and frequency) and presence of diseases.

Evaluation of body composition

For the body composition, the abdominal circumference (AC), BMI and body fat percentage were measured. Weight and height measurements were taken according to the model proposed by Lohman et al.[20] The AC measurement was taken with the person in standing position, at the widest abdominal perimeter, between the last rib and the ileac crest, in accordance with the World Health Organization.[21]

Body fat percentage was obtained by bioelectrical impedance (BIA), brand Biodynamics Model® model 310, in accordance with Heyward & Stolarczyk[22] and classified according to Bray,[23] where reference values change with gender (normality for men 15-25% and for women 20-35%).

Evaluation of eating habits

Data about eating habits and consumption were obtained with the food frequency questionnaire defined by own authors and converted into daily servings.

Food frequency questionnaire was accomplished as follows: frequency by week, number of times that the patient reported consumption per week divided by seven (days of week), which is obtaining a decimal value. For daily servings, the following example: bread 4 times per week à 4/7 = 0.57 (represents how many times it is consumed in day). If it is daily frequency, the numbers are whole, 1, 2 or more times a day, that is, the following terminology is considered: 1x a week (0.14), 2x a week (0.28), 3x a week (0.42), 4x a week (0.57), 5x a week (0.71), 6x a week (0.82) and 7x a week, for instance, all days are equivalent to1.

Table I
Socio-demographic characteristics of patients

Variables	*n (%)*
Gender	
Female	32 (79)
Male	9 (21)
Family Income	
1-2 minimum wages	10 (24)
Over 2 minimum wages	31 (76)
Educational background	
Up to high school	29 (71)
High school (ongoing, incomplete or complete)	12 (29)
Occupation	
Retired/Homemaker	16 (39)
With paid activity	25 (61)
Reasons for attendance	
Life quality improvement	36 (87)
Others[(1)]	5 (13)
Alcoholism	
Yes	16 (39)
No	25 (61)
Smoking	
Yes	2 (5)
No	39 (95)
Physical activity	
No	31 (76)
Yes[(2)]	10 (24)
BMI (Body Mass Index)	
> 40 ≤ 45	26 (63)
> 45 < 50	11 (27)
> 50	4 (10)
Correlated diseases	
CNCD[(3)]	56 (61)
Bones[(4)]	9
Psychic[(5)]	12
GIT[(6)]	5
Others[(7)]	9

[(1)]Recommendations for bariatric surgery, breast cancer.
[(2)]Walking, soccer, weight training, aerobic exercises.
[(3)]Chronic non-communicable diseases: bronchitis, breast cancer, cardiomegaly, diabetes, dyslipidemia, hypertension, obesity.
[(4)]Arthritis, bone pains, herniated disc, osteoporosis.
[(5)]Psychics: anxiety, depression, bipolar disorder.
[(6)]Gastrointestinal Tract: colitis, gastritis, hiatal hernia.
[(7)]Others: uric acid, hepatic steatosis, glaucoma, hypothyroidism, labyrinthitis, Down syndrome, Hashimoto syndrome.

Statistical analysis

Statistical analysis were performed by STATISTICA 6.0 software, adopting $p < 0.05$ as significant level. Data were distributed into mean, median, minimum, maximum and standard deviation. Pearson's correlation was performed to correlate the sugar consumption with BMI and AC, and bread servings with physical activity level.

Results

In table I, from the 41 patients assessed, 79% (n = 32) were both adult and elderly women and 21% (n = 9) adult and elderly men. As for the financial condition, based in family income in minimum wages, approximately 76% (n = 31) presented an income of over 2 wages.

As for school background, was observed that individuals present low level: 71% (n = 29) studied up to high school. The type of occupation corresponds to the current job, and not necessarily to the user's educational training. Therefore, were considered jobs like candy store and coffee shop clerks, accountant, nurse and pharmacy's assistants, journalist, teacher, physiotherapist, among others (table I).

Most patients, 87% (n = 36), came to the nutritional clinic at University to improvement quality of life and to lose weight through Brazilian food guide pyramid (table I).

According to the individuals themselves, only 5% (n = 2) had smoking habits and 39% (n = 16) consumed alcoholic beverages. In the same proportion, physical activity is rare in more than half of the patients, only 24% (n = 10) engaged in some form of weekly physical activity (table I).

On table II, was we observed that the maximum BMI found was 54 kg/m^2, the same way the maximum AC was 148 cm, values considered to be very high according to the cut-off points of WHO. Body fat percentage was present in 97.6% (n = 40) from individuals evaluated, in according to Bray.[23]

We also verified that bread and rice (cereal, roots and tubercles group) presented a high level of daily consumption (73.2% and 87.8%; n = 30 and n = 36, respectively). The daily consumption of cooked/uncooked greens occurred only 56.1% (n = 23) for leaves and 43.9% (n = 18) for vegetables. The daily consumption of fruit was also was not sufficient: 51.2% (n = 21). It was clarified with a low daily intake of natural fruit juice, 46.3% (n = 19) who was consumed "rarely/never". For the sugar servings intake, 34.1% (n = 14) consumed every day, which may be the result of its replacement for dietetic sweeteners, since they were consumed more often daily (53.7%) (n = 22). The result of the consumption frequency of sweets was for most interviewed subjects (39%, n = 16) intake "weekly" and only 6 (14.6%) report intake daily. Besides, the most food daily is bread, followed by rice, which was observed intake of once per day (table III).

With aim to clarify what food group is responsible to aggravate of morbid obesity, we performed the analysis of Pearson's correlation, thus we observed a positive correlation between sugar intake and BMI (fig. 1) and AC (fig. 1B), which could have happened because the individuals who have higher BMI. Furthermore, was found a negative correlation between the consumption frequency of bread with physical activity frequency per week (fig. 2).

Discussion

According to socio-economic data, we observed that morbid individuals evaluated in the present study are low level of school background and family income (table I); which is related to the poor nutrition quality, instead of ingestion of fruit and greens.[24] On the other hand, overweight in Brazil reaches half of the men and women, exceeding 28 times the prevalence of underweight in men and 13 times in women.[25]

According to correlation analysis of figures 1A and 1B, we found a similarity with the study of Levy et al.[13] which evaluated the influence sugar consumption on energetic participation of macronutrients from diet and observed that for each calorie gained from sugar increases in 0.3 the participation calories of fats and

Table II
Profile anthropometric of patients

Variables	*Mean*	*Median*	*Minimum*	*Maximum*	*S.D.*
Age (years)	48.5	49.0	20.0	80.0	15.5
BMI adults	44.6	42.6	40.3	54.0	3.7
BMI elderly	43.7	43.1	40.1	47.6	2.6
% Fat male	34.8	34.9	29.8	39.6	2.9
% Fat female	44.6	45.2	31.8	50.1	3.5
Abdominal Circumference (cm) male	131.7	133.0	120.0	148.0	10.5
Abdominal Circumference (cm) female	123.6	116.0	117.0	125.0	8.9

BMI: Body mass index; S.D: Standard deviation.

Table III
Food frequency questionnaire in accordance with food groups

Food	*Daily*		*Weekly*		*Sometimes*		*Rarely/Never*		*Total number*
Cereal, Roots and Tubercles Group									
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	
Bread	30	73.2	10	24.4	0	0.0	1	2.4	41
Rice	36	87.8	4	9.8	0	0.0	1	2.4	41
Cereals Bars	2	4.9	10	24.4	2	4.9	27	65.9	41
Pasta	1	2.4	29	70.7	9	22.0	2	4.9	41
Potato	3	7.3	25	61.0	11	26.8	2	4.9	41
Corn	0	0.0	4	9.8	9	22.0	28	68.3	41
Crackers	8	19.5	14	34.1	10	24.4	9	22.0	41
Cookies	3	7.3	6	14.6	7	17.1	25	61.0	41
Mean	10.4	–	12.8	–	6.0	–	11.9	–	–
Vegetable and Fruit Group									
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	
Cooked/Uncooked Leaves	23	56.1	14	34.1	4	9.8	0	0.0	41
Cooked/Uncooked Vegetables	18	43.9	19	46.3	2	4.9	2	4.9	41
Fruits	21	51.2	17	41.5	0	0.0	3	7.3	41
Fruit Juice	4	9.8	15	36.6	3	7.3	19	46.3	41
Mean	16.5	–	16.25	–	2.25	–	6	–	–
Meat and Egg Group									
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	
Eggs	2	4.9	26	63.4	8	19.5	5	12.2	41
Red Meat	12	29.3	27	65.9	2	4.9	0	0.0	41
Swine Meat	0	0.0	7	17.1	12	29.3	22	53.7	41
Poultry Meat	5	12.2	30	73.2	5	12.2	1	2.4	41
Fish	1	2.4	11	26.8	12	29.3	17	41.5	41
Mean	4	–	20.2	–	7,8	–	9	–	–
Sugar and Sweet Group									
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	
Sugar	14	34.1	4	9.8	0	0.0	23	56.1	41
Sweetener	22	53.7	1	2.4	1	7.3	15	36.6	39*
Chocolate Powder Mix	4	9.8	7	17.1	5	12.2	25	61.0	41
Filled Cookies	1	2.4	5	12.2	8	19.5	27	65.9	41
Sweets in general	6	14.6	16	39.0	9	29.3	7	17.1	38*
Jam	0	0.0	3	7.3	5	12.2	33	80.5	41
Powder Juice	9	22.0	8	19.5	7	17.1	17	41.5	41
Mean	8.0	–	6.3	–	5.7	–	21.0	–	–

*Numbers of food frequency questionnary with no answer in this item.

reduces in 0.07 the participation of proteins, which may be one of the reasons for favoring weight gain and increasing of AC.[13] Monteiro et al.[26], in the last three decades, one of the main change in dietary pattern was the increase of simple sugar intake.

As observed in the present study, more than half of the individuals consume fruit and greens daily (table II). This is also verified in other regions of Brazil, where consumption of fruit and greens, in five or more days per week, is 7.3% in Macapá and 38.6% in Porto Alegre.[27]

According to the correlation between physical activity levels and bread consumption (fig. 2), we observed that patients who engage in physical activity frequently present improvement in eating habits. Thus, the initiative of eating habits re-education during morbid obesity is seen as a good nutritional evolution. Besides, is known that physical activity can improvement insulin sensitivity, increasing the expression of the intracellular proteins from insulin signaling, such as the phosphorylation in tyrosine of insulin receptor and insulin receptor substrate 1, as well as to increase the transport of glucose

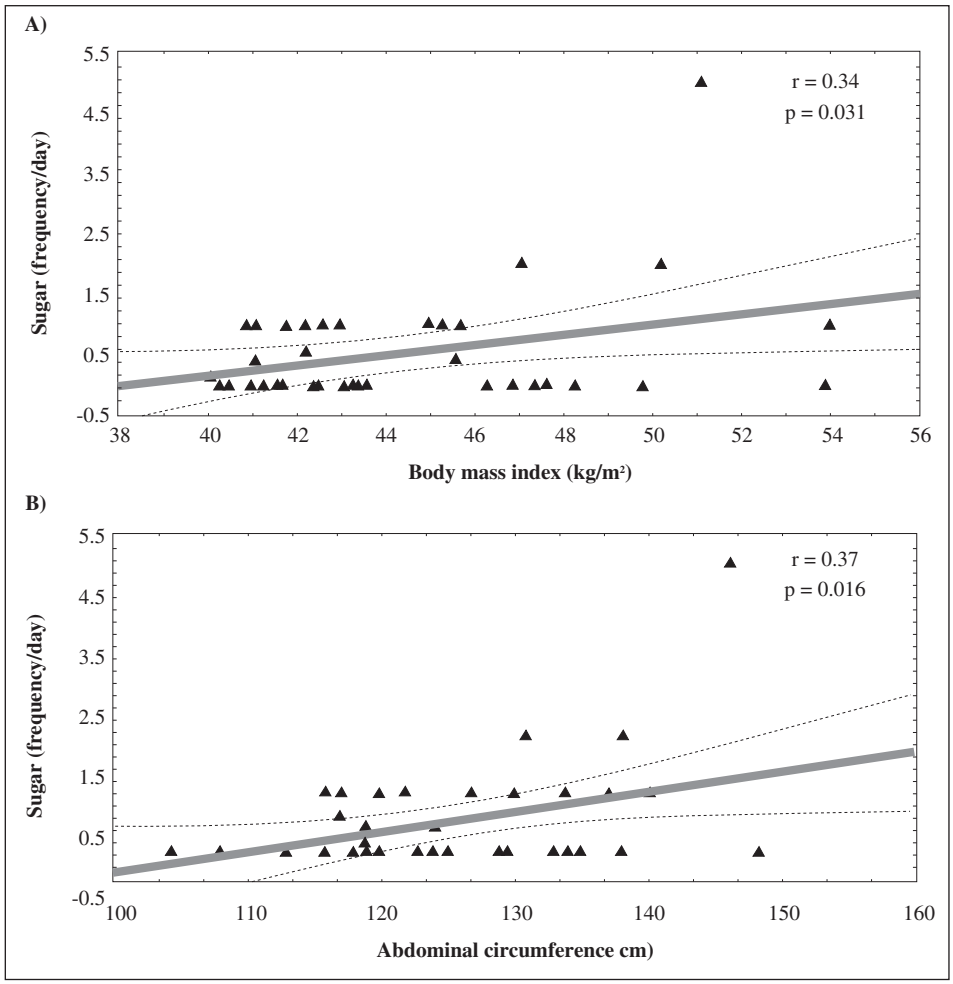

Fig. 1.—Positive relation between sugar intake frequency and body mass index and abdominal circumference.

in the skeletal muscle. Exercises also increase blood flow, allowing higher insulin availability for other peripheral tissues.[28] This is a highly important factor, considering that sedentary lifestyle is present in subjects evaluated in present study.

Evidences indicate that physical exercise, changes in eating habits and non-pharmaceutical treatments, decreases AC, arterial pressure and triacylglycerol levels, reducing obesity, as well as the prevalence of metabolic syndrome.[4,5,29]

According to OPAS[30] the low physical activity level causes 1.9 million deaths per year in the world. In general, is estimated that the lack of exercise may be responsible for 10% to 16% of breast and colon cancer and diabetes, and for 22% of the ischemic heart disease. However, chronic diseases are responsible for 59% of 56.5 million annual deaths and 45.9% of total amount of diseases.

In present study, 100% of individuals are found at risk of metabolic problems associated to obesity, according to AC. Furthermore, AC is the best parameter to assess the risks imposed by accumulation of fat cells, once fat triples the risk for heart attacks or strokes; raises 5 times the probability of developing diabetes; offers 30% of cancer risk, especially of breast, uterus and colon; raises serum triacylglicerol levels and LDL-c; increases blood pressure; and contributes to sleep apnea.[31-34]

Gomes[35] found that fruits, greens and vegetables as part of habitual diet can prevent non-communicable chronic diseases, besides yielding an appropriate ingestion of micronutrients and fibers. However, Ferreira & Magalhães[36] observed that the consumption of vegetables is rarely achieved by obese subjects. On the other hand, a household survey conducted in São Paulo city from 1979 to 1999, showed an increase of 500% of consumption of sweets.[37] It cannot be stated for sure, but in some cases, the food frequency questionnaire is not answered truthfully and facts might be obscured. To avoid embarrassment, the lie appears as a mode to cover dysfunctional behavior.[38]

Conclusion

In summary, we verified that morbid obsesses who are looking for nutritional counseling presents poor eating habits and sedentary lifestyle.

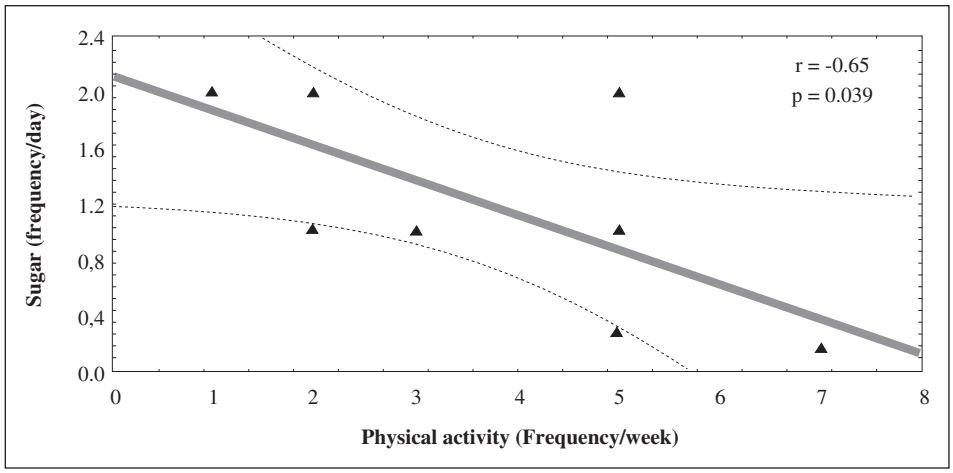

Fig. 2.—Negative relation between bread consumption frequency and physical activity frequency per week.

Particularly, sugar was considered one of main aggravating factors of body gain and physical exercise frequency showed to be associated with the reduction of bread intake. Therefore, we highlight the relevance of associating physical activity plus nutritional counseling for reduction of body fat in individuals with morbid obesity.

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