Dietary Patterns and their Association with Socio-demographic Characteristics and Perceived Academic Stress of College Students in Puerto Rico

Carla Fabián, MHSN, LND; Ideliz Pagán, MHSN; Josué L. Ríos, MHSN;
Jesmari Betancourt, MHSN; Sonia Y. Cruz, MHSN, LND; Anaisa M. González, MHSN, LND;
Cristina Palacios, PhD, MS, LND; Michael J. González, DSc, FACN, PhD;
Winna T. Rivera-Soto PhD, MPH, LND

Objective: University students face academic responsibilities that may produce stress, which may lead to changes in dietary patterns (DPs). These changed patterns can become dysfunctional, often resulting in a negative impact on the health of the stressed student. Little is known about DPs in college students in Puerto Rico (PR). The purpose of this study was to describe the DPs of college students in PR and the association of these patterns with socio-demographic characteristics and perceived academic stress.

Methods: This retrospective epidemiological study investigated self-reported DPs in a representative sample of 275 college students, in relation to socio-demographic characteristics, body composition (BC), and perceived academic stress; a Diet Quality Index was developed using the USDA Food Patterns for 2010 to determine whether their DPs were adequate or inadequate.

Results: Most of the participating students were female (67.6%), ranged from 21 to 30 years old (88%), lived in low household incomes (42.7%), and had healthy weights (56.4%). Most of the students perceived the stress levels as being moderate (60.7%). Most had diets that were below the dietary recommendations for grains, fruits, vegetables, dairy products, and protein, whereas fat consumption was adequate. Overall, most had inadequate DPs (62%). DP was significantly associated with age ($p<0.05$); older students had better DPs than did younger students. In terms of the different schools ($p<0.05$), those students from the School of Medicine and those from the School of Public Health had better DPs than did the students from the other schools. DP was not associated with income, gender, BMI, stress level, or course load.

Conclusion: The majority of the students had inadequate DPs, which inadequacy was associated with both the age of the student and the school that he or she attended. [*P R Health Sci J 2013;1:36-43*]

Key words: Dietary patterns, College students, Academic stress

High stress levels in college students may affect memory, concentration, and problem-solving ability, and may lead to decreased learning, coping, and academic performance (1). University students face responsibilities that lead to academic stress and which may also affect their overall health status (2). Studies have shown there to be an association between stress and health (3, 4). The influences of stress are defined not only in psychological terms but also in behavioral ones: An individual undergoing stress may alter his or her physical activity levels, may begin or resume smoking or augment his or her current rate of smoking, may make out-of-character food choices (type, amount, or both), or may do any combination or all of the previous (5).

Lazarus et al. (6) define stress as a process in which demands are made in (or by) a person's internal or external environment and these demands call on resources that are perceived to be beyond those that are available to that individual, that is, the pressure resulting from this process exceeds that individual's perceived ability to cope. Academic stress is defined as an individual's evaluation of academic demands (7)—which demands are inevitably perceived and evaluated differently by others—and the effectiveness with which he or she responds to them.

Students may experience changes in their dietary patterns (DPs), which changes may be influenced by the environment (8) or by stressful situations, such as the studying for and/

Nutrition Program, Department of Human Development, Graduate School of Public Health, University of Puerto Rico Medical Sciences Campus, San Juan, Puerto Rico

The authors have no conflicts of interest to disclose.

Address correspondence to: Winna T. Rivera-Soto, PhD, Nutrition Program, School of Public Health, University of Puerto Rico Medical Sciences Campus, PO Box 365067, San Juan, PR 00936-5067. Email: winna.rivera@upr.edu

or taking of exams (9). The aforementioned patterns can become dysfunctional, often resulting in a negative impact on the health of the stressed student (10). The presence of academic stress leads to the development of new food trends or patterns, many times because of the lack of time, new kinds of processed foods, schedules, and the distance between the place of study and a person's residence (8, 11-14).

The term "eating behaviors" refers to how an individual decides how to feed himself, and these behaviors are a combination of habits, practices, and ways of eating (15). DPs are those repeated practices (16) that make up or determine an individual's dietary habits (15). These patterns are refined as the person develops and depend on factors such as preferences, habits, availability, economic situation, convenience, religion, customs, and nutritional requirements (17).

It has been found that the changes in lifestyle experienced by new college students are reflected in their DPs, which changes include a reduction in the number of daily meals (2, 11, 12) (usually for reasons of time and/or economic difficulty) (11). According to Vargas-Zárate (18), college students tend to have unbalanced diets. In addition, studies have shown that when an individual is experiencing stress, food consumption tends either to increase or decrease (9, 12). In either case, high-calorie foods such as sweets and high-fat/sugary snacks comprise the diet of many students in moments of stress (5, 9). Students undergoing stress are apt to reduce their consumption of fruits and vegetables, leaning more towards the aforementioned sugary and/or fatty foods (e.g., fast food) as well as imbibing alcohol (19).

There are factors that lead a person to have inappropriate dietary practices, such as lack of time, economic situation, and distance between the place of study and residence (11-13). Studies, both in the US and in other countries, have explored the lifestyle of college students and the possible influences of that lifestyle on the diets of those students (5, 9, 11-14, 19). However, little is known about DPs among college students in Puerto Rico. The purpose of this study was to describe the DPs of first- and second-year students attending (the second semester of the 2010-2011 school year) the University of Puerto Rico (Medical Sciences Campus [UPR-MSC]) and to describe as well the association of DP with socio-demographic characteristics and academic stress.

Subjects And Methods

Subjects

The sample of this epidemiological study was proportionally stratified according to the population size of each of the professional schools of the Medical Sciences Campus of the University of Puerto Rico—the School of Nursing, the School of Pharmacy, the School of Medicine, the School of Dental Medicine, the School of Health Professionals (SHP), and the School of Public Health—and was open to students (of these schools) who, in the second semester of the 2010-2011 school year, were enrolled in their first or second year at UPR-MSC. The stratification procedure was performed by dividing the total number of participants from each school by the overall number of students (from each school) eligible for participation. Doing this, we obtained the proportion from each school, which we then multiplied by the total population of each school, resulting in the total sample size of each school. This procedure resulted in a total sample of 252 students from all of the professional schools at UPR-MSC, with a distribution of 26 (14.7%) from Nursing, 7 (7.5%) from Pharmacy, 94 (35.4%) from Medicine, 10 (7.9%) from Dental Medicine, 41 (16.5%) from Health Professionals, and 74 (17.8%) from Public Health. Third and fourth year students, those in special enrollment programs, those enrolled in joint programs, and those who were pregnant were excluded from participating in the study. This study was approved by the Institutional Review Board (IRB).

Methods

Subjects were recruited through e-mail, flyers posted around the campus, and direct contact. Those interested in participating in the study were given an information sheet that explained the purpose, procedure, and duration of the study and the confidentiality of the process. Those wishing to participate were given the questionnaire to be completed.

The questionnaire was specifically developed for this study and validated by experts. Participants were instructed to complete the questionnaire in August of 2011, based on their experiences during the academic period covering from January to May 2011. It took about 30 minutes for the participants to complete the questionnaire which consisted of questions on socio-demographic characteristics, body composition, academic information, physical activity, and DP. The socio-demographic characteristics were limited to age, gender, household income, and the particular school the participant attended. Height and weight were self-reported and considered for the calculation of body mass index (BMI = weight (kg)/ [height (m)]^2 for each individual. BMI was classified according to the World Health Organization values (20), in which one is considered to have a normal weight if BMI is < 25 kg/m^2, overweight if BMI is 25.1 – 29.9 kg/m^2, and obese if BMI is > 30 kg/m^2. The academic information was evaluated as the Perception of Course Load and Total Stress Level. Perception of Course Load refers to how the respondents felt the course load was during the second semester of 2010-2011, and it was assessed with a question dealing with the perception of academic load and having the following response options: low, moderate, and high. In addition, Total Stress Level was assessed using a stress questionnaire (21) developed by another study, which questionnaire consisted of 27 questions.

The adapted questionnaire assessed academic stressors only even though we know that there are other stressors outside the academic environment that may add to academic stress, which possible stressors include social and economic situations. The response for each question was based on a Likert scale, with response options ranging from never to always. A total score was achieved by combining the scores from the 27 questions. Those with a score of <67.9 points were classified as having a low stress level, those with a score ranging from 68 to 81 were classified as having a moderate stress level, and those with a score >82 were classified as having a high stress level. The stress questionnaire was tested using Cronbach's Alpha (0.895). To measure physical activity, the questionnaire included a list of activities categorized according to type (vigorous, moderate, light, or sedentary), frequency, and duration.

DP was assessed using a quantitative Food Frequency Questionnaire (FFQ). In order to analyze the results of the FFQ and determine the diet quality of each subject with a modified Diet Quality Index (DQI), we calculated the Total Energy Expenditure (TEE) according to gender, age, physical activity, and body composition. The TEE consisted primarily of Basal Metabolic Rate (BMR), Thermic Effect of Food, and Physical Activity (22). The BMR was calculated using the Mifflin-St. Jeor formula: (for females) 10W + 6.25H – 5A – 161; (for males) 10W + 6.25H – 5A + 5; where W = weight in kg, H = height in cm, and A = age. For both, men and women, we determined a kilocalories range of 2000 to 2400 per day. However, the DQI does not discriminate subjects who eat food groups in amounts that are below or above the recommendations of the US Department of Agriculture Food Pattern 2010 (USDAFP-2010) (23). To determine food adequacy we used the recommended kilocalories for each individual, using the same TEE formula. We also considered the total eating occasions per day (the sum of total meals and consumption of non-healthy snacks) as part of the DP category. A copy of the questionnaire is available from the senior author, upon request.

Diet quality index (DQI)

The DQI is designed to provide a summary measure of overall diet quality (24, 25). It measures population food intake against an objective "good or adequate diet," such as is recommended by the USDAFP-2010 (23). To determine the DQI of our subjects, we modified a DQI questionnaire (25). Our 3 major aspects were variety, adequacy, and moderation. The DQI represents a collection of scores applied to selected dietary components to make up a total DQI score. Based on his or her total score, each individual was categorized as having an "adequate" or "inadequate" dietary pattern. Scores for each component were summarized in each of the 3 main categories, and the scores for all 3 categories were added, resulting in the total DQI score, ranging from 0 to 65. Subjects who had a total score ranging from 33 to 65 points (>50% of dietary recommendations) were classified as having an adequate DP (A-DP), whereas those who scored fewer than 33 points (<50% of dietary recommendations) were classified as having an inadequate DP (I-DP).

Variety

Variety in the diet was evaluated as overall variety. Inclusion of at least 1 serving of food per day from each of the 5 food groups (grains, vegetables, fruit, dairy, protein) defined the maximum overall variety score. If any one of these food groups was not consumed in a given day, the perfect score of 15 was reduced by 3 points per each food group missed (Table 1).

Adequacy

Adequacy evaluates the intake of dietary elements that must be supplied in sufficient amounts to guarantee a healthy diet. The scores for the 7 components in the category were assigned on the basis of the intake recommendation for each food group, depending on the mean kilocalorie of the total sample (Table 1). The maximum score for adequacy was 41 points, which score was reached when a participant had the highest score if he/she reached the intake recommendations for all of the food groups. As the participant consumed less or more of the recommended amounts, the score decreased.

Moderation

Moderation evaluates the intake of foods that may need to be restricted, such as fat, sugary/fatty snacks, and soft drinks. In this category we established a maximum score of 9 points, each component with a total point of either 0 or 3 (Table 1). For fat moderation, intake lower or equal than 7 teaspoons per day was given the highest score of 3 points. On the other hand, scores for non-healthy snacks and soft drinks were based on frequency. The consumption of less than 1 time a week (times/wk) of such snacks and/or soft drinks was considered reasonable or acceptable (26). The consumption of less than 1 times/wk of these foods was given the highest score of 3 points.

Statistical analysis

Normality was assessed with the Shapiro–Wilk test. Univariate analyses were presented as mean and standard deviation and frequency or proportion, whereas bivariate analyses were presented as correlations using Pearson's chi-squared test. The chi-squared test was used to analyze and define the association between categorical variables and DP. Differences in means were assessed by student *t*-test or Analysis of Variance, with a post-hoc Bonferroni test. All the analyses were done using the Statistical Package for Social Sciences (SPSS) version 20.0. Statistical significance was set at $p<0.05$.

Results

Our study sample consisted of 275 subjects—89 (32.2%) men and 186 (67.4%) women; the sample was proportionally stratified by school (Table 2). According to our sample, most of the individuals belonged to the School of Medicine (94; 34.2%) or the School of Public Health (78; 28.4%), with the fewest number of students belonging either to the School of Pharmacy (8; 2.9%) or to the School of Dental Medicine (15; 5.5%). Most students (117; 42.7%) reported living in households with incomes lower than or equal to $24,999, annually. Each subject also, self-reported his or her age and provided details of his/her weight, and height. In terms of age, 88% of the participants were from 21 to 30 years age group. Data from weight and height were used to calculate and categorize each person's BMI. Most of the college students in the study had a healthy weight (150; 56.4%), whereas 7.5%, 25.9%, and 10.2% were underweight, overweight, or obese, respectively.

Course load was perceived as high by 68.3% of the students, while total stress level was perceived by 60.7% of the students as being moderate (Table 3). There was a correlation between academic load and total stress level ($p<0.001$).

Students tended to consume approximately 3.80 + 1.21 meals per day. Snacks consumption was analyzed in terms of frequency these foods were consumed per day; however, it was re-arranged to times per week for easier understanding (Table 4). Students reported consuming soft drinks an average of 6 times/week, chocolate and/or sugar cookies, 3 times/week, ,nutrition bars and/or oatmeal cookies, 2 to 3 times/wk, chips, other types of candy, peanuts and/or cake, 1 to 2 times/wk, and Vienna sausages and/or nutritional drinks, less than 1 time/wk (Table 4). Students reported that the frequency of snacks'consumption

Table 1. Components of diet and diet quality and the percentage of the sample in each component subcategory (2000–2400 kcal/day)

Component	Scoring criteria	Percent (%)
Variety (0-15 points)		
Overall food group variety/day	≥ 1 serving from each food group/d = 15	17.0
(protein, dairy, grain, fruit, vegetables)	Any 1 food group missing/d = 12	21.7
	Any 2 food groups missing/d = 9	24.3
	Any 3 food groups missing/d = 6	22.5
	≥ 4 food groups missing/d = 3	10.9
	No servings from any food groups/d = 0	3.6
		100%
Adequacy (0-41 points)		
Meals/day	6 meals/d = 6	8.4
(0-6 points)	5 meals/d = 5	12.7
	4 meals/d = 4	24.4
	3 meals/d = 3	27.6
	2 meals/d = 2	22.2
	1 meal/d = 1	4.0
	<1 meal/d = 0	0.7
		100%
Grain group/day	6-8 oz/d = 6	2.6
(0-6 points)	5 oz/d or 9 oz/d = 5 pts.	17.0
	4 oz/d or 10 oz/d = 4 pts.	6.7
	3 oz/d or 11 oz/d = 3 pts.	1.9
	2 oz/d or 12 oz/d = 2 pts.	24.4
	1 oz/d or 13 oz/d = 1 pt.	20.0
	<1 oz/d or > 14 oz/d = 0 pts.	27.4
		100%
Vegetable group/day	> 2.5 cups/d = 5	8.2
(0-5 points)	2 cups/d = 4	0.7
	1.5 cups/d = 3	0.0
	1 cup/d = 2	9.7
	0.99-0.25 cups/d = 1	39.8
	<0.25 cups/d = 0	41.6
		100%
Fruit group/day	> 2 cups/d = 4	13.8
(0-4 points)	1.5 cups/d = 3	0.7
	1 cups/d = 2	14.1
	0.5 cups/d = 1	36.1
	<0.5 cups/d = 0	35.3
		100%
Dairy group/day	3 cups/d = 6 pts.	0.4
(0-6 points)	2.5 cups/d or 4 cups/d = 5 pts.	10.4
	2 cups/d or 5 cups/d = 4 pts.	5.6
	1.5 cups/d or 6 cups/d = 3 pts.	1.1
	1 cup/d or 7 cups/d = 2 pts.	17.2
	0.5 cups/d or 8 cups/d = 1 pt.	23.9
	<0.5 cups/d or > 9 cups/d = 0 pts.	41.4
		100%
Protein group/day	5.5-6.5 oz/d = 6 pts.	19.7
(0-6 points)	5 oz/d or 7 oz/d = 5 pts.	0.0
	4 oz/d or 8 oz/d = 4 pts.	8.6
	3 oz/d or 9 oz/d = 3 pts.	8.6
	2 oz/d or 10 oz/d = 2 pts.	17.3
	1 oz/d or 11 oz/d = 1 pt.	28.3
	<1 oz/d or > 12 oz/d = 0 pts.	17.5
		100%
Water/day	> 8 cups/d = 8	42.5
(0-8 points)	4-7 cups/d = 7	27.6
	<1-3 cups/d = 3	29.9
		100%
Moderation (0-9 points)		
Total fat/day	< 7 tsp./d = 3	87.0
(0-3 points)	>7 tsp./d = 0	13.0
		100%
Snacks/day	< 0.14 times/d = 3	1.8
(0-3 points)	>0.14 times/d = 0	98.2
		100%
Soft drinks/day	< 0.14 times/d = 3	32.5
(0-3 points)	>0.14 times/d = 0	67.5
		100%

did not change in periods of high stress levels, expect for chocolate; they reported an increase in chocolate consumption in such periods.

Table 2. Socio-demographic characteristics and body composition of the sample

		Total/Mean + S.D.	Percentage (%)
Age	21-30 years	242/ (28.59 + 9.57 years)	88.0
	31 years or older	33/ (33.33 + 11.07 years)	12.0
		275	**100%**
Gender	Male	89	32.4
	Female	186	67.6
		275	**100%**
Household income	$0-$24,999	117	42.7
	$25,000-$74,999	101	36.8
	>$75,000	56	20.5
		274†	**100%**
School	Nursing	34	12.4
	Pharmacy	8	2.9
	Medicine	94	34.2
	Dental Medicine	15	5.5
	Health professions	46	16.6
	Public health	78	28.4
		275	**100%**
BMI	Underweight	20	7.5
	Healthy weight	150	56.4
	Overweight	69	25.9
	Obese	27	10.2
		266‡	**100%**

†One student did not complete the section regarding household income; ‡Nine students did not provide either their height or their weight for the BMI calculation.

Table 3. Course-load and total stress level perceptions in the sample

Level	Course-load perception (%)	Total stress level perception (%)
Low	2.9	37.1
Moderate	28.8	60.7
Heavy	68.3	2.2
	100%	**100%**

As described in the Methods section, diet quality was assessed taking into account 3 aspects: variety, adequacy, and moderation (Table 1). In terms of variety, students tended to miss 2 food groups (24.3%), 3 food groups (22.5%), or 1 food group (21.7%). Overall, the majority of the population had diets with little variety. In terms of adequacy, most of the subjects ate at least 3 meals/d (27.6%), consisting of <1 oz/d or >14 oz/d of grains (27.4%), <0.25 cups/d of vegetables (41.6%), 0.5 cups/d of fruit (36.1%), <0.5 cups/d or > 9 cups/d of dairy products, 1 oz/d or 11 oz/d of protein (28.3%), and >8 cups/d of water. In general, the sample had the lowest scores for adequacy except for in terms of their water consumption. Finally, for moderation, 87% of the students had the maximum points in fat moderation, whereas 98.2% and 67.5% had the minimum score in non-healthy snack and soft drink moderation. Overall, 37.9% were classified as having A-DPs, whereas 62.1% were classified as having I-DPs.

Table 4. Snacks and soft drink frequency in the sample

Snacks and soft drinks	Mean frequency (times/week)	Frequency of snack consumption during periods of increased stress		
		Decreased %	Increased %	Unchanged %
Soft drinks	~6 times/w	2.0	36.0	62.0
Chocolate	~3 times/w	2.9	50.9	46.2
Cookies	~3 times/w	1.1	42.2	56.7
Nutrition bars	~2-3 times/w	1.8	16.1	82.1
Oatmeal cookies	~2-3 times/w	2.5	12.0	85.5
Chips	~1-2 times/w	2.5	28.4	69.1
Candy	~1-2 times/w	3.3	23.4	73.3
Peanuts	~1-2 times/w	2.9	18.9	78.2
Cake	~1-2 times/w	1.8	28.7	69.5
Vienna sausages	<1 time/w	2.2	6.5	91.3
Nutritional drinks	~<1 time/w	1.5	7.6	90.9
Total snacks consumption/ week	**~27 times/w**			

Because the DQI is unable to discriminate between those individuals who ate more of a given food group than what is recommended by the USDAFP-2010 and those who ate less (23), we defined the food adequacy of grains, vegetables, fruits, dairy, protein, and fat in terms of the kilocalories needed for each individual instead of using the 2000-2400 kcal range (Table 5). Overall, 96.3% of the students ate less grain than is recommended by the USDAFP-2010 (23), 97.0% ate less vegetables than recommended, 87.7% ate less fruit, 94.8% ate less dairy, and 56.9% ate less protein than is recommended. However, fat consumption was adequate according to these recommendations, with 90.7% of the respondents eating the recommended amount of fat.

We also examined the association between DP and several socio-demographic characteristics (Table 6). We found that DP was significantly associated with age ($p<0.05$): older students had better DPs than younger students did. We also found that DP was significantly associated with the specific school that a given student attended ($p<0.05$); students from the School of Medicine and those from the School of Public Health had better DPs than did the students from the other schools. DP was not associated with income, gender, BMI, or stress level. However, it was found that 60% of obese students had A-DPs.

Table 5. Dietary patterns and adequacy of food groups

		Frequency	Percentage (%)
Dietary patterns			
Inadequate		164	62.1
Adequate		100	37.9
Total		**264†**	**100%**
Food groups adequacy			
Grains	Below	260	96.3
	Adequate	8	3.0
	Above	2	0.7
		270‡	**100%**
Vegetables	Below	261	97.0
	Adequate	8	3.0
		269‡	**100%**
Fruits	Below	236	87.7
	Adequate	33	12.3
		269‡	**100%**
Dairy	Below	254	94.8
	Adequate	2	0.7
	Above	12	4.5
		268‡	**100%**
Protein	Below	153	56.9
	Adequate	6	2.2
	Above	110	40.9
		269‡	**100%**
Fat	Adequate	244	90.7
	Above	25	9.3
		269‡	**100%**

†Eleven students did not provide information in any of the 3 major aspects (variety, adequacy, and moderation) used to determined the DQI in order to classify them as having either an inadequate or adequate dietary pattern. ‡Thirty-six students (5 from the grain group; 6 from the vegetable, fruits, protein, and fat groups; and 7 from the dairy group) did not provide any information regarding any of the food groups.

Table 6. Dietary patterns and their association with socio-demographic characteristics, body composition, and total stress level perception

		Dietary Pattern		
		Inadequate (%)	Adequate (%)	Chi-square Sig.[2]
Age	21-30 years	64.7	35.3	0.02†
	31 years or older	58.0	32.0	
Gender	Male	57.1	42.9	0.255
	Female	58.0	32.0	
Household income	$0-$24,999	57.9	42.1	0.585
	$25,000-$74,999	67.3	32.7	
	>$75,000	62.7	37.3	
School	Nursing	68.8	31.2	0.015‡
	Pharmacy	100	0.0	
	Medicine	58.8	41.2	
	Dental Medicine	80.0	20.0	
	Health Professions	62.2	37.8	
	Public health	55.7	44.3	
BMI	Underweight	52.6	47.4	0.085
	Healthy weight	64.4	35.6	
	Overweight	66.2	33.8	
	Obese	40.0	60.0	
Total stress level perception	Low	58.8	41.2	0.591
	Moderate	66.0	34.0	
	Heavy	61.0	39.0	

†A t-test showed that DPs were significantly better in older students than it was in younger students; ‡An ANOVA post-hoc Bonferroni test showed that the students of the School of Public Health and those of the School of Dental Medicine had significantly better DPs than did the students of the other schools (p<0.05).

Discussion

Females made up the majority (67.6%) of the present study's sample; 88% of the sample members fell in the 21 to 30 years age group, 42.7% had low household incomes, and 56.4% had healthy weights. It was found that 60.7% of the participants perceived their stress levels to be moderate, and 68.3% felt that they were carrying a heavy course load. Most subjects consumed diets that were below the dietary recommendations for the consumption of grains, fruits, vegetables, dairy products, and protein, whereas fat consumption was adequate. Overall, most had inadequate DPs (62%). DP was significantly associated with age ($p<0.05$), in that older students had better DPs than did younger students. In terms of the different schools ($p<0.05$), those students from the School Medicine and the School of Public Health had better DPs than did the students from the other schools. However, DP was not associated with income, gender, BMI, perceived stress level, or perceived course load.

In terms of stress level results, researchers have found that those who study any health sciences have more stress than other students do (28). Science-majoring students tend to that occur concurrently with the necessity of managing challenging course loads ."experience stress caused by changes in their lifestyles that occur concurrently with the necessity of managing challenging course loads." (29). In the present study, we also found that most students perceived their total stress levels to be moderate and most perceived their course loads to be heavy, both of which perceptions are consistent with what has been reported in the literature. When we asked students about their academic information, most of the sample reported having heavy course loads and moderate stress levels. This discrepancy between the two perceptions may be due to the time frame used in our questionnaire, even though academic load was significantly correlated with stress level ($p<0.001$). Because the total stress level was determined via a validated and modified stress questionnaire, meaning that this level was the only criteria related to stress used to analyze and define whether there was an association between student DP and academic stress instead of between DP and course load.

As has been found, among students of various other studies (29-31), most of our students consumed soft drinks about 6 times per week and most consumed sugary and/or fatty snacks around 1 to 3 times per week. In total, non-healthy snacks were consumed 27 times per week (about 3 times per day). This high consumption of soft drinks and non-healthy snacks by college-age students may be driven by stress (5, 9, 12, 19) and/or lack of time (11-13), as others have found. According to Norte & Ortiz (26), the consumption of non-healthy snacks should be limited to once per week or fewer.

In terms of the consumption of each food group, the present study found that most of the study participants consumed fewer

than 5 servings of fruit and vegetables daily, an amount that is similar to that found in other studies among college students (30, 32-34). We also showed that most students consumed inadequate (below the recommendations) amounts of grain and proteins but, on the other hand, adequate amounts of fat. Other studies of university students have also found that members of this population frequently consume inadequate amounts of grain, protein, and fat (18, 30, 35). Studies have found that this behavior may result from such factors that can affect college students' food selection as time, economic situation, stress, and course load (8, 9, 11-13, 18). However, this is self-reported data from the FFQ, and we did not include a 24-hour recall to validate the information. With respect to DP classification, researchers have found that most college students tend to have I-DPs (18, 30-35). In our investigation, most of the members of our sample had I-DPs.

In the present study, we also found a significant association between DP and age and between DP and the specific school being attended. Studies suggest that even if a given population knows and understands the basic concepts of healthy eating, this knowledge does not translate into the actual consumption of foods that are part of a balanced diet (36). However, our association analyses show that the students from the School of Public Health and those from the School of Dental Medicine had significantly better DPs than did those attending any of the other schools ($p<0.05$), some of which schools provide nutrition classes"(as do the other schools already mentioned). On the other hand, when it comes to age, a possible explanation for the differing levels of adequacy of the DPs of younger as opposed to older students might be the change in lifestyle or the transition from high school to college that most first-year students experience (2, 19). Although we did not find an association between DP and obesity, other researchers have found that frequent snackers (part of a DP) tend to have a lower BMI than do those who snack less often (higher BMI) (37, 38). Another study found that non-healthy diet was one of the leading factors contributing to obesity in college students, with dietary intake being statically significant in terms of an individual's being overweight or obese (39). Surprisingly, in our study, 60% of obese students had A-DPs. Once again, this may be because the data are self-reported, because of the time frame used in our questionnaire, or because of a recently changed DP.

Although the present study did not find an association between stress and DP, other studies have found an association between stress and biological changes that can affect food selection (9) and lead to unhealthy behaviors such as smoking and poor physical activity (5). It has also been found that a relatively higher perception of stress in college students is associated with their own poor eating habits (39), which in turn lead to I-DPs. Other factors that can lead a student to have an I-DP are lack of time and his or her economic situation (11-13). For example, according to Driskell (14), college students frequently visit fast food establishments (high-calorie/fat food) mainly because they lack time and that combined with their economic situations results in their having unbalanced diets.

In conclusion, most of our students had I-DPs; therefore, healthy eating practices need to be emphasized in this population. Our findings suggest the need for strategies to improve competence in the area of nutrition, especially with respect to information relating to guidelines for healthy eating practices. We recommend that undergraduate institutions provide their students with access to healthy foods and snacks that are distributed on campus by vending machines or at other food points.

Resumen

Objetivo: Estudiantes universitarios enfrentan responsabilidades académicas que pueden llevar a desarrollar estrés, lo cual puede inducir cambios en sus patrones alimentarios (PAs). Estos patrones pueden ser disfuncionales y tener un impacto negativo en la salud del estudiante. Poco se sabe acerca de los PA de universitarios en Puerto Rico (PR). El propósito de este estudio fue describir los patrones alimentarios de universitarios en PR y la asociación de estos patrones con las características socio-demográficas y el estrés académico percibido. Métodos: Este estudio epidemiológico retrospectivo investigó, de forma auto-reportada, los PAs de una muestra representativa de 275 universitarios, sus características socio-demográficas, la composición corporal y el estrés académico percibido por éstos. Se desarrolló un Índice de Calidad de Dieta utilizando el Patrón de Alimentos del USDA 2010, para clasificar sus PAs en adecuados o inadecuados. Resultados: La mayoría de los estudiantes fueron mujeres (67.6%), 21-30 años (88%), con bajo ingreso económico (42.7%) y peso saludable (56.4%). La mayoría percibió el nivel de estrés total de forma leve (60.7%) y tenía una dieta por debajo de las recomendaciones dietarias para farináceos, frutas, vegetales, productos lácteos y carne, mientras que para las grasas fue adecuado. En general, la mayoría tenía un PA inadecuado (62%). Hubo una asociación entre PA y edad ($p<0.05$), donde los estudiantes mayores tenían un PA más adecuado en comparación con los de los más jóvenes. En cuanto a escuela ($p<0.05$), los estudiantes de Medicina y Salud Pública tenían un PA más adecuado en comparación con los de otras escuelas. No hubo asociación entre PA e ingreso, género, BMI y estrés académico percibido. Conclusión: La mayoría de los estudiantes tenían PAs inadecuados, los cuales estuvieron asociados a edad y escuela.

Acknowledgment

Approved by the IRB (Protocol number A4540112; August 10, 2011).

References

1. Goff AM. Stressors, Academic Performance, and Learned Resourcefulness in Baccalaureate Nursing Students. Int J Nurs Educ Scholarsh 2011;8:Article1.
2. Nelson M, Larson N, Barr-Anderson D, Neumark-Sztainer D, Story M. Disparities in dietary intake, meal patterning, and home food environments among young adult nonstudents and 2 and 4 year college students. Am J Pub H 2009;99:1216-9.
3. DeLongis A, Folkman S, Lazarus RS. The impact of daily stress on health and mood: Psychological and social resources as mediators. J Pers Soc Psychol 1988;54:486-95.
4. Wilkinson R, Marmot M. Determinants of Health: The Solid Facts. 2nd Ed. WHO Europe 2003. Accessed 2### Month ##. Available from: Url: http://www.euro.who.int/__data/assets/pdf_file/0005/98438/e81384.pdf
5. Oliver G, Wardle J. Perceived effects of stress on food choice. Physiol Behav 1999;66:511-5.
6. Lazarus RS, DeLongis A, Folkman S, Gruen R. Stress and adaptational outcomes. The problem of confounded measures. Am Psychol 1985;40:770-85.
7. Pulido M, Serrrano M, Valdés E, Chávez M, Hidalgo P, García F. Estrés académico en estudiantes universitarios. Psico y Salud 2011;21:31-7.
8. Gómez L. Conducta alimentaria, hábitos alimentarios y puericultura de la alimentación. CCAP 2002;7:38-50.
9. Zellner DA, Loaiza S, González Z, Pita J, Morales J, Pecora D, Wolf A. Food selection changes under stress. Physiol Behav 2006;87:789-93.
10. Díaz Y. Estrés académico y afrontamiento en estudiantes de Medicina. Rev Hum Med 2010; 10.
11. Ibáñez E, Thomas Y, Bicenty A, Barrera J, Martínez J, Gerena R. Cambios de hábitos alimentarios de los estudiantes de odontología de la Fundación Universitaria San Martín de Bogotá, Colombia. Nova – Public Cient Cienc Bioméd 2008;6:27-34.
12. Tobar-Vargas L, Vásquez-Cardoso S & Bautista-Muñoz L. Descripción de hábitos y comportamientos alimentarios de los estudiantes de la facultad de ciencias de la Pontificia Universidad de Javeriana - 2005. Rev Facul Cienc 2008;13:55-63.
13. Weinstein S, Shide D, Rolls B. Changes in food intake in response to stress in men and women: Psychological factors. Appetite 1997;28:7-18.
14. Driskell J, Meckna B, Scales N. Differences exist in the eating habits of university men and women at fast-food restaurants. Nutr Research 2006;26:524-30.
15. Ramos F. Diferencia entre hábitos, prácticas y costumbres alimentarias. Red Peruana Alim y Nutr 2005; 1-8.
16. Aparicio M. Conocimiento sobre nutrición y estilos de vida de los estudiantes de primer y tercer año de la Escuela de Medicina del Recinto de Ciencias Médicas de la Universidad de Puerto Rico, año académico 2002-2003 [doctoral thesis]. San Juan, PR: University of Puerto Rico, Medical Sciences Campus; 2004.
17. Gerbens-Leenes P, Nonhebel S. Consumption patterns and their effects on land required for food. Ecol Econ 2002;42:185-99.
18. Vargas-Zárate M, Becerra-Bulla, & Prieto-Suárez E. Evaluating university student's dietary intake in Bogotá, Colombia [in Spanish]. Rev Salud Pública (Bogota) 2010;12:116-25.
19. Papadaki A, Hondros G, Scott J, Kapsokefalou M. Eating habits of university students living at, or away from home in Greece. Appetite 2007;49:169-76.
20. WHO. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. World Health Organ Tech Rep Ser 2000;894:i-xii.
21. Barraza Macías A. Un modelo conceptual para el estudio del estrés académico. Rev Electr Psicol Iztacala 2006;9:110-29.
22. Gropper S, Smith J, Groff J. Body Composition, Energy Expenditure and Energy Balance. In: Advanced Nutrition and Human Metabolism. 5th ed. Belmont, CA: Wadsworth Publishing Co., Inc.; 2009; 291-2.
23. USDA. 2010 Dietary Guidelines for Americans.
24. Kim S, Haines PS, Siega-Riz A, Popkin BM. The Diet Quality Index-International (DQI-I) Provides an Effective Tool for Cross-National Comparison of Diet Quality as Illustrated by China and the United States. J Nutr 2003;133:3476-84.
25. Patterson RE, Haines PS, Popkin BM. Diet quality index: capturing a multi-dimensional behavior. J Am Diet Assoc 1994;94:57-64.
26. Norte Navarro AI, Ortiz Moncada R. Calidad De La Dieta Española Según El Índice De Alimentación Saludable. Nutr Hosp 2011;26:330-6.
27. Roman C, Ortiz F, Hernandez Y. El estrés académico en estudiantes latinoamericanos de la carrera de Medicina. Rev Ibero Educ 2008; 28:21-8.
28. Wichianson JR, Bughi SA, Unger J, Spruijt-Metz D, Nguyen-Rodriguez S. Perceived stress, coping and night-eating in college students. Stress Health 2009;25:235-40.
29. Strong K, Parks SL, Winett R, Anderson E, Winett R, Davy BM. Weight Gain Prevention: Identifying Theory-Based Targets for Health Behavior Change in Young Adults. J Am Diet Assoc 2008;108:1708-15.
30. Bion F, de Castro Chagas M, de Santana Muniz G, de Sousa L. Estado nutricional, medidas antropométricas, nivel socioeconómico y actividad física en universitarios brasileños. Nutr Hosp 2008;23:234-41.
31. Spanos D, Hankey C. The habitual meal and snacking patterns of university students in two countries and their use of vending machines. J Hum Nutr Diet 2010;23:102-7.
32. Racette SB, Deusinger SS, Strube MJ, Highstein GR, Deusinger R. Weight changes, exercise, and dietary patterns during freshman and sophomore years of college. J Am College Health 2005;53:245-51.
33. Brevard PB, Ricketts CD. Residence of college students affects dietary intake, physical activity, and serum lipid levels. J Am Diet Assoc 1996;96:35-8.
34. Driskell JA, Kim YN, Goebel KJ. Few differences found in the typical eating and physical activity habits of lower-level and upper-level university students. J Am Diet Assoc 2005;105:798-801.
35. Montero Bravo A, Ubeda Martín N, García González A. Evaluación de los hábitos alimentarios de una población de estudiantes universitarios en relación con sus conocimientos nutricionales. Nutr Hospit 2006;21: 466-73.
36. Lopez Nomdedeu C. Educación nutricional de niños/as y adolescentes. In: Serra Majem L, Aranceta Bartrina J. eds. Alimentación Infantil y Juvenil. Estudio enKid, Vol. 3. Barcelona: Masson; 2002:61-8.
37. AI-Rethaiaa AS, Fahrny AA, AI-Shwaiyat NM. Obesity and eating habits among college students in Saudi Arabia: A cross sectional study. Nutr J 2010;9:939-48.
38. Suleiman A, Alboqai, Yasein N, El-Qudah, Bataineh M, Obeidat B. Prevalence of and factors associated with overweight and obesity among Jordan university students. J Biol Sci 2009;9:735-45.
39. Cartwright M, Wardle J, Steggles N, Simon AE, Croker H & Jarvis MJ. Stress and dietary practices in adolescents. Health Psychol 2003; 22:362-9.