Association between Dietary Patterns and Body Composition in a Group or Puerto Rican Obese Adults: a Pilot Study

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Objective: Obesity is a public health problem in Puerto Rico. Dietary patterns that include high intakes of energy and sweetened drinks and low consumption of fruits, vegetables and fiber are associated with obesity. The aim of this study is to relate dietary patterns with body composition in obese subjects.

Methods: Dietary patterns were evaluated using 3-day food records. Body composition was assessed by body weight, hip and waist circumferences and % body fat, and then used to classify subjects by obesity stages using BMI and by low or high risk using WHR or % body fat. The resulting comparison groups were associated with energy, macronutrients, fruits, vegetables, fiber, and sweetened drinks intake and with meal energy density and meal frequency intake. Kruskal Wallis and Mann Whitney tests were used to compare groups and Spearman correlations were used for continuous variables.

Results: Thirty subjects completed the study. By BMI, 30% were obese type I, 33% type II and 37% type III; by WHR, 43% were low risk and 57% high risk; by % body fat, all were high risk. Dietary patterns were similar between groups. WHR was positively correlated with fiber consumption (r=0.42; p<0.05) and CHO intake (r=0.35; p=0.057).

Conclusion: In this pilot study, dietary patterns appeared similar between groups and sound with nutritional recommendations; however, we observed a poor quality of the diet due to very low intakes of fruits, vegetables and fiber and high intakes of sweetened drinks. [*P R Health Sci J 2011;1:22-27*]

Key words: Body composition, Obesity, Waist to hip ratio, Dietary patterns

Overweight and obesity are serious public health problems in Puerto Rico and worldwide. It is estimated that 63% of adults in the US population are overweight or obese, while in Puerto Rico, the prevalence is 65% (1). Overweight and obesity are risk factors of several chronic diseases, such as diabetes mellitus, coronary heart disease, hypertension, osteoarthritis, and many types of cancer, leading to excessive death and lack of total health (2).

Several studies have shown that overweight and obesity are associated with dietary patterns that include low consumption of fruits, vegetables and fiber and high intake of sweetened drinks, and increased energy intake (3-5). Sugar sweetened drinks, especially those carbonated, provide little nutritional benefit and contribute to increase weight gain, and probably also increase the risk of diabetes, fractures, and dental cavities (6). The meal time patterns, as frequency of meals, snacks and missing meals have also been suggested as important aspects in energy regulation, as most adult studies show that lower meal frequency consumption is associated with a higher Body Mass Index (BMI) (7).

Little information is available relating dietary patterns and body composition in Puerto Ricans. It is important to identify the dietary patterns that contribute to overweight and obesity in our population, to later design effective and sound nutritional interventions to help reduce this condition. Therefore, the present study aimed to relate dietary patterns with body composition in a group of Puerto Rican obese subjects.

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The authors have no conflict of interest to disclose.

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Subjects were classified by BMI, waist to hip ratio (WHR), and percent (%) body fat, and these groups were related with dietary patterns. Dietary patterns were defined in the present study as a combination of factors associated with intake, such as energy and macronutrients (protein, carbohydrate (CHO) and fat) intake, specific food groups (fruit, vegetable, fiber and sweetened drinks) intakes, meal frequency intake and energy density of meals.

Methods

This was a secondary analysis from a clinical study in obese adults performed in the Puerto Rico Clinical and Translational Research Consortium (PRCTRC), in the University of Puerto Rico, Medical Sciences Campus (UPR-MSC). The aim of the main study was to test the impact of a high dairy and elemental calcium intake on body composition and blood lipids in a group of obese Puerto Rican adults. This study was approved by the Institutional Review Board (IRB) of the UPR-MSC.

Subjects

Sedentary obese subjects, aged 22-50 years, were recruited through flyers, local newspaper and radio advertisements in the San Juan area in Puerto Rico. The sample size calculation was done in the main study with a one-way analysis of variance, resulting in 7 subjects per group, which was increased to 30 to allow for drop-outs. Following preliminary screening by telephone, volunteers were invited to the PRCTRC for an orientation meeting. A detailed description of the study was provided and written consent form was obtained from each participant. Eligibility criteria included being 21-50 years old, with a body mass index (BMI) of 30 kg/m^2 or more, with no chronic health conditions, not taking calcium supplements or taking medication regularly (including hormones, birth control pills, weight reducing pills, insulin, cholesterol reducing pills), and not lactose intolerance. Women were ineligible if they were pregnant or lactating, which was verified by a urine-based pregnancy test. These criteria were defined based on the main study of calcium and body composition (8).

Assessments

Dietary patterns were evaluated with a 3-day food record, which was completed by all subjects at home. Each subject was asked to record all foods and drinks consumed (including alcohol intake) during 24 hours for three days, two days of the week and one day of the weekend. Subjects were asked to specify time and place of each meal, type of foods, preparations, and brands as precisely as possible, and the amount of each food and beverage consumed. Detailed oral and written instructions were given to each subject to take home. In addition, each subject received a portion size picture booklet, which included food models of typical foods, measuring cups and spoons, different sized bowls, glasses, plates and mounds, to help subjects estimate portion sizes. Each record was carefully reviewed by a registered dietitian for completeness and accuracy of recording and analyzed using the Nutritionist Pro Nutrient Analysis Software (2007, Axxya System, Stafford, TX). This record was used to calculate average consumption of energy, CHO, protein, fat, fiber and consumption of fruits, vegetables, and sweetened drinks servings. For fruits, a serving was considered as one medium whole fruit, ½ cup fruit in pieces or 4 ounces of 100% fruit juice; for vegetables, a serving was considered as 1 cup raw or ½ cup cooked vegetables; and for sweetened drinks, a serving was considered as 12 ounces of carbonated drink, lemonade, iced tea or juice drink. These serving sizes were automatically calculated by the software. Alcohol consumption was not included in the analysis because only 2 subjects reported its consumption during this period of time. In addition, meal energy density (ED) was calculated using the following formula: total kcal / total weight of the foods (g). Meal frequency intake was calculated as average of number of meals recorded per day and timing (breakfast, morning snack, lunch, afternoon snack, dinner and nighttime snack).

For body composition, the following measurements were performed: body weight, height, waist and hip circumference, and % body fat. These measurements were used to later classify subjects by BMI, waist-to-hip ratio (WHR) and % body fat. Body weight was measured with a calibrated scale (Detecto Inc., IL), and height was measured using a wall-mounted tape. BMI was defined as the individual's body weight divided by the square of his or her height and was labeled as kg/m^2 unit. Subjects were classified by BMI as obesity type 1 (BMI 30.0-34.9 kg/m^2), obesity type 2 (BMI 35.0-39.9 kg/m^2) or obesity type 3 (BMI ≥40.0 kg/m^2) (WHO, 2006). Waist circumference was taken to assess the fat distribution, using a measure tape between the edge of the ribs and the iliac crest. Hip circumference was taken placing the measuring tape at the maximum extension of the buttocks. WHR was then calculated as: waist circumference (cm) / hip circumference (cm). Subjects were classified by WHR as low risk (WHR <0.85 in women and <1.00 in men) or as high risk (WHR ≥0.85 in women and ≥1.00 in men) (9). These anthropometric measurements were taken by the PRCTRC trained personnel, with subjects in standing position, with the weight evenly distributed on both feet, and wearing light clothing, no shoes or accessories. Percent body fat was assessed by dual x-ray absorptiometry (DXA) (Hologic DP-W, Bedford, MA). Subjects were classified by % body fat as high risk (>39% if 20-39 y, >40% if 40-59 y and >42% if 60-79 in women; and >25% if 20-39 y, >27% if 40-59 y and >30% if 60-79 y in men) or low risk (if below these percentages) (10).

Physical activity was assessed by the Framingham Physical Activity Index questionnaire (11), which has been previously validated in Puerto Rican adults (12). A person who reports sleeping all day will have an index of 24 while a very active person will have an index of 72. This questionnaire was completed during 3 days at home. Detailed oral and written instructions were provided. Each questionnaire was carefully reviewed by a member of the research team for completeness and accuracy.

Statistical analysis

Median and 25th and 75th percentiles were computed for all the continuous variables. To test differences in dietary patterns between the BMI, WHR and % body fat classifications, Kruskal Wallis and Mann Whitney tests were performed, accordingly. In addition, Spearman correlations were performed between measures of dietary patterns and BMI or WHR as continuous variables. Study data were collected and managed using REDCap electronic data capture tools hosted at UPR-MSC (13). REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies. Statistical significance was set at $p<0.05$. The statistical SPSS software program (version 15.0, 2006, SPSS Inc, Chicago, IL) and Microsoft Excel for Windows 2007 were used for all the statistical analyses. All data are presented as median (25th and 75th percentiles).

Results

A total of 30 subjects completed the study, 24 women and 6 men. Table 1 shows subjects' baseline characteristics according to BMI and WHR classifications. The distribution of obesity in the total sample size was 30.0% for obesity type 1, 33.3% for obesity type 2, and 36.6% for obesity type 3, for a median BMI of 38.2 kg/m2. All subjects were classified as obese by % body fat (median 44.2%, 25th and 75th percentiles 40.8-47.1%); therefore, we were not able to have a comparison group for body fat. Age, educational level and physical activity index were similar in all groups, with a median age of 38.4 years, median educational level of 16 years and median physical activity index of 28.4, which reflects a sedentary level.

Energy, macronutrient and food intakes are shown in Table 2. The distributions of energy and macronutrient intakes were similar among the BMI and WHR classifications. Median calorie intake for all the subjects was 1,861 kcal, median protein intake was 83.3 g, median CHO intake was 229 g and median fat intake was 70 g. No significant correlations were observed between BMI and the consumption of energy or macronutrients but a positive trend was observed between WHR and CHO intake ($r=0.35$, $p=0.057$) (Table 3). There were also no significant differences in the intakes of fiber, fruits, vegetables and sweetened beverages (including fruit juices) by BMI or WHR classifications (Table 2). However, we found a significant correlation between WHR and fiber consumption ($r=0.42$, $p<0.05$) (Table 3). Daily fruit consumption was very low (median 0 servings/day), while daily consumption of sweetened drinks was high (median 1.9 servings/day). Also, we found that total dietary fiber intake was low, only 10.5 g/d.

Most subjects consumed the 3 main meals and about half of them consumed snacks; however, meal frequency was not significantly different among groups according to BMI or WHR classification (Table 2). Most subjects consumed 3 to 5 meals per day (median 3.67 meals/d). There were no significant differences in the number of meals eaten by obesity classifications. No significant correlations were found between numbers of meals and BMI or WHR (Table 3).

Meal energy density (ED) by BMI and WHR classification is also shown in Table 2. There were no significant differences between the ED of meals and snacks among the groups. No significant correlations were found between ED of meals and BMI or WHR (Table 3).

Discussion

The present pilot study showed that dietary patterns (energy and macronutrient's consumption, fiber, fruits, vegetables, and sweetened drinks' intake, meal frequency intake and meal energy density) in this small sample size of 30 obese Puerto Rican adults were similar between BMI and WHR classifications. However, we found that WHR was positively correlated with CHO intake and fiber consumption.

Although in this study we did not find a significant association between energy and macronutrient's intake and body

Table 1. Baseline characteristics of the subjects (median (25th and 75th percentiles))

Classification	By BMI[1]			By WHR[2]		Total
	Type 1 N=9	Type 2 N=10	Type 3 N=11	Low Risk N=13	High Risk N=17	N=30
Age (years)	41.8 (40.8-45.9)	34.5 (29.8-40.2)	34.6 (30.7-43.5)	35.8 (32.1-44.2)	41.1 (30.9-43.7)	38.4 (31.1-43.9)
Educational level (years)	16.0 (14.0-16.0)	16.0 (15.0-16.0)	16.0 (14.0-16.0)	16.0 (16.0-16.0)	16.0 (12.0-16.0)	16.0 (15.5-16.0)
Physical activity index	28.5 (27.4-29.8)	28.2 (27.3-30.1)	31.9 (26.5-33.2)	27.7 (26.9-30.1)	28.7 (27.6-32.5)	28.4 (27.4-32.0)
BMI (kg/m²)	31.9 (31.4-34.4)	37.6 (36.9-40.0)	46.6 (44.6-47.6)	–	–	38.2 (34.4-45.2)
WHR	–	–	–	0.82 (0.80-0.91)	0.92 (0.87-0.95)	0.88 (0.82-0.94)

[1]BMI (body mass index) classification: type I (BMI 30.0-34.9 kg/m²), type II (BMI 35.0-39.9 kg/m²), and type III (BMI ≥40.0 kg/m²)
[2]WHR (waist to hip ratio) classification: low risk (WHR <0.85 in women and <1.00 in men) and high risk (WHR ≥0.85 in women and ≥1.00 in men)
No significant differences were found among the 3 BMI classifications by Kruskal Wallis or between the 2 WHR classifications by Mann Whitney.

composition, others have. A study in 847 adult subjects from Belgium found that overweight and obese men had higher total energy, protein and fat intakes compared with normal weight men (14). Energy percentages from carbohydrates and fiber were negatively related to BMI in men, whereas in women a higher CHO and fiber intake was positively associated with obesity. Also, a large study in Greece with 27,862 healthy adults found that protein intake was positively associated with BMI (15). The lack of significant associations in our study may be related to the small sample size; therefore, a larger study is warranted in this population.

In the present study we did not find a significant association between fruits and vegetables intakes and body composition, although those classified as obese type III (by BMI classification) and with high risk (by WHR classification) consumed fewer fruits and vegetables compared with the other groups (not statistically significant). Others have found an inverse relation between fruits and vegetables intakes and obesity. A cross-sectional analysis of 11,707 adults in Europe found an inverse association between fruits and vegetables intake and weight gain (16). In addition, an analysis from the Nurses' Health Study with 74,063 women found that fruits and vegetables consumption prevented weight gain and reduced the risk of obesity (4). It is likely that in the present study the lack of statistical significance between fruits and vegetables intakes with body composition is due to the limited sample size. It is worth mentioning that daily fruits and vegetables consumption was extremely low compared to other reports, which was 0 (0.0-0.6) servings of fruits per day and 0.3 (0.0-0.7) servings of vegetables per day. A large cohort study in adult nurses found an average fruit intake of 1.9 servings per day and vegetable intake of 3.2 servings per day (4), which is considerably greater than the present study.

Although we did not find an association between obesity and sweetened drinks intake, other studies have. A study in adults from rural communities of Wyoming, Montana and Idaho found a significant association between the consumption of sweetened drinks and overweight (17). Another study

Table 2. Energy, macronutrient and food intakes, meal frequency and meal energy density by BMI and WHR classification (median (25th and 75th percentile))

Classification	By BMI[1]			By WHR[2]		Total
	Type 1 N=9	Type 2 N=10	Type 3 N=11	Low Risk N=13	High Risk N=17	N=30
Energy and Macronutrients						
Energy (kcal)	1766 (1576-2196)	1861 (1783-2186)	2167 (1493-2350)	1827 (1592-2252)	1878 (1524-2372)	1861 (1578-2339)
Protein (g)	79.9 (62.3-89.8)	84.8 (64.3-92.0)	83.6 (65.2-95.5)	84.2 (64.9-92.7)	79.6 (62.3-89.8)	83.3 (64.9-91.6)
CHO (g)	228.6 (184.4-262.4)	241.6 (222.8-271.2)	208.9 (162.8-271.1)	219.7 (184.4-251.3)	244.4 (212.8-284.1)	229.2 (192.3-265.1)
Fat (g)	70.7 (57.7-89.0)	69.1 (56.0-85.3)	69.2 (51.0-91.9)	66.4 (57.9-89.2)	70.7 (52.8-84.5)	70.0 (54.3-88.6)
Fruits/Vegetables/ Sweetened Drinks						
Fruits (servings)	0.0 (0.0-0.3)	0.2 (0-1.1)	0.0 (0.0-0.3)	0.0 (0.0-0.9)	0.0 (0.4)	0 (0.0-0.6)
Vegetables (servings)	0.5 (0.0-0.9)	0.4 (0-0.7)	0.2 (0.0-0.7)	0.2 (0-0.6)	0.5 (0.8)	0.3 (0.0-0.7)
Sweetened drinks (servings)	2.4 (1.3-4.7)	1.7 (0.6-4.0)	1.9 (0.9-3.3)	2.4 (0.8-4.3)	1.7 (2.7)	1.9 (0.8-3.9)
Meal Frequency						
Breakfast (%)	100 (100-100)	100 (100-100)	100 (67-100)	100 (100-100)	100 (83-100)	100 (100-100)
Morning snack (%)	33 (17-67)	33 (33-75)	33 (0-100)	33 (17-100)	33 (33-67)	33 (33-67)
Lunch (%)	100 (67-100)	100 (67-100)	100 (100-100)	100 (100-100)	100 (67-100)	100 (67-100)
Afternoon snack (%)	33 (33-83)	33 (0-100)	33 (0-67)	67 (33-100)	33 (0-67)	33 (0-67)
Dinner (%)	100 (50-100)	100 (67-100)	100 (100-100)	100 (83-100)	100 (83-100)	100 (92-100)
Night-time snack (%)	33 (0-67)	50 (0-67)	67 (33-100)	67 (17-67)	67 (0-67)	67 (0-67)
Number of meals	3.67 (3.33-5.00)	4.33 (3.59-5.00)	3.67 (3.33-5.00)	4.33 (3.33-5.00)	3.67 (3.33-4.84)	3.67 (3.33-5.00)
Meal Energy Density						
Breakfast	0.94 (0.71-1.29)	0.92 (0.86-1.73)	1.23 (0.79-1.55)	0.79 (0.67-1.31)	1.12 (0.90-1.50)	0.95 (0.79-1.40)
Morning snack	1.05 (1.82-1.62)	1.04 (1.53-1.95)	0.57 (0.37-1.84)	0.89 (0.57-1.37)	1.05 (0.46-1.45)	0.89 (0.48-1.36)
Lunch	1.07 (0.95-1.36)	1.14 (0.95-1.77)	1.16 (0.86-1.17)	1.05 (0.91-1.30)	1.16 (0.95-1.30)	1.13 (0.93-1.91)
Afternoon snack	0.71 (0.46-3.16)	0.94 (0.44-1.32)	0.55 (0.44-2.18)	0.74 (0.51-1.03)	0.85 (0.38-2.91)	0.74 (0.44-1.97)
Dinner	1.11 (0.93-1.43)	0.68 (0.66-1.38)	1.1 (0.89-1.17)	0.84 (0.68-1.26)	1.30 (0.86-1.43)	1.02 (0.81-1.35)
Night-time snack	0.61 (0.36-1.34)	1.00 (0.65-2.30)	0.61 (0.52-1.06)	0.61 (1.28-3.82)	0.84 (1.66-4.77)	0.75 (0.52-3.04)

[1]BMI (body mass index) classification: type I (BMI 30.0-34.9 kg/m^2), type II (BMI 35.0-39.9 kg/m^2), and type III (BMI ≥40.0 kg/m^2)
[2]WHR (waist to hip ratio) classification: low risk (WHR <0.85 in women and <1.00 in men) and high risk (WHR ≥0.85 in women and ≥1.00 in men)
No significant differences were found among the 3 BMI classifications by Kruskal Wallis or between the 2 WHR classifications by Mann Whitney.

suggested that sweetened drinks can promote weight gain and obesity, by increasing total energy intake (6). In the present study, sweetened drinks intake, which included all fruit juices and sodas, was 1.9 servings per day and it represented more than 15% of the total daily calories. This is higher compared to that reported from NHANES data, which found that 9.2% of total calories came from sweetened drinks in the US population (18).

Contrary to most reports, we found that fiber consumption was positively correlated with WHR; however, considering our small sample size, this should be taken cautiously and confirmed with a larger sample size. Others have found fiber consumption inversely correlated with body weight (19) and weight gain (16). However, the study by Duvigneaud et al (14) in Belgium found a direct correlation between fiber intake and obesity, similar to our study. The very low fiber intake in the present study, which was 10.5 g/d, is consistent with the low intake of fruits and vegetables.

We did not find an association between the numbers of meals eaten by the subjects, which median was 3.6 meals per day, and BMI or WHR, contrary to other reports, possible due to our small sample size. A study in the UK in 95 adults found that the average number of meals consumed by women (4.4 meals per day) and men (4.3 meals per day) were negatively correlated with body weight and BMI (20). Furthermore, a study in 330 French men found that BMI and WHR declined significantly as the number of occasions of meals increased (21). We also did not find associations between energy density of the meals and the obesity classifications. A large study analyzing data from NHANES (1999-2004) found that individuals who regularly consume snacks are less obese compared to non-snackers (22). However, a high energy density of all meals was found to be significantly and positively associated with gain weight and greater BMI with time in 186 Caucasian women (23). Women who consumed diets lower in energy density reported lower energy intakes and consumed fewer servings of desserts, refined grains, and fried foods, and consumed more servings of fruit and cereal. Therefore, although energy density of all meals may lead to greater BMI, energy density of snacks may do the opposite.

Table 3. Correlations between dietary variables and BMI or WHR classifications

Dietary variable	By BMI[1] Spearman correlation	By BMI[1] p value	By WHR[2] Spearman correlation	By WHR[2] p value
Energy and Macronutrients				
Energy (kcal)	0.11	0.578	0.26	0.160
Protein (g)	0.02	0.915	0.25	0.174
CHO (g)	-0.06	0.771	0.35	0.057
Fat (g)	-0.05	0.815	-0.08	0.683
Fiber (g)	-0.02	0.932	0.42	0.021
Fiber/fruits/Vegetables/ Sweetened Drinks				
Fruits (servings)	0.15	0.423	-0.17	0.370
Vegetables (servings)	-0.15	0.435	0.13	0.494
Sweetened drinks (servings)	-0.10	0.959	0.25	0.187
Meal Frequency				
Breakfast (%)	-0.17	0.366	-0.07	0.730
Morning snack (%)	-0.01	0.954	0.25	0.186
Lunch (%)	0.17	0.426	-0.06	0.735
Afternoon snack (%)	-0.16	0.376	-0.03	0.873
Dinner (%)	0.15	0.403	-0.17	0.366
Night-time snack (%)	0.15	0.417	0.25	0.185
Number of meals	-0.12	0.527	0.00	0.987
Meal Energy Density				
Breakfast	0.28	0.450	-0.10	0.595
Morning snack	-0.28	0.176	-0.29	0.164
Lunch	-0.15	0.953	0.07	0.730
Afternoon snack	-0.03	0.131	0.28	0.137
Dinner	0.01	0.873	-0.02	0.940
Night-time snack	0.07	0.366	-0.07	0.744

[1]BMI (body mass index) classification: type I (BMI 30.0-34.9 kg/m^2), type II (BMI 35.0-39.9 kg/m^2), and type III (BMI ≥40.0 kg/m^2)
[2]WHR (waist to hip ratio) classification: low risk (WHR <0.85 in women and <1.00 in men) and high risk (WHR ≥0.85 in women and ≥1.00 in men)

The main limitations of the study were the small sample size and the lack of a comparison group (normal weight or overweight), which may have limited the ability of finding significant associations in many of the variables tested. In addition, smoking habits were not taken into consideration. However, the present study carefully reviewed the dietary patterns of obese individuals, by processing the food records by a trained registered dietitian, which minimized changes in the interpretation of foods and serving sizes. In addition, the use of a booklet with illustrations of food and serving sizes found it easier to estimate serving sizes, a great limitation in most nutritional studies. Furthermore, this is the first study reporting associations between dietary patterns and body composition in Puerto Ricans. Further research is needed to confirm these results with a greater sample size.

In conclusion, the present pilot study showed that energy, protein, CHO and fat intake and meal patterns were apparently similar within the BMI or WHR classifications in this small group of Puerto Ricans. Total energy intake, macronutrients intake distribution and meal frequency intake appeared nutritionally adequate. However, we observed in this group that diet quality was poor, due to the very low consumption of fruits, vegetables and fiber, and a high consumption of sweetened drinks. We propose further studies with a larger sample size and including individuals considered normal as well as overweight/obese by BMI and WHR standards, to study the dietary patterns that promote a healthier lifestyle.

Resumen

Objetivo: El sobrepeso y la obesidad son problemas de salud pública en Puerto Rico. Los hábitos dietarios que incluyen el alto consumo de energía y bebidas azucaradas y el bajo consumo de frutas, vegetales y fibra están asociados con la obesidad. El propósito de este escrito fue relacionar los hábitos dietarios con la composición corporal en 32 sujetos obesos. Métodos: Los hábitos dietarios se evaluaron con el registro de consumo de alimentos de 3 días. La composición corporal fue evaluada con peso corporal, circunferencias de la cintura y cadera y % de grasa corporal, y luego se clasificaron a los sujetos en grados de obesidad con el índice de masa corporal (IMC), en bajo o alto riesgo con la razón cintura-cadera (RCC) y con el % de grasa corporal. Estos grupos comparativos fueron asociados al consumo de energía, macronutrientes, frutas, vegetales, fibra y bebidas azucaradas y con la densidad energética y frecuencia de las comidas. Se analizaron los datos con las pruebas Kruskal Wallis, Mann Whitney y correlación Spearman. Resultados: Treinta sujetos completaron el estudio. Por IMC, 30% eran obesos tipo I, 33% tipo II y 37% tipo III; por RCC, 43% eran bajo riesgo y 57% alto riesgo; por % de grasa corporal, todos eran alto riesgo. Los hábitos alimentarios fueron similares entre los grupos. La RCC se correlacionó positivamente con el consumo de fibra ($R=0.42$; $p<0.05$) y de CHO ($R=0.35$; $p=0.057$). Conclusión: Los hábitos dietarios fueron similares entre los grupos; sin embargo, la calidad de la dieta fue pobre debido a la baja ingesta de frutas, vegetales y frutas y la alta ingesta de bebidas azucaradas.

Acknowledgments

Supported by the RCMI-RCRII Award, 1P20 - RR11126, RCMI Award G12RR-03051 and RCMI-Clinical Research Center award G12RR03051. This publication was possible by Grant Number 5P20RR011126 from the NCRR, NIH. Its contents are solely the responsibility of the authors and do not necessarily represent the official view of NCRR or NIH.

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