EPIDEMIOLOGY

Prevalence of Obesity and its Association with Blood Pressure, Serum Lipids and Selected Lifestyles in a Puerto Rican Population of Adolescents 12-16 Years of Age

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Objectives. **To describe the prevalence of obesity and determine its association with blood pressure, serum lipids and lifestyles in adolescents attending a public junior-high school in San Juan, Puerto Rico.**

Methods. **During the 1999-2000 academic school year, 352 students, ranging in age from 12 years to 16 years, were screened for weight, height, and blood pressure. A sub-sample of voluntary adolescents (n=26) was screened for serum lipids and lifestyles were assessed using a standardized questionnaire.**

Results. **The prevalence of level I obesity and level II obesity among 12 to 16 years old adolescents were 33.2% and 14.2%, respectively. The mean systolic and diastolic blood pressures were significantly higher in obese than in non-obese adolescents (p<.001). There were no significant differences in serum lipids between the study groups (p>.05). However, the obese group showed higher median levels of total cholesterol, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, and triglycerides. The study group reported engaging in hazardous lifestyles (alcohol intake, smoking, and unhealthy eating patterns), but no real differences in lifestyles were found between obese and non-obese groups (p>.05).**

Conclusions. **A high prevalence of level I and level II obesity was found in this population. In addition, significant positive correlations between blood pressure and body mass index were observed. This study underscores the need to assess the burden of obesity in Puerto Rico in order to develop community intervention strategies encouraging early detection and conduct modification towards healthier lifestyles.**

Key Words: Obesity, Adolescents, Blood pressure, Lipid profile, Ordinal logistic regression model, Proportional odds model, Puerto Rico

Obesity has long been treated as merely an esthetic problem until the American Heart Association announced in 1998 that obesity itself has become a life-long disease and a major risk factor for cardiovascular disease, which is becoming a dangerous epidemic (1). National surveys have revealed a dramatic increase in its prevalence in the adult, as well as in the youth population, during the last decades. Data from the National Health and Nutrition Examination Survey (NHANES) evidenced that the age-adjusted prevalence of obesity (defined as a body mass index values at or above 30 kg/m^2) in adults 20 years and older was 30.5% in 1999-2000 compared with 23% in 1988-94. If the earlier NHANES II (1976-1980) is taken into account, the age-adjusted prevalence of obesity, among adults aged 20 to 74 years, has doubled from 15% to an estimated 31% in 1999-2000 (2).

Since it has been evidenced that obesity persists from late school-age years to adulthood, these findings have had a great impact in the study of youth obesity (3-5). The 1999-2000 NHANES reported that the prevalence of overweight (defined as body mass index values at or above the 95th percentile of the sex-specific grow chart and considered level II obesity in the present study) between children aged 6-11 years and adolescents aged 12-19 years reached an alarming 15% (6). When comparing these findings with earlier surveys, it is noticeable that the prevalence of obesity in the youth population has increased dramatically. From 1976-1980 to 1999-2000, the prevalence of overweight in children and adolescents increased from an estimated 7% to 15% and 5% to 15%, respectively.

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Furthermore, it has been suggested that childhood obesity not only precludes to adult obesity, but that it also relates to irregular serum lipids, increased blood pressure, insulin resistance syndrome, type 2 diabetes mellitus, and some hazardous lifestyles (e.g. smoking, alcohol intake, physical inactivity, and unhealthy eating patterns). These obesity co-morbidities have been identified as potent cardiovascular disease risk factors in adults (1, 7-10). In fact, studies have shown that this cluster of risk factors can persist from childhood to adulthood, thus, becoming a predictor for cardiovascular disease later in life (8, 10, 11). Therefore, the detection and intervention of the onset of obesity in early life offers the best hope for preventing disease with its associated co-morbidities later in life. The present study determined the prevalence of obesity in a defined population of adolescent students and correlated the body mass index (BMI) with levels of blood pressure, serum lipids, and hazardous lifestyles.

Methods

This study was divided in two stages. The first stage consisted of a census to determine the prevalence of obesity and to describe its association with blood pressure. During the school year 1999-2000, seventh to ninth grade adolescents (N=352), ranging in age from 12 to 16 years, from a public high school in San Juan, Puerto Rico, were screened for weight, height and blood pressure in February 2000. Ninety-two percent (352/382) of the students participated in the initial screening. Informed written consent was obtained from both the parents and the students. Standardized techniques were used to measure weight and height, and all measurements were taken wearing school uniforms and no shoes. Single weight and height measurements were performed. Weight in pounds (lbs) was assessed with a mechanical balance beam scale to the nearest 0.5-pound. Height in inches was measured with a stadiometer to the nearest 0.5-inch. After subjects had been measured for weight and height, a single measurement of systolic and diastolic blood pressure (mm Hg) was taken with the participant in the sitting position after 5 minutes of rest. A standard mercury sphygmomanometer and a cuff adequate for the participant's arm were used. The cuff was placed on the participant's left arm. Blood pressure measurements were gathered from an ongoing screening performed by two registered nurses and sponsored by the Puerto Rico's Department of Education. Blood pressure measurements were taken for 254 students.

The BMI was determined for each student using standards from the National Center for Health Statistics (12). The subjects were classified into three weight levels according to their sex-and-age-specific percentile of body mass index (BMI): BMI < 85^{th} percentile (normal or non-obese), 85^{th} to 94^{th} percentiles (obese level I), and $\geq 95^{th}$ percentile (obese level II).

The second stage of this study consisted of an exploratory study to evaluate the association of obesity with serum lipids, blood pressure measurements and hazardous lifestyles in a sample of 26 voluntary adolescents. A second informed written consent was obtained from both the parents and the students. Subjects were instructed to fast for 12 hours before the screening. A certified phlebotomist collected blood samples using the finger prick technique and processed using a standardized portable measuring equipment. Levels of total cholesterol, triglycerides, and high-density lipoprotein cholesterol (HDL-C) were determined. Levels of low-density lipoprotein cholesterol (LDL-C) were estimated using Friedewald's equation which is described bellow (13):

$$\text{LDL} = \text{Total cholesterol} - \left[\text{HDL} + \frac{\text{Triglycerides}}{5}\right]$$

A standardized self-administered questionnaire was used to assess information regarding cigarette smoking, alcohol intake, physical activity, and eating patterns. This study was approved by the Institutional Review Board of the University of Puerto Rico Medical Sciences Campus.

Data were analyzed using the SAS software (version 8, SAS Institute, Cary, N.C.). Continuous variables were presented as means with their respective standard deviations, and categorical variables were expressed as percentages. Differences in prevalence of obesity by sex and age groups were tested using the Chi-square distribution. An ordinal logistic regression model (proportional odds model) was used to determine the influence of age and sex on the prevalence of obesity levels (14). In these analyses, three levels of obesity (non-obesity, level I obesity and level II obesity) were defined as the outcome categories. The variables age, sex and their interaction terms were used as predictor variables. An analysis of variance (ANOVA) was performed to assess the expected values of the blood pressure and serum lipids among the three levels of obesity. Pearson correlation coefficients were used to evaluate the relationship between BMI and the following variables: systolic blood pressure, diastolic blood pressure, and serum lipids. Multiple regression analysis was performed to evaluate the influence of age and sex on the relationship between BMI and systolic and diastolic blood pressures.

Since the second stage of this study was performed on a small sample (n=26), only two categories of obesity were considered: non-obese and obese (BMI that exceeded the 85th percentile). The Mann-Whitney-Wilcoxon test was employed to compare the median values of serum lipids levels between obese and non-obese subjects. The Fisher's exact test was utilized to establish the association between obesity and the median values of serum lipids. This test was also used to evaluate the association between obesity and selected lifestyles.

Results

The distribution of the 352 adolescent students that participated in the first stage of this study was divided by age and sex. Fifty-six percent of the subjects were females, and the overall mean (±SD) age was 13.6±1.1 years. The average body mass index was 22.3±5.1 kg/m^2, being higher for females (22.6±5.27 kg/m^2) than for males (21.93±4.86 kg/m^2) (Table 1). The overall prevalence of

Table 1. Anthropometric Characteristics by Sex and Age in a Junior-High School in San Juan, Puerto Rico, 1999-2000 (n=352)

Sex	Age	n	Weight, Kg Mean (±SD)	Height, m Mean (±SD)	BMI, Kg/m2 Mean (±SD)
Females	Overall	198	55.52 (±15.29)	1.56 (±0.07)	22.60 (±5.27)
	12	36	51.89 (±14.47)	1.53 (±0.07)	21.90 (±5.40)
	13	58	54.90 (±14.57)	1.56 (±0.07)	22.56 (±4.90)
	14	69	56.06 (±14.64)	1.58 (±0.06)	22.36 (±5.05)
	15-16	35	59.23 (±18.03)	1.57 (±0.06)	23.86 (±6.11)
Males	Overall	154	58.81 (±17.69)	1.62 (±0.01)	21.93 (±4.86)
	12	31	52.03 (±19.28)	1.54 (±0.11)	21.54 (±5.61)
	13	42	56.41 (±20.44)	1.59 (±0.11)	21.89 (±5.84)
	14	48	58.71 (±11.30)	1.64 (±0.09)	21.53 (±3.23)
	15-16	33	68.36 (±16.68)	1.72 (±0.07)	22.95 (±4.79)

level I and level II obesity were estimated to be 33.2% and 14.2%, respectively (Table 2). The prevalence of level I obesity was similar in both sexes, while the prevalence of level II obesity was slightly higher in females. The prevalence did not significantly differ by sex (p>.05). The prevalence of level I and level II obesity seemed to decrease with increasing age until it reaches the 15-16 year old threshold, where a sudden increase occurs. However, when stratified by age and sex, it is noticeable that this increase mainly occurs in the female group, and not among their male counterparts. When the ordinal logistic regression model was used, the results showed no significant differences in the prevalence of obesity by sex after adjusting for age (Adjusted $POR_{F\ vs.\ M}$ = 1.04; 95% CI: 0.67,1.62) (Table 3).

Table 2. Prevalence of Obesity* by Sex and Age in a Junior-High School in San Juan, Puerto Rico, 1999-2000 (n=352).

			Prevalence of Obesity* (%)			
Characteristics		n	Level I† Obesity	p value‡	Level II† Obesity	p value‡
Sex						
	Females	198	33.3	.9432	15.2	0.6722
	Males	154	33.1		13.0	
Age in years						
	12	67	38.3	.6667	17.9	0.4047
	13	100	34.0		14.0	
	14	117	29.9		10.3	
	15-16	68	32.4		17.6	
Sex-Age						
Female	12	36	38.9	.6135	13.9	0.8516
	13	58	34.5		13.8	
	14	69	27.5		14.5	
	15-16	35	37.1		20.0	
Male	12	31	38.7	.8137	22.6	0.1102
	13	42	33.3		14.3	
	14	48	33.3		4.2	
	15-16	33	27.3		15.2	
Overall	--	352	33.2	--	14.2	--

*Obesity levels were determined for each student using standards from the National Center for Health Statistics (11).
†Obesity level I: BMI between the age-sex specific 85th and 94th percentiles; Obesity level II: BMI that exceeds the age-sex specific 95th percentile.
‡Test for homogeneity of proportions for each obesity level

Table 3. Prevalence Odds Ratio (POR) of Obesity level by Sex and Age Using an Ordinal Logistic Regression Model*

Predictor Variable	POR	95% CI
Sex†		
Female vs. Male	1.04	0.67, 1.62
Age in years‡		
12 vs. 14	1.54	0.83, 2.86
13 vs. 14	1.23	0.70, 2.17
15-16 vs. 14	1.23	0.65, 2.30

*Based on the condition of proportional odds:

$$\text{Ln}\left[\frac{\Pr(\text{Obesity II})}{\Pr(\text{Obesity I + Non-obese})}\right] = \text{Ln}\left[\frac{\Pr(\text{Obesity II + Obesity I})}{\Pr(\text{Non - obese})}\right]$$

†Adjusted for age
‡Adjusted for sex

The mean systolic blood pressures (mm Hg) were significantly higher among obese than in non-obese subjects (level II: 112.06±12.14; level I: 106.12±8.81; non-obesity: 100.11±10.53, respectively, p<.001). Similarly, the mean diastolic blood pressures (mm Hg) were significantly higher among obese than in non-obese subjects (level II: 78.67±8.62; level I: 71.86±8.42; non-obesity: 68.93±9.76, respectively, p<.001). Moreover, significant increases in mean systolic and diastolic blood pressures were noted for higher levels of obesity between sexes (p<.001) (Table 4). Significant positive correlations were shown between BMI and the following variables:

Table 4. Mean (±SD) Levels of Systolic and Diastolic Blood Pressures by Sex and Level of Obesity in a Junior-High School in San Juan, Puerto Rico, 1999-2000 (n=254).

			Blood Pressure, mm Hg			
Sex	Obesity Level	n	Systolic Mean (±SD)	p value	Diastolic Mean (±SD)	p value*
Females	Overall	142	100.97 (±10.22)		70.91 (±9.42)	
	Non-Obesity†	92	97.67 (±8.75)	<0.0001	68.94 (±9.08)	0.0011
	Level I Obesity‡	28	105.07 (±8.97)		73.04 (±8.54)	
	Level II Obesity**	22	109.55 (±10.90)		76.46 (±9.48)	
Males	Overall	112	105.59 (±12.09)	0.0006	70.89 (±10.53)	0.0001
	Non-Obesity†	75	103.09 (±11.76)		68.93 (±10.60)	
	Level I Obesity‡	23	107.39 (±8.64)		70.44 (±8.25)	
	Level II Obesity**	14	116.00 (±13.31)		82.14 (±5.79)	

* p-value for ANOVA except for males diastolic blood pressure where Kruskal-Wallis one way analysis of variance was used due to heterogeneity of variance. Obesity levels were determined for each student using standards from the National Center for Health Statistics (11).
† BMI below the age-sex specific 85th percentile
‡ BMI between the age-sex specific 85th and 94th percentiles
** BMI that exceeds the age-sex specific 95th percentile

Table 5. Relationship between Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), BMI, Age and Sex: Multiple Linear Regression Model (n=254).

Regression Model	Regression coefficients ($ß_i$)	Standard error SE ($ß_i$)	p value*
SBP = $ß_0$ + BMI ($ß_1$) + Age ($ß_2$) + Sex ($ß_3$)	$ß_0$ = 68.346	7.619	<.0001
	$ß_1$ = 1.039	0.118	<.0001
	$ß_2$ = 1.088	0.543	0.0462
	$ß_3$ = 5.263	1.222	<.0001
DBP = $ß_0$ + BMI ($ß_1$) + Age ($ß_2$) + Sex ($ß_3$)	$ß_0$ = 57.802	7.328	<.0001
	$ß_1$ = 0.720	0.114	<.0001
	$ß_2$ = -0.188	0.522	0.7189
	$ß_3$ = 0.576	1.176	0.6248

*p-value for Student's t test

systolic blood pressure (r=0.46, p<.001) and diastolic blood pressure (r=0.37, p<.001). These results were confirmed after adjusting for age and sex (p<.001) (Table 5). Systolic blood pressure was statistically associated with the following variables: BMI (p<0.0001), age (p=0.0462) and sex (p<0.0001); diastolic blood pressure was statistically associated only with BMI (p<0.0001).

Twenty-six volunteers, out of the 352 study subjects, participated in the second stage of this study. Their mean (± SD) age was 13.6 (±1.2) years, and approximately 70% were females. The mean (± SD) BMI was 22.7 (±5.0) Kg/m^2, and the percentages of level I and level II obesity were 42.3% and 19.2%, respectively. Analysis of serum lipids revealed that the median levels for total cholesterol, HDL-C, LDL-C and triglycerides were 137.0 mg/dl, 44.0 mg/dl, 73.5 mg/dl, and 58.0 mg/dl, respectively. Although the medians for total cholesterol, HDL-C, LDL-C, and triglycerides were higher in obese than in non-obese subjects, the median total cholesterol was the only serum lipid to reach marginal level of significance (p=.0516) (Table 6). Classifying subjects according to the overall median values (above or below) for each serum lipid revealed the following findings: (1) obese subjects had 5.3 (95% CI: 0.76, 43.0) times the odds of having total cholesterol levels above the median value than their counterparts; (2) obese subjects had 2 (95% CI: 0.31, 13.4) times the odds of having HDL-C levels above the median value compared with non-obese subjects; and (3) the odds of having levels of LDL-C and triglycerides above their corresponding median values were 2.6 (95% CI: 0.41, 17.8)

Table 6. Levels of Serum Lipids in a Sample of Volunteers in a Junior-High School in San Juan, Puerto Rico, 1999-2000 (n=26).

Serum lipid	Median (mg/dl)	P value*
Total cholesterol (mg/dl)		
Overall	137.0	
Obese	143.0	0.0516
Non-obese	122.0	
HDL-C (mg/dl)		
Overall	44.0	
Obese	54.0	0.4178
Non-obese	42.0	
LDL-C (mg/dl)		
Overall	73.5	
Obese	75.5	0.3367
Non-obese	65.0	
Triglycerides (mg/dl)		
Overall	58.0	
Obese	58.0	0.6971
Non-obese	57.0	

*Median test for association

and 1.37 (95% CI: 0.22, 8.6) times higher in obese than in non-obese subjects, respectively. However, none of these results reached statistical significance (p>.05) (Table 7).

Table 7. Prevalence Odds Ratio (POR) between Obesity* and Serum Lipids in a Sample of Volunteers in a Junior-High School in San Juan, Puerto Rico, 1999-2000 (n=26).

Serum lipid	Levels Above Median	Levels Below Median	POR (95% CI)	p-value†
Total cholesterol (mg/dl)				
Obese	8	3	5.3	0.55
Non-obese	5	10	(0.76, 43.0)	
Obese	7	4	2.0	0.32
Non-obese	7	8	(0.31, 13.4)	
Obese	7	4	2.6	0.21
Non-obese	6	9	(0.41, 17.8)	
Obese	6	5	1.37	0.50
Non-obese	7	8	(0.22, 8.6)	

* Obese group included level I and level II obesity
† Fisher's exact test

In general, obese and non-obese subjects reported similar hazardous lifestyles (p>.05) (data not shown). The majority of subjects reported having consumed less than two portions of fresh fruits (84%), natural fruit juice (80.8%), vegetables (92.3%), and salad (92.3%) the day prior to testing. Participants reported having performed on one occasion or less the following activities during the week previous to the interview: vigorous physical activity (64%), moderate physical activity (69.3%), and muscle strengthening activities (80.8%). Sixteen percent of all subjects reported current cigarette smoking, and 30.8% reported having consumed alcohol during the previous 30 days.

Discussion

The results of this study showed a high prevalence of level I and level II obesity in this population. Although no real difference in the prevalence of level I obesity was observed between sexes, female subjects had a higher prevalence of level II obesity than their counterparts. It has been reported that physiological maturation and ethnicity must be taken into consideration when utilizing the BMI to describe obesity among different ethnic groups (15). Taking this finding into consideration, it is probable that different physiological changes might have contributed to the disparity in the prevalence of obesity level II between sexes.

Although a considerable percentage of these obese adolescents will grow and physically mature to be non-obese adults, unfortunately, a large percentage of them will eventually turn into obese adults. Some studies have found that obese adolescents are at greater risk of becoming obese adults and to suffer at a young age, from high blood pressure and high levels of serum total cholesterol, triglycerides, and LDL-C (4, 10, 11, 16-18). Furthermore, it has been reported that these risk factors have a tendency to cluster in obese children, adolescents and young adults, and that this cluster usually persists and worsens throughout adulthood (1, 8, 18).

The results of the blood pressure screening showed that obese adolescents do have significantly higher systolic and diastolic blood pressures than their non-obese counterparts, and that there is a significant increase in blood pressure with increased levels of obesity. These results were confirmed by the fact that there was a significant positive association between systolic and diastolic blood pressures and BMI after controlling for age and sex. These findings are supported by others (1, 4, 7, 10, 17, 18) stating that there is an increase in blood pressure among obese adolescents.

Despite of the reduced number of subjects that participated in the second stage of the study, it was possible to notice some differences in serum lipids between study groups. The obese group had marginally significant higher levels of total cholesterol. In addition, obese adolescents had greater odds of having serum lipids above the median values. These results are consistent with other reports (4, 17, 19) stating that obese adolescents usually present abnormal levels of serum lipids, and that obese adolescents show higher levels of serum lipids than their counterparts.

Several researchers (4, 5, 17, 18) have found that obese adolescents show a tendency to report more and poorer lifestyles than non-obese adolescents. According to the self-reported information of our participants, more than 80% of all subjects reported consuming 1 or less portions of fresh fruit and/or juice, vegetables or salad the day before the study; more than 65% reported having done, on one occasion or less, some kind of physical activity the prior week; 16% reported being current smokers and 30% reported to be current alcohol users. Although our study did not have the statistical power to detect any differences in lifestyles between study groups, the majority of the students was engaging in hazardous lifestyles.

Various limitations of the current study should be considered before conclusions are drawn. One of the major concerns was the utilization of BMI as a surrogate for obesity. Regardless of the fact that BMI is the most commonly used obesity indicator in epidemiological settings, BMI only relates body weight to height without considering body fat percentage. In addition, the BMI, blood pressure and serum lipids standards and cut-off points used to classify subjects were age-sex-specific values proposed in the United States; however, no such standards are available for the Puerto Rican population. Due to the fact that these norms do not necessarily apply to our population, there is an increased probability of classification bias. Blood pressure reading accuracy may have been affected since only one measurement was recorded. Furthermore, the relatively small sample size achieved in the second stage of the study limited our ability to estimate the odds ratios with greater precision. Potential biases due to subject selection and classification, as well as, non-response and information bias must be taken into consideration. Finally, our results would be unlikely to apply to the entire universe of adolescents in Puerto Rico.

Notwithstanding the limitations of the study, obesity is a prevalent health problem in this particular population of adolescents. These obese subjects had higher levels of blood pressure, higher levels of total cholesterol, LDL cholesterol and triglycerides. They also engaged in poor nutritional and physical activity patterns. In addition, a large percentage of these subjects are current smokers and alcohol users. Along with the findings of Smoke and colleagues (18), these suggest that clustering of obesity with other risk factors can develop at an early age. Longitudinal studies have established that these characteristics increase the risk of both cardiovascular disease and diabetes mellitus, first and third leading causes of death in Puerto Rico. The results obtained in the study parallel the findings obtained in the Behavioral Risk Factor Surveillance System conducted in Puerto Rican adults during 2000 and 2001. Compared with the U.S. nationwide median percentages, the prevalence of diabetes (9.8% vs. 6.5%), lack of exercise during the past month (49.2% vs. 25.7%), and high blood pressure (26.4% vs. 25.6%) were higher in Puerto Rico during 2001 (20). Similarly, the prevalence of overweight, defined as a BMI between 25.0 and 29.9 kg/m^2, and the prevalence of obesity, defined as a BMI at or above 30 kg/m^2, were higher in Puerto Rico than the U.S. nationwide median percentages reported in 2000 (39.3% vs. 36.7% and 21.7% vs. 20.1%, respectively) (21).

It has been evidenced that the economic impact of obesity and its related comorbidities is substantial and appears to lessen life expectancy markedly (1, 22-24). Thus, intervention should focus on the primary prevention of obesity in early life, where unhealthy lifestyles and behaviors are easier to modify by encouraging healthy living. Parents of young individuals at greater risk should be identified and targeted as to promote better nutritional behaviors, more active lifestyles and overall health not only for their children, but for the entire family. To achieve this goal, further research on obesity and its related co-morbidities in youngsters should be directed towards understanding the critical periods for its development (25). Establishing population-wide-based norms and standards of different markers, as to improve the diagnosis of obesity, and the identification of individuals and populations at risk are warranted. The American Heart Association has recently provided strategies for promoting optimal cardiovascular health that can be integrated into the comprehensive pediatric care of children (26). In light of one of the national health objectives for 2010 aimed at reducing the prevalence of obesity among adults to less than 15% (27), innovative public health policies and programs addressed to design and implement successful community and family-oriented interventions encouraging early detection and conduct modification towards healthier lifestyles should be able to reverse the actual trend.

Resumen

Esta investigación se diseñó para describir la prevalencia de obesidad en la población de estudiantes adolescentes entre las edades de 12 a 16 años en una escuela pública adscrita al Departamento de Educación de Puerto Rico durante el año académico 1999-2000. Además, evaluó la asociación entre el índice de masa corporal y la presión arterial, los niveles de lípidos en suero y ciertos estilos de vida en un subgrupo de esta población de adolescentes. La población de estudiantes constó de 352 sujetos entre las edades de 12 a 16 años. Se determinó la edad, la estatura, el peso corporal y la presión arterial sistólica y diastólica. Además, se determinaron los niveles de lípidos en suero y se administró un cuestionario auto-administrable sobre estilos de vida en un grupo pequeño (n=26) de sujetos voluntarios. Se encontró que 33.2% de la población se encontraba bajo el nivel I de obesidad (índice de masa corporal entre las percentilas 85 y 94 por sexo y edad) y que 14.2% estaba bajo el nivel II de obesidad (índice de masa corporal sobre la percentila 95 por sexo y edad). La presión arterial promedio, tanto sistólica como diastólica, fue significativamente mayor ($p<.001$) en el grupo de obesos que en el grupo no obeso. No se observaron diferencias estadísticamente significativas ($p>0.05$) en los niveles de lípidos en suero según el nivel

de obesidad. Sin embargo, los niveles medianos de colesterol total, lipoproteínas de baja densidad, lipoproteínas de alta densidad y triglicéridos fueron mayores en el grupo de obesos que en el grupo no obeso. Aunque no hubo diferencias significativas (p>.05) entre los hábitos alimentarios, la actividad física, el hábito de fumar y el uso de alcohol entre los grupos de estudio, se encontró que ambos grupos tienden a adoptar estilos de vida nocivos a la salud. Este estudio encontró una prevalencia alta de obesidad nivel I y nivel II en el grupo de adolescentes estudiados. Además, se observó una correlación positiva significativa entre la presión sanguínea y el índice de masa corporal. Los hallazgos de este estudio resaltan la necesidad de investigar la magnitud real del problema de obesidad en Puerto Rico para así desarrollar estrategias de intervención enfocadas en la detección temprana y la modificación de conductas que promuevan estilos de vida saludables.

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