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Prevalence of overweight/obesity and factors associated with the preventive-predictive value in schoolchildren aged 6 to 11 in Río Gallegos, Santa Cruz, Argentina

Prevalencia de sobrepeso-obesidad y factores asociados con valor predictivo-preventivo en escolares de 6 a 11 años de Río Gallegos, Santa Cruz, Argentina

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ABSTRACT In Argentina there is little information available about overweight/obesity in schoolchildren. The aims of this study are to analyze the prevalence of overweight/obesity and to determine the factors with preventive value in schoolchildren in Río Gallegos, Santa Cruz, Argentina. This is a prevalence study based on a mixed probability sampling. A total of 1,645 students, aged 6 to 11 years, were interviewed with their parents. The nutritional diagnosis of overweight and obesity was established using body mass index, according to the criteria of the International Obesity Task Force. The prevalence of overweight and obesity was high: 25.6% (IC95%: 23.5; 27.7) and 13.8% (IC95%: 12.1; 15.5) respectively; these percentages are similar to national results and higher than those found in studies from other provinces and other Latin American countries. A prediction model was constructed using a multivariate logistic regression analysis, considering the overweight as the dependent variable. The final model included as variables: having one sibling or being an only child, maintaining a high level of consumption of fast foods, and maintaining a high level of consumption of soft drinks.
KEY WORDS Overweight; Obesity; Prevalence; Disease Prevention; School Health; Argentina.

RESUMEN En Argentina la información de sobrepeso-obesidad en escolares es escasa. Los objetivos de este estudio son analizar la prevalencia de sobrepeso-obesidad y determinar los factores con valor preventivo en escolares de Río Gallegos, Santa Cruz, Argentina. Se trata de un estudio de prevalencia. Se aplicó un muestreo probabilístico mixto. 1.645 escolares de 6 a 11 años fueron entrevistados con sus padres. El diagnóstico nutricional se hizo con el índice de masa corporal siguiendo los criterios del International Obesity Task Force. Las prevalencias de sobrepeso-obesidad encontradas fueron altas: 25,6% (IC95%: 23,5; 27,7) y 13,8% (IC95%: 12,1; 15,5) respectivamente, semejantes a resultados nacionales y superiores a otros estudios provinciales y latinoamericanos. Se construyó un modelo de predicción mediante análisis de regresión multivariado considerando como variable dependiente al exceso de peso. El modelo final incluye: tener un hermano o ninguno, alto consumo de comidas rápidas y alto consumo de gaseosas.
PALABRAS CLAVES Sobrepeso; Obesidad; Prevalencia; Prevención de Enfermedades; Salud Escolar; Argentina.

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INTRODUCTION

The World Health Organization (WHO) highlights that the prevalence of childhood obesity has reached epidemic proportions worldwide, considering it among the chronic diseases that can and must be prevented (1). Researching excess body weight in children is a priority because this condition is associated with elevated blood lipid levels, hypertension and altered serum insulin levels (2). The nutritional diagnosis in children is based on body mass index (BMI), given its correlation with body fat assessed by skinfold measurement. The International Obesity Task Force (IOTF), a subgroup of WHO experts, regards this index as a standard measure for determining and comparing prevalence of overweight and obesity in children and adolescents in different world populations (3,4). In the literature, the term "excess body weight" encompasses both overweight and obesity in a single entity, established by BMI values equal to or higher than 25 or the corresponding value by age and sex, extrapolated from the cut-off points for overweight in adulthood (2,3,5).

The WHO organizes the world statistics on chronic diseases by diagnoses and risk factors according to country and continent. Many research studies carried out worldwide are compiled in the WHO's database (6). In Latin America and particularly in Argentina, research studies have been carried out which include heterogeneous age groups, objectives and diagnostic criteria (7,8). Studies based on the IOTF's criteria show prevalences of overweight of between 10.9% and 21.1%, and of obesity of between 3.7% and 6.7% (8,9). The recommended tables were applied in Argentina's National Survey of Nutrition and Health (ENNyS, from the Spanish *Encuesta Nacional de Nutrición y Salud*), which is directed at children from 6 months to 5 years of age, women between 10 to 49 years of age, as well as pregnant women. At the national level, the prevalences of overweight and obesity in women aged 10 to 15 years was 23.5% and 5.8% respectively. In the Argentine Patagonia (a) percentages were higher: 30.4% for overweight and 10.6% for obesity (10).

Excess body weight in schoolchildren is associated with multifactorial and complex processes of individual and family behavior, as well as with sociocultural and economic transformations. Attempts to explain the underlying reasons for excess body weight include family history of obesity, birth weight of more than 3500 g (5,11), little physical activity, eating habits favoring the consumption of high energy density products encouraged by advertising (5,8,12), and the nutritional transition along with the social and work changes in modern life that condition family attitudes and consumption (13,14).

This study (b) aims at determining the prevalence of overweight and obesity in schoolchildren in Río Gallegos and establishing a possible relationship with the geographical climate as well as other factors that predict the development of excess body weight, through the selection of variables explicative of the problem and the use of a step-by-step regression procedure that selects the simplest and most accurate model.

OBJECTIVES

The objectives of this study were to analyze the prevalence of overweight and obesity and identify factors associated with the preventive and predictive value for overweight/obesity in schoolchildren aged 6 to 11 in Río Gallegos, Santa Cruz, in 2005.

MATERIALS AND METHODS

This is a cross-sectional or prevalence study; this type of study was selected because the surveys permit the study of eating habits in schoolchildren at a particular moment. The study population included schoolchildren of both sexes born between 1994 and 1999 from the 18 public schools in Río Gallegos. The school enrollment for the year 2005 was 7,540 children, 3,792 boys and 3,748 girls, with an average of 400 students aged 6 to 11 per school, homogeneously distributed by age group and sex. List of students were prepared in alphabetical order by school, grade and age.

A mixed probability sampling was applied combining stratified and systematic sampling according

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to age groups. Schools were assigned a random order. The stratified sampling was carried out in relation to the different age groups. The systematic selection was made in each age group from a random starting point in the lists made for this purpose.

Once the schoolchildren were selected for the study, a second sampling was carried out for the laboratory testing. The laboratory sample was made up of subjects in the survey sample. A total number of 1,645 schoolchildren were studied, of whom 1,293 were only interviewed and 352 were both interviewed and tested. In 10 of the 352 cases, the blood extraction was not sufficient to carry out the lipid studies. The interview and measurements were carried out with all the schoolchildren who had parental authorization. Afterwards, the cases that did not meet the selection criteria were separated. A total number of 1,743 schoolchildren were selected, 98 of whom were excluded because they fell out of the age range of the study or because of diagnosis and/or treatment of diabetes, dysthyroidism or disability. The schoolchildren's parents were notified of this research study through a school communication containing an informed consent form by which they could authorize the children's participation with their signature. During the study, as each interview was being conducted, the procedures were explained to the legal parents or guardians, and the parents of those schoolchildren selected for blood extraction were asked to sign a second informed consent to authorize that procedure as well. The group of schoolchildren whose parents refused consent or did not complete the informed consent form was compared with the sample selected, and no significant differences between both groups were found. This comparison was carried out according to criteria for non-respondents in cross-sectional studies (15).

Trained and pre-evaluated health care staff interviewed each student with their parents. The questionnaire centered on eating habits and physical activity, and was developed using several authors, including the ENNyS as a nationally representative source (7,8,10,12,16,17). The survey methods selected were those considered the most appropriate taking into account their advantages and limitations (8,18). The questionnaire included a structured recollection of what was eaten the previous day and the frequency of consumption in the last week, without examining the nutritional composition of the foods or the portions. The interview was prepared in accordance with the objectives of the study, staff availability (given a lack of nutrition specialists) as well as technical and operational capacity (8,18,19). A pilot test was carried out to adapt the instrument so as to facilitate the comprehension of the vocabulary used. The results of the pilot were excluded from the analysis due to modifications in the format.

Listed below are the independent variables taken into consideration:

- Sociodemographic variables including age, sex, number of siblings and parents' level of education.
- Variables associated with eating habits, including the foods consumed the previous day and during that week. The category "high consumption" corresponded to a frequency of 4 or more times a week. Fast food was defined as informal foods prepared quickly, such as hamburgers, pizza, French fries and hot dogs, among others (18).
- Physical activity, using the category "active" for students in the habit of doing extracurricular physical activity (such as walking, riding a bicycle, etc.) 3 or more times a week, and "passive" for those involved in such activity less than 3 times a week (7,17).
- Anthropometric variables including weight and height, used for calculating BMI.
- Blood pressure readings, both systolic and diastolic.
- Blood lipids determined through the levels of cholesterol and triglycerides.

The anthropometric measurements of 769 boys and 876 girls (n = 1,645) were studied between August and September 2005. The nutritional status classification was based on the cut-off points of BMI values recommended by the IOTF, according to sex and age (3,20). The guidelines established by the Argentine Pediatrics Society were followed in order to detect differences between children with normal BMI values and underweight children (4,21). The children were measured without bulky clothing and shoes. The weight, height and blood pressure were measured under

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standard conditions with calibrated instruments: an electronic scale, a free-standing aluminum stadiometer (measuring range: 60-200 cm) and an electronic sphygmomanometer with small cuffs appropriate for children's arm circumference. Blood pressure was measured at rest twice and the resulting values were subsequently classified in accordance with the 90th percentile for sex, age and height (22). Blood samples were obtained after a 12 to 14-hour fast in order to determine the concentrations of total cholesterol, high-density lipoprotein cholesterol (HDL cholesterol), low-density lipoprotein cholesterol (LDL cholesterol) and triglycerides (2).

Analysis Strategies and Statistical Tests

Prevalences of overweight and obesity were estimated according to sex and age and the prevalence of potential risk factors estimated for three groups formed according to BMI: normal weight, overweight and obesity. The Chi-square test was used to compare proportions. A 5% significance level was considered for accepting the null hypothesis.

The prevalence ratios (PR) and their respective 95% confidence intervals were obtained separately for overweight and obesity. Two independent analyses were made taking into consideration the population groups according to BMI, sex and age, in accordance with the IOTF's criteria (3): one between the schoolchildren in the overweight group and those in the normal weight group, excluding the children in the obesity group; and the other between the schoolchildren in the obesity group and those in the normal weight group, excluding the children in the overweight group.

Although this was a prevalence study, upon recovering information about the temporality of some variables, we studied those which could help contribute to the prediction of overweight in schoolchildren. First, the relevant variables were studied through univariate analyses. Then, by means of a multivariate regression analysis (using a step-by-step procedure), we obtained a parsimonious prediction model, which was evaluated through the contingency table for the Hosmer-Lemeshow test. We ensured that the application of the prediction model would contemplate the conceptual relevance of excess body weight in the context of the study; in other words, that the variables would have predictive capacity aimed at orienting prevention strategies (23). The analyses were made using the program SPSS version 15.0 (Statistical Package for the Social Sciences) for Windows. P-values <0.05 were considered statistically significant.

This study followed the ethical principles recognized by the Helsinki Declaration (24). Two informed consent forms were developed, one for the interview and the anthropometric measurements, and the other for authorizing blood extraction for laboratory testing. The project was evaluated and approved by the Ethics Committee of the Río Gallegos Regional Hospital.

RESULTS

In the total study population of 1,645 schoolchildren aged 6 to 11 years, the prevalences of overweight and obesity found were 25.6% (95% CI: 23.5; 27.7) [n = 421] and 13.8% (95% CI: 12.1; 15.5) [n = 227] respectively; in other words, a total of 648 schoolchildren were found to have excess body weight: 39.4% (95% CI: 37.0; 41.8). The prevalence of overweight was 23.7% in boys and 27.3% in girls and the prevalence of obesity was 14.8% in boys and 12.9% in girls. The distribution of overweight and obesity prevalence according to age was found to be similar.

Table 1 shows the absolute and relative frequencies of normal weight, overweight and obesity groups according to the different variables researched. The analysis indicated that the highest BMI values were associated with: an increased prevalence of having one sibling or being an only child, high levels of consumption of fast food and soft drinks in the last week, passivity in relation to physical activity, high blood pressure readings, lowered levels of serum HDL cholesterol and increased levels of serum triglycerides.

Table 2 shows the results of factors found to be associated with overweight in comparison with the normal weight group. The prevalence of overweight was high in children with frequent fast food and soft drink consumption habits. In relation to the number of siblings, the children with one or no siblings

Table 1. Percentage distribution of normal weight, overweight and obesity groups according to the variables studied. Public schools in Río Gallegos, Argentina, 2005.

Variables	Groups according to body mass index						p-value[a]
	Normal weight		Overweight		Obesity		
	%	No.	%	No.	%	No.	
AGE IN YEARS[b]							
6	11.1	111	14.0	59	11.5	26	0.310
7	17.2	171	18.1	76	21.6	49	
8	15.8	158	17.3	73	17.6	40	
9	19.9	198	15.2	64	19.8	45	
10	20.2	201	20.7	87	18.5	42	
11	15.8	158	14.7	62	11.0	25	
SEX							
Female	52.6	524	56.8	239	49.8	113	0.184
Male	47.4	473	43.2	182	50.2	114	
NUMBER OF SIBLINGS							
2 or more	77.7	769	69.2	290	58.2	131	0.000
1 or more	22.3	221	30.8	129	41.8	94	
MOTHER'S LEVEL OF EDUCATION[c]							
Primary school completed	5.3	53	5.5	23	4.4	10	0.215
Primary school not completed	19.1	190	18.3	77	19.4	44	
Secondary school completed	24.0	239	27.8	117	19.4	44	
Secondary school not completed	22.5	224	20.7	87	25.6	58	
Tertiary or university education	8.0	80	8.1	34	6.6	15	
No response	21.2	211	19.7	83	24.7	56	
FAST FOOD[d]							
No consumption	20.8	197	4.1	17	2.2	5	0.000
Intermediate consumption	73.9	698	30.1	125	13.6	31	
High consumption	5.3	50	65.8	273	84.1	191	
SOFT DRINKS[d]							
No consumption	8.8	86	2.4	10	2.6	6	0.000
Intermediate consumption	69.5	676	19.3	81	17.6	40	
High consumption	21.7	211	78.3	328	79.7	181	
PHYSICAL ACTIVITY[e]							
Active	80.3	801	77.9	328	69.6	158	0.000
Passive	19.7	196	22.1	93	30.4	69	
BP READINGS[f]							
< 90th percentile	65.0	645	61.3	258	54.0	121	0.007
≥ 90th percentile	35.0	347	38.7	163	46.0	103	
HDL CHOLESTEROL							
> 40 mg/dl	68.4	147	62.5	45	45.5	25	0.007
≤ 40 mg/dl	31.6	68	37.5	27	54.5	30	
LDL CHOLESTEROL							
< 130 mg/dl	93.0	200	87.5	63	87.3	48	0.007
≥ 130 mg/dl	7.0	15	12.5	9	12.7	7	
TRIGLYCERIDES							
< 110 mg/dl	78.1	168	68.1	49	41.8	23	0.000
≥ 110 mg/dl	21.9	47	31.9	23	58.2	32	

Source: Own elaboration.

BP = Blood Pressure
[a]The Chi-square test among the groups of variables. Significance level p-value<0.05.
[b]Age in complete years.
[c]Mother's level of education: the category "Primary school not completed" includes "No education."
[d]Intermediate consumption: 1-3 times/week. High consumption: >4 times/week.
[e]Passive: <3 times/week. Active: >3 times/week.
[f]Blood pressure readings according to the 90th percentile for age, sex and height.

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had a frequency of overweight 1.3 times higher than the group of children with 2 or more siblings. Overweight was also found to be associated with dyslipidemia (high levels of LDL cholesterol and triglycerides and low levels of HDL cholesterol).

Table 3 shows the factors associated with obesity in comparison with the normal weight group. The prevalence of obesity in the schoolchildren presenting factors of exposure was different from that of the normal weight group. The differences were statistically significant. High fast food and soft drink consumption habits had a greater effect on BMI. High blood pressure readings were associated with obesity. Schoolchildren with dyslipidemia had a frequency of obesity 4.2 times greater. Children in the "passive" category in terms of physical activity showed a frequency of obesity 1.5 times greater than those in the "active" group.

The variable selection procedure for the logistic regression analysis took into account: association, precedence in time, and biological plausibility (23). In the analysis, excess body weight (BMI $\geq$ 25 kg/m^2 according to sex and age and using IOTF criteria) was considered the dependent variable. The covariables (predictor variables) introduced were: number of siblings, time of residence, mother's level of education, high consumption of fast food, high consumption of soft drinks, and passivity in relation to physical activity. Table 4 shows the coefficients and their respective p-values obtained from the multivariate

Table 2. Prevalence and prevalence ratios of overweight according to exposure factors in children attending public schools in Río Gallegos, Santa Cruz, Argentina, 2005.

Variables	Prevalence[a] %	PR[b]	95% CI	p-value[a]
FAST FOOD/WEEK				
≤ 3 times (ref)	13.69	-	-	-
≥ 4 times	84.52	6.17	5.26; 7.24	0.000
FAST FOOD DAY BEFORE				
No (ref)	11.08	-	-	-
Yes	57.36	5.18	4.22; 6.34	0.000
SOFT DRINKS/WEEK				
≤ 3 times (ref)	10.60	-	-	-
≥ 4 times	60.85	5.70	4.64; 7.01	0.000
SOFT DRINKS DAY BEFORE				
No (ref)	9.27	-	-	-
Yes	46.29	4.99	3.87; 6.44	0.000
DYSLIPIDEMIA[d]				
No (ref)	22.55	-	-	-
Yes	57.14	2.53	1.64; 3.90	0.000
NUMBER OF SIBLINGS				
2 or more (ref)	27.38	-	-	-
1 or none	36.85	1.35	1.14; 1.59	0.000
PHYSICAL ACTIVITY				
Active (ref)	29.05	-	-	-
Passive	32.17	1.11	0.92; 1.34	0.299
BP READINGS				
Normal (ref)	28.57	-	-	-
High	31.96	1.12	0.95; 1.32	0.180

Source: Own elaboration.

PR = Prevalence Ratio
95% CI = 95% Confidence Interval
(ref) = Reference Group
BP = Blood Pressure
[a]Prevalence of overweight according to exposure factors.
[b]Quotient between prevalence in exposed individuals and prevalence in unexposed individuals.
[c]The Chi-square test among the groups of variables. Significance level p-value<0.05.
[d]Dyslipidemia: high levels of LDL cholesterol and triglycerides, and/or low level of HDL cholesterol.

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Table 3. Prevalence of obesity and prevalence ratios of obesity according to exposure factors in children attending public schools in Río Gallegos, Santa Cruz, Argentina, 2005.

Variables	Prevalence[a] %	PR[b]	95% CI	p-value[a]
FAST FOOD/WEEK				
≤ 3 times (ref)	3.87	-	-	-
≥ 4 times	79.25	20.50	14.78; 28.42	0.000
FAST FOOD DAY BEFORE				
No (ref)	4.07	-	-	-
Yes	44.52	10.94	7.67; 15.60	0.000
SOFT DRINKS/WEEK				
≤ 3 times (ref)	5.69	-	-	-
≥ 4 times	46.17	8.11	6.01; 10.95	0.000
SOFT DRINKS DAY BEFORE				
No (ref)	5.25	-	-	-
Yes	31.70	6.03	4.22; 8.62	0.000
DYSLIPIDEMIA[d]				
No (ref)	15.57	-	-	-
Yes	65.38	4.20	2.80; 6.29	0.000
NUMBER OF SIBLINGS				
2 or more (ref)	14.55	-	-	-
1 or none	29.84	2.05	1.63; 2.58	0.000
PHYSICAL ACTIVITY				
Active (ref)	16.47	-	-	-
Passive	26.03	1.58	1.23; 2.03	0.000
BP READINGS				
Normal (ref)	15.79	-	-	-
High	22.88	1.45	1.14; 1.83	0.002

Source: Own elaboration.

PR = Prevalence Ratio
95% CI = 95% Confidence Interval
(ref) = Reference Group
BP = Blood Pressure
[a]Prevalence of overweight according to exposure factors.
[b]Quotient between prevalence in exposed individuals and prevalence in unexposed individuals.
[c]The Chi-square test among the groups of variables. Significance level p-value<0.05.
[d]Dyslipidemia: high levels of LDL cholesterol and triglycerides, and/or low level of HDL cholesterol.

logistic regression analysis. The simplest prediction model included the following variables: number of siblings, consumption of fast food and consumption of soft drinks.

DISCUSSION

This is a prevalence study in schoolchildren attending public schools in Río Gallegos. The prevalences of overweight (25.6%) and obesity (13.8%) obtained in the schoolchildren studied confirm that excess body weight has reached epidemic levels (1). More than a third of schoolchildren have excess body weight (39.4%), an identified risk factor associated with the onset of non-communicable chronic diseases (2,7,17).

Difficulties arise in interpreting these figures because in Argentina such data comes from studies with different objectives, methodologies, age groups and standards of reference. Some of them use the same BMI diagnostic criteria and/or include the age groups covered in this study. For example, the prevalences of overweight and obesity in this study are similar to those found in the results of the ENNyS for women aged 10 to 49 years in the Patagonia region, with percentages 4.8% lower in the case of overweight (25.6% vs. 30.4%) and 3.2% higher in the case of obesity (13.8% vs. 10.6%) (10). When comparing the results obtained in this study with a research study

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Table 4. Multivariate analysis (prediction model) of excess body weight, according to exposure factors, in children attending public schools in Río Gallegos, Santa Cruz, Argentina, 2005.

Variables	Excess body weight			
	β[a]	p-value[b]	β exponent[a]	95% CI
NUMBER OF SIBLINGS				
2 or more (ref)	-	-	-	-
1 or none	0.565	0.001	1.76	1.27; 2.44
FAST FOOD/WEEK				
≤ 3 times (ref)	-	-	-	-
≥ 4 times	3.144	0.000	23.19	16.25; 33.10
SOFT DRINKS/WEEK				
≤ 3 times (ref)	-	-	-	-
≥ 4 times	1.537	0.000	4.65	3.43; 6.31
CONSTANT	-2.283	0.000	0.102	

Source: Own elaboration.

95% CI = 95% Confidence Interval
(ref) = Reference Group
[a]β coefficient for each variable.
[b]Statistical significance through the Wald test and the Chi-square test.

on the national prevalence of obesity in adolescents at pediatric consults, the prevalence found in this study was 4.7% higher in the case of overweight and 8.4% higher in the case of obesity (overweight: 20.8%; obesity: 5.4%) (9). With reference to a study conducted in Chubut in children aged 6 to 14 years, the prevalence of overweight in this study is similar to that found in Chubut and that of obesity 8.3% higher (overweight: 21.1%; obesity: 5.5%) (25). On the other hand, the results obtained in San Salvador de Jujuy (overweight: 17.4%; obesity: 6.7%) (26) and Río Negro (overweight: 14.6%; obesity: 3.7%) (8) indicate lower percentages.

The results are comparable with those of studies conducted in Brazil and Mexico using the same diagnostic standards. The prevalences of overweight and obesity were lower in Brazil and similar in Mexico. In Recife, Brazil (27), the prevalences of overweight and obesity in children aged 2 to 10 years were 14.5% and 8.3% respectively. In Mexico (5), the prevalences of overweight and obesity in schoolchildren aged 6 to 11 years were 28.1% and 13.7% respectively.

Neither sex nor age was associated with statistically significant differences in excess body weight. These findings coincide with the results of the research studies conducted in Chubut and Jujuy (25,26). In Mexico, Chile and Brazil, the prevalences of overweight and obesity were not found to be associated with the schoolchildren's sex (5,28,29).

Those children with one or no siblings showed a higher proportion of overweight (30.8%) and obesity (41.8%), with a frequency of overweight 1.3 times higher and a frequency of obesity 2 times higher than children with 2 or more siblings. The category "1 or no siblings" (variable "number of siblings") was included in the final prediction model. These results coincide with a study on schoolchildren in Chile (28) and a case-control study conducted in Brazil (11) which show a higher risk of obesity for children with one or no siblings. The inverse relationship between excess body weight and number of siblings could be explained by factors such as the family's buying power and/or active play in the case of children with more than one sibling. Limitations were found in gathering information about the parents' level of education. The interviews included questions regarding both the mother and the father's levels of education, however, depending on the family structure, in some cases answers were only given regarding the level of education of the parent accompanying the child.

The results of this study coincide with the literature in relation to eating habits. The survey incorporated questions on consumption the previous

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day taking into account observations from other research studies (16,29). Authors who studied consumption in terms of portions also highlight that proportions in the previous day's consumption reflect consumption averages (10,18,19). The study of the frequency of consumption enabled the classification of schoolchildren into categories of consumption, which is useful in prevalence studies when comparing the association between the exposure and the event (19).

Passivity in relation to physical activity was associated with obesity, although this variable was excluded from the final model. It was difficult to collect information about the time spent doing sedentary activities as parents reported that their children also watched television when they were alone in the house.

The criteria applied to differentiate physically active from physically passive individuals were the same as those used in the National Survey of Risk Factors (*Encuesta Nacional de Factores de Riesgo*) of the National Ministry of Health of Argentina. Because the National Survey includes people of 18 years of age or over, it is difficult to draw comparisons with this study (17). The results of the National Survey suggest that the province of Santa Cruz has the highest percentage of low physical activity or physically passive people in Argentina (60.3%). In another study conducted in Argentina, it was shown that 75.9% of individuals had a sedentary lifestyle, with a similar prevalence of obesity in both physically active and sedentary individuals (14.3% and 12.5% respectively) (7).

Dyslipidemia and elevated blood pressure values were identified as exposure factors in relation to the increase in BMI. These results agree with findings of other studies (2,5,8,10-12). Upon studying these variables through univariate analyses, statistically significant associations with excess body weight were found. Dyslipidemia and elevated blood pressure readings were not included in the multivariate analysis. This decision was made following the principle of temporality – that is, precedence in time – for establishing a prediction (23). The levels of serum lipids and blood pressure corresponded to measurements carried out on the date of the survey; therefore, follow-up or previous studies would be necessary to recover the history of these variables in schoolchildren's health.

As excess body weight and exposures were assessed in a single point in time, the results may be affected by the reverse causation bias, that is, the exposures under study may be determined by excess body weight. On the other hand, excess body weight may modify the behavior of some explicative variables such as eating habits or physical activity. As a result, the associations identified are not interpreted as causal relationships.

In order to minimize the possibility of a selection bias in this study, previous meetings were held with school staff and with the children's families. The populations of participants and non-participants were compared according to the following variables: age, sex, grade, morning or afternoon school shift, nationality, place of birth, time of residence and number of siblings. A weighing procedure adjusted to the response probability was applied, using the Chi-square test to obtain the statistical value of these cases. Both populations were found to be similar. In those cases where information was missing, it was observed that such cases were random and made up less than 5%; therefore, it was not necessary to study these cases (15).

The analysis included PR to avoid errors in overestimating associations, according to the prevalences of overweight and obesity found in the study, of higher than 10%. Logistic regression analyses were included to facilitate comparisons with other studies and to construct a prediction model indicating possible factors to take into account for preventing excess body weight.

The prediction model constructed for overweight-obesity in schoolchildren in Río Gallegos includes the following associated factors: number of siblings, frequency of high levels of fast food consumption and high levels of soft drink consumption. It may be useful to consider these characteristics, which do not explain whether schoolchildren will develop excess body weight or not, but reflect the true cause and, as a result, can allow us to predict on the premise of detection for prevention purposes.

In Río Gallegos the climate is characterized by cold and constant winds, explaining why families are used to spending time indoors and traveling by car, which in turn conditions their eating habits and physical activity. This situation is further aggravated by a hectic daily context that reduces the

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time available for family life, food preparation, and play, among other activities.

The results of this study are consistent with those found in the literature review (1,5,10,11, 27,28). They enable us to visualize the magnitude and importance of excess body weight in schoolchildren in Río Gallegos and identify the most relevant associated factors so as to establish priorities and complement preventive interventions in the family and school environments, promoted by Public Health programs at national and municipal levels (30). Given that this is a cross-sectional study, its results may serve as a basis for qualitative, longitudinal or mixed studies favoring the study process and the construction of new approach strategies.

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ENDNOTES

a. Patagonia is the southernmost region in Argentina, made up of the provinces of Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz and Tierra del Fuego (10).

b. This article is based on part of the thesis "Estudio de prevalencia de sobrepeso-obesidad y factores asociados en escolares de Río Gallegos, 2005" (Study of the prevalence of overweight/obesity and associated factors in schoolchildren in Río Gallegos, 2005), submitted to obtain the Master's Degree in Epidemiology, Management and Health Policy from the Universidad Nacional de Lanús. The thesis was directed by Dr. Marcio Alazraqui (31).

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