Prevalence Of Overweight/Obesity In School-Aged Children From Celaya, Guanajuato, Mexico, And Its Association With Arterial Hypertension: A Cross-Sectional Study.

N Padilla-Raygoza, L Ruiz-Paloalto, R Guerrero, C Canfield

Citation

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Abstract

Introduction. Obesity represents a major public health threat due to the high incidence of chronic disease in persons who are obese. Objective: to determine the prevalence of overweight/obesity in school age children in Celaya, Mexico, and its association with arterial hypertension. The protocol for this study was reviewed and approved by the Research and Bioethics Committee at the School of Nursing and Obstetrics at the University of Guanajuato. Materials and methods. The study is a cross-sectional, analytic, comparative, and community-based. Population: students enrolled in public elementary schools in Celaya, Guanajuato, Mexico. Inclusion criteria: both male and female children eight years of age and older were enrolled in the study given that their parents signed an informed consent, and that they assented to participate. Male and female children ages six and seven were also included in the study if their parents signed the informed consent. Exclusion criteria: children younger than six years of age, children who did not assent to participate in the study, children whose parents did not sign the informed consent. Sample: We randomized select four elementary schools in Celaya; in them, we invited parents and children to participate in the study. We measured age, gender, weight, height, Body Mass Index (BMI) and arterial tension. Outcomes were: not overweight: children at or below the 74th percentile of the CDC's 2000 BMI curve; overweight/obese: children at or above the 75th BMI percentile. Hypertension was defined as having arterial tension above the 95th percentile given height, age, and gender. Statistical analysis. Chi-squared and Odds Ratio tests were performed to assess the association between overweight/obesity and arterial hypertension. Results. Our final sample included 301 children. The prevalence of overweight/obesity in our sample was 66.11% (199/301), while the prevalence of arterial hypertension was 7.97% (24/301). A Chi-squared test resulted in $X^2 = 3.45$ df 1 p=0.06 when testing the association between overweight/obesity and arterial hypertension; the Odds Ratio was OR= 2.74 CI95%=0.90 to 8.30.Discussion. The prevalence of overweight/obesity in elementary school children was higher than we had expected to find. We also conclude that overweight/obesity and arterial hypertension are associated within this population.

INTRODUCTION

Individuals who have overweight or obese are at high risk of developing chronic diseases. Particularly worrisome is the increasing trend of Type 2 diabetes and metabolic syndrome at early ages (1). Obesity is the result of imbalance between calorie intake and energetic output. This is of particular concern for children, who tend to consume diets that are high in caloric density and low in fiber. In addition, many children consume large amounts of sugar in beverages and have low rates of physical activity (2).

In 1990,no one state in the United States of America had an obesity rate above 15%. By 2000, more than 22 states exhibited obesity rates above 20%, and by 2005, 15 states had obesity rates exceeding 25% (3). In Mexico, obesity rates increased from 18.6% in 1999 to 26.0% in 2006, according to the National Survey of Health and Nutrition (4, 5). During 2003–2004, the National Health and Nutrition Examination Survey in USA (NHNES) reported that 33.6% of children and teenagers were either obese (17.1%) or at risk of becoming obese (16.5%) (6).

Obesity represents a major risk factor for many conditions. It increases individual's risk of experiencing stroke by 200%, coronary heart disease by 250%, the risk of arterial hypertension by 400% and type 2 diabetes by 300-400% (7).

Factors associated with obesity include intake of processed foods with high caloric density, being weaned at an early age, and low intake of fruits and vegetables (low intake of foods with low caloric density). Other factors associated with obesity include urbanization and the mechanization of transportation (e.g., driving for transportation rather than walking or riding a bike). Engaging in non-physical activities such as watching T.V., using the computer, and playing video games rather than participating in physical activities are also associated with obesity (4). Interestingly, attending school is also associated with obesity among children, and 26% of children become obese before adolescence (4). For children, the consequences of overweight/obesity are many and varied:

Physical: Glucose intolerance, insulin resistance, type 2 diabetes, arterial hypertension, lipid conditions, fatty liver, sleep apnea and orthopedic problems.

Emotional: Low self-esteem, negative body image and depression.

Social: Discrimination, negative stereotyping, anorexia and bulimia.

All of these factors have the potential to cause further damage to children's health. They also represent an overwhelming additional burden to the Mexican health care system. Therefore, we must explore strategies aimed at preventing or reducing the prevalence of obesity and overweight in children. The first step to achieving this goal is to determine the prevalence of obesity among school age children. For this reason, the objective of this study was to determine the prevalence of overweight/obesity in school age children in Celaya, Guanajuato. As overweight/obesity is the primary risk factor for arterial hypertension (8), we also wanted to determine the association between overweight/obesity and arterial hypertension within this population . It was necessary for us to conduct this study because data on overweight/obesity and arterial hypertension are not available in the regional literature.

Our protocol was reviewed and approved by Research and Bioethics Committee at the School of Nursing and Obstetrics of Celaya, University of Guanajuato.

MATERIAL AND METHODS

Study design: this is a cross-sectional, analytic, comparative, community-based study.

Population: students attending public elementary schools in Celaya, Guanajuato, Mexico.

Subjects.

INCLUSION CRITERIA

Male and female children, eight years of age or older, whose parents signed the informed consent and who assented to participate.

Male and female children, six and seven years of age, whose parents signed the informed consent.

EXCLUSION CRITERIA

Children, eight years of age or older, who did not assent to participate in the study.

Children whose parents did not sign the informed consent.

Sample: we identified 176 public elementary schools in Celaya and randomly selected 4. Within these selected institutions, we invited parents and children to participate in the study.

Sample Size: In order to calculate the sample size, our anticipated obesity prevalence was set at 46%, with a maximum obesity prevalence of 55%. From a population of 49,671 children enrolled at public elementary schools, and given the expected prevalence, our sample size was set at 118 children (EpiInfo 3.5.1, 2008,CDC, Atlanta, GA, USA).

We measured :

Age, determined as the time between the birthday and interview date, in years. Gender was established by assessing phenotypic characteristics; it was measure as male or female. Weight was measured using the Medidata MS Series®, which is a digital scale with an altimeter. Children were weighed wearing the minimum amount of clothing deemed acceptable and without shoes. It was measure in kilograms. Height was measured using the Medidata MS Series®. Children were measured standing in an erect position without shoes. It was measure in meters. Body Mass Index (BMI) was the weight/height expressed in squared meters; it was the body mass. Arterial tension was measured using the RossMax® digital baumanometer three consecutive times per participant.

We classified children in terms of whether they were overweight, obese or severely obese. Non-overweight children were defined as having a BMI at or below the 74th

percentile using the CDC's pediatric BMI curve from 2000. Overweight/obese children were defined as those having a BMI at or above the 75 th percentile using the same curve (10). Within the overweight/obese group, children having a BMI between the 75th-84 th percentiles were considered overweight, those between the 85th-96th percentiles were considered obese, and those in the 97 th percentile or above were considered severely obese. Arterial hypertension was defined as arterial tension above the 95th percentile given the participant's height, age and gender (11).

STATISTICAL ANALYSIS

Descriptive statistics were employed in order to summarize each of the variables. Chi-squared test was also used to investigate the association between overweight/obesity and arterial hypertension.. The Odds Ratio (OR) between arterial hypertension and obesity was established in order to understand the effect of obesity on arterial hypertension. Additionally, we used chi-squared test to investigate trend in the association between arterial hypertension and different categories of BMI (not overweight, overweight, obese, severely obese).

In order to demonstrate the statistical significance of our results, the p value was fixed at 0.05.

All statistical analysis was done using Stata 10.0®.

RESULTS

We invited 400 parents to allow their children to participate in the study. 75.25% (301/400) agreed to allow their children to participate, thus our sample was comprised of 301 children. The mean of age within our sample was 8.79±1.83 years; mean of weight 36.39±13.38 kilograms, mean height 1.32±0.13 meters, mean BMI 20.30±4.70 Kg/m2, mean SBP 112.70±13.93 mm/Hg, mean DBP 73.11±11.37 mm/Hg (Table I).

Figure 1

Table I Quantitative characteristics of the school age children, Celaya, 2009 (n=301)

Variable	Range	Mean	Standard deviation
Age (years)	6 to 13	8.79	1.83
Weight (Kilograms)	17.80 to 84.95	36.39	13.38
Stature (Meters)	0.82 to 1.64	1.32	0.13
Body Mass Index (Kg/M^2)	13.49 to 42.24	20.30	4.70
Systolic blood pressure (mm Hg)	80 to 180	112.70	13.93
Diastolic blood pressure (mm Hg)	42 to 125	73.11	11.37

Source: Questionnaires of research

52.49% of our sample was male (158/301), 7.97% did have arterial hypertension (24/301), and 66.11% had overweight or obesity (199/301); within our sample, 33.89% were not overweight (102/301), and 31.23% had severe obesity (94/301). (Table II).

Figure 2

Table II Qualitative characteristics of the school age children, Celaya, 2009 (n=301)

Variable	n	%
Gender		
Male	158	52.49
Female	143	47.51
Status of obesity		
Overweight/obesity	199	66.11
Without overweight	102	33.89
Group of obesity		
Severe obesity	94	31.23
Obesity	71	23.59
Overweight	34	11.30
Without ovwerweight	102	33.89
Arterial hypertension		
Yes	24	7.97
No	277	92.03

Source: Questionnaires of research

When we performed a cross tabulation between arterial hypertension and gender, we found that there are not associated (X^2 =1.05 p=0.31) and that the OR was 0.64 when comparing females with males (Table III). The cross tabulation between high blood pressure and overweight/obesity did not reveal an association (X^2 =3.45, p= 0.06), and the OR was 2.74 (Table III). Children with

arterial hypertension were 2.74 times more likely to be overweight or obese than non-hypertensive children.

Figure 3

Table III. Cross-tabulation from overweight/obesity and gender with arterial hypertension, Celaya, 2009 (n=301)

	With arterial hypertension n %	Without arterial hypertension n %	X^2	p-value	OR (CI95%)
Gender			1.04	0.31	0.64
Male	15 9.49	143 90.51			(0.27 to1.52)
Female	9 6.29	134 93.71			
Status obesity			3.45	0.063	2.74
Overweight/obesity	20 10.05	179 89.95			(0.90 to8.30)
Without overweight	4 3.92	98 96.08			

Source: Questionnaires of research

Table IV shows the observed association between the different categories of obesity and high blood pressure (p=0.007). The table shows that the more severe the obesity, the more frequently arterial hypertension was observed in our sample of children. We also found that hypertensive children were 4.65 times more likely to be severely obese (Table IV). The population attributable risk of arterial hypertension in the exposed population (i.e., those children who are severely obese) is as follows: OR-1/OR = 4.65 – 1 / 4.65 = 0.79 = 79%. Thus, if severe obesity had been avoided in this sample, we would have avoided 79% of the hypertensive cases that were observed.

Figure 4

Table IV Cross-tabulation between group of obesity and arterial hypertension, Celaya, 2009(n=301)

	Arterial hypertension n %	With arterial hypertension n %	X^2	p-value	OR (CI95%)	AFex
Severe obesity	15 62.50	79 28.52	8.09	0.004	4.65 (1.40 to19.88)	0.79
Obesity	3 12.50	68 24.55	0.01	0.92	1.08 (0.15 to 6.61)	0.074
Overweight	2 8.33	32 11.55	0.23	0.63	1.53 (0.13 to11.23)	0.35
Without overweight*	4 16.67	98 35.38	---	-------	-------	

Source: Questionnaires of research X^2 for trend =12.01 df 3 p=0.007

OR= Odds Ratio CI95% Confidence interval at 95%

AFex Attributable fraction in exposed

DISCUSION

Our sample was obtained by probabilistic methods and our results can be widespread to school age children population from Celaya. However, we should recognize the possibility of selection bias; may be possible that the children participating in the study could be to have more frequently obesity than children that not participate in the study, because the parents could think that their children were obese.

Overweight/obesity prevalence in our sample was 65.85% (Table II); it is higher than the prevalence reported by National Survey on Health and Nutrition from Mexico in 2006, of 26% (5). Garduño et al., development a mathematical model to estimate the prevalence of obesity in Mexico; the model estimated that a cohort hypothetical of children, in the 2050, when these children are in 40's years old, the prevalence of obesity should be 67.3% (14). Our results show that the prevalence of overweight/obesity of 66.11%, is almost that the same that Garduño's model (14). This difference could be by the non- healthy life styles in our children.

Halabe (15) estimated that prevalence of arterial hypertension in Mexican children was 1%, but in our sample, the prevalence was 7.97%. Our findings agree with the OMS' affirmation (10): "obesity is a risk factor for arterial hypertension". We found that children with severe obesity had higher prevalence of arterial hypertension than children with obesity or overweight.

Using attributable fraction in exposed, we estimated that the number of cases of hypertensive children should be diminishing considerably, if less children were obeses.

CONCLUSION

We found a prevalence of overweight/obesity higher than two times at the prevalence from 26% reported in the National Survey on Health and Nutrition in Mexico (5), confirming the worrying situation of the epidemic of obesity in Mexico. In addition, our sample had high prevalence of arterial hypertension compared with that reported by Halabe (15).

Because the high prevalence of both conditions in these children, there is probable that experiencing diseases, that in the future, impact in the quality of life and premature death, if they do not take the appropriate changes to control obesity.

It is important that community of Public Health design and apply interventions to improve the hemodynamic conditions in obese children and control overweight and obesity in Mexico and in the World. We should design interventions to help at children to improve life styles now and in the future.

ACKNOWLEDGEMENTS

We wish to thank PROMEP at the Mexican Ministry of Education for supporting this research with the PROMEP/103.5/08/5163 award. We also want to recognize the data collection help provided by Mirna Natali Vega Casillas and Dulce María Soria Lara, both students pursuing Bachelor's Degrees in Nutrition.

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Author Information

Nicolas Padilla-Raygoza
Division of Health Sciences and Engineering, Campus Celaya Salvatierra, University of Guanajuato

Laura Ruiz-Paloalto
Department of Clinical Nursing, Division of Health Sciences and Engineering, Campus Celaya Salvatierra, University of Guanajuato

Rosalina Díaz Guerrero
Division of Health Sciences and Engineering, Campus Celaya Salvatierra, University of Guanajuato

Caitlin M. Canfield
School of Public Health and Tropical Medicine, Tulane University