

## Underweight, overweight and obesity prevalence among adolescent school children in the Province of La Pampa, Argentina

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### ABSTRACT

**Introduction.** While different epidemiological studies as part of their survey include data of adolescents of the province of La Pampa regarding overweight and obesity prevalence, their experimental designs have certain limitations as far as the description of the regional reality.

**Objective.** To obtain a diagnosis of the situation regarding the body composition profile among 13 year old adolescents in the Province of La Pampa.  
**Population and Methods.** A cross-sectional study was conducted in a sample of male and female adolescents born in 2001. Weight, height, waist circumference, scapular and tricipital skinfolds were measured.

**Results.** Of the 711 adolescents assessed, 5 subjects (0.7%) had a weight below the third percentile for age and sex. In relation to overweight and obesity, the sample values were 26.4% and 14.1%, respectively (27.5% and 16.9% of male; 25.5% and 11.7% of female adolescents). Of the total sample, 15.8% (16.5% of male and 15.6% of female adolescents) had waist circumference values compatible with abdominal obesity. As far as body fat values, 36.8% (37.4% of male and 36% of female adolescents) had above normal values according to skinfold thickness measurements.

**Conclusion.** In contrast with the small prevalence of low weight in the region, overweight and obesity are a significant problem among the studied population in La Pampa.

**Key words:** *overweight, obesity, prevalence, adolescents, La Pampa.*

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### INTRODUCTION

A wealth of evidence suggests that obesity is increasing at an alarming rate throughout the world<sup>1-6</sup> significantly affecting health at early ages.<sup>7,8</sup>

Recent studies have revealed a trend towards an increase in the prevalence of obesity in emerging countries, especially in urban areas. In Argentina, the available information is consistent with what has been published and has been warning about the severity of this, both in children<sup>10</sup> as well as in adults.<sup>11</sup>

In view of global transitions regarding physical activity and healthy food consumption,<sup>12</sup> non-communicable chronic diseases, like obesity, have become the leading cause of death worldwide.<sup>13-15</sup> Another aspect of concern regarding obesity are its treatment-related difficulties.<sup>16</sup> It is therefore a challenge to implement prevention strategies at an early age so as to stop this increasing trend of obesity prevalence.<sup>17-19</sup>

The objective of this study is to obtain an updated overview of the body composition profile among 13 year-old schoolchildren in the province of La Pampa, so as to adjust prevention programs at present in place based on the observed evidence.

### POPULATION AND METHODS

#### Study design

This was an epidemiological, descriptive, cross-sectional study. Between June and October 2014, based on an initiative from the Ministry of Social Welfare of the Province of La Pampa and supported by the Ministry of Education, a sample of male and female adolescents born in 2001 was taken from 29 schools of the 15 most densely inhabited towns of the province. As a whole, they accounted for 78% of the total number of inhabitants in the province (population according to the 2010 census: 5404) and were representative of the different regional realities. The estimation of the minimum sample size was done with the aim of assessing, at least, 11% of the total number of inhabitants in the province (represented by a minimum of 594 adolescents assessed), and this percentage was chosen based on

feasibility and convenience. All the adolescents attending the selected schools were invited to participate. Only those who accepted to participate and whose parents had given their consent and authorized their participation in the study were included. Before conducting the study, its ethical and methodological aspects were evaluated and approved by the Ministry of Social Welfare and the Ministry of Education authorities.

### Anthropometric assessments

Height was measured with the head aligned in the Frankfort horizontal plane using a calibrated stadiometer. Weight was determined with an electronic scale (Silfab, Argentina), subjects were barefooted and dressed in light clothes. Waist circumference was measured with the subject in the standing position and hands by the side of the body, at the end of exhalation, using a non-stretchable measuring tape (Tag Master, China) and having the umbilicus as the anatomic land mark; the technique of juxtaposition was used. Body mass index (BMI) was estimated based on the weight/height squared.

Two well-trained evaluators measured the subscapular and tricipital skinfolds using a metal caliper (Faga, Argentina).<sup>20</sup> Body fat percentage was determined by means of the Slaughter equation,<sup>21</sup> based on the tricipital and subscapular skinfolds, for subjects aged between 12 and 13.9 years old.<sup>22</sup>

For the diagnosis of low weight, two different criteria were used (a Z score below 2 or a weight for age percentile below 3). The presence of height for sex values below the 3<sup>rd</sup> percentile was considered as short stature. In all cases, tables proposed by the Argentine Society of Pediatrics<sup>23</sup> were used as reference.

For the diagnosis of overweight and obesity, the Argentine Society of Pediatrics guidelines<sup>24</sup>

were followed; in these guidelines, a BMI value with a Z score between 1 and 2 was considered as overweight, and when the Z score was above 2, it was deemed as obesity. In turn, waist circumference values over the 90<sup>th</sup> percentile indicated abdominal obesity.<sup>25</sup>

With respect to the classification of results obtained by estimating body fat percentage, cut-off points proposed by Williams et al were used, which considered the presence of  $\geq 25\%$  in male and of  $\geq 30\%$  in female adolescents as fat excess.<sup>26</sup>

By analyzing the combination of BMI, waist circumference and body fat percentage data, a subset of subjects simultaneously diagnosed by these three measurements was defined.

### Statistical analysis

The SPSS software for Windows was used (version 17.0, SPSS Inc, Chicago, IL). Data were expressed as mean  $\pm$  standard deviation (SD) of the mean, unless otherwise specified, and were analyzed by the Student's t test. Frequency values were analyzed using the  $\chi^2$  test. A *p* value of  $<0.05$  was statistically significant.

## RESULTS

Overall characteristics of the sample are described in *Table 1*. No differences were observed regarding age, weight and waist circumference between female and male adolescents, though a difference was seen in height (which was significantly higher among boys) and in the assessment of skinfolds and estimated body fat percentage, with values significantly higher among girls.

### Low weight prevalence

Of the total sample, 2 male subjects had a BMI with a Z score below 2, which corresponded

TABLE 1. Overall characteristics of the sample

Outcome measures	Boys (n= 327)	Girls (n= 384)	<i>p</i>
Age (years)	13.2 $\pm$ 0.3	13.2 $\pm$ 0.3	0.97
Weight (kg)	55.0 $\pm$ 0.8	53.7 $\pm$ 11.3	0.18
Height (cm)	1.59 $\pm$ 0.08	1.57 $\pm$ 0.06	< 0.001
BMI (kg/cm <sup>2</sup> )	21.5 $\pm$ 4.4	21.6 $\pm$ 4.1	0.61
Waist (cm)	76.5 $\pm$ 11.5	75.8 $\pm$ 10.3	0.35
Subscapular skinfold (mm)	12.27 $\pm$ 9.45	15.78 $\pm$ 8.90	< 0.001
Tricipital skinfold (mm)	16.02 $\pm$ 9.01	19.62 $\pm$ 8.34	< 0.001
Body fat (%)	23.69 $\pm$ 14.01	28.28 $\pm$ 9.62	< 0.001

Values show the mean  $\pm$  standard deviation.

BMI: body mass index.

to a low weight prevalence of 0.3%, as per this approach. In turn, using a body weight percentile below 3 by sex and age as diagnostic criteria, the total number of cases increased to 5, resulting in a 0.7% of low weight in the studied sample. Only 3 subjects (0.4%) had a height for the age below the 3<sup>rd</sup> percentile, and 2 of them also had a body weight below the 3<sup>rd</sup> percentile.

### Overweight and obesity prevalence estimated by body mass index

The prevalence of overweight was 26.4%, and that of obesity, 14.1%. Overweight prevalence was similar among boys and girls (27.5% and 25.5%, respectively), but obesity frequency was higher among boys (16.9% and 11.7%, respectively), although this difference was not statistically significant ( $p = 0.052$ ).

### Abdominal obesity prevalence

Of all the subjects, 15.8% had waist circumference values above the 90<sup>th</sup> percentile. No significant differences were found between boys and girls.

### Classification according to body fat estimated by skinfold measurement

Of the sample, 36.8% had values above normal. Even though the percentage was slightly higher in girls compared to boys (37.4% and 36.0%, respectively), this difference did not reach statistical significance.

### Association among overweight classifications by body mass index, waist circumference and fat percentage

Considering as diagnostic criterion the coexistence of a BMI with a Z score over 2, a

waist circumference above the 90<sup>th</sup> percentile by age and gender, and a high body fat percentage, a prevalence of 11.53% of obesity diagnosed simultaneously as per the three criteria was registered in all the sample. This value was slightly higher among boys (12.23%) when compared to girls (10.94%) (Table 2).

## DISCUSSION

As far as we know, this is the first epidemiological study conducted in the Province of La Pampa. Even though in other studies,<sup>10,27</sup> data of adolescents of our province are included as part of the survey, their designs have certain limitations regarding the description of the regional reality. Specifically, in the National Survey on Nutrition and Health,<sup>27</sup> boys older than 72 months of age were not included in the sample, while girls were evaluated as a whole with the rest of women between 10 and 49 years old. In turn, in the study by Kovalskys et al,<sup>10</sup> data were collected from pediatric offices and were reported as part of the south region, which included La Pampa and provinces of the Patagonia region.<sup>10</sup> Therefore, although this information contributed to improving our knowledge about the regional nutritional status, obtaining specific data for the province was a health need.

The evaluated age group was selected taking into account other previous studies that presented evidence in relation to age ranges similar to those of our sample<sup>7,10</sup> and because it was logistically convenient.

An aspect to underscore from the present study was the small prevalence of low weight and short stature. Besides difficulties inherent to the interpretation of these results considering that most of the studies conducted to detect low

TABLE 2. Association among overweight classifications by body mass index, waist circumference and body fat percentage estimated by skinfold measurement

BMI Category	High waist value, n (%)	High fat value	High waist + fat value
<i>Boys</i>			
Normal weight (n= 182)	3 (1.6)	21 (11.5)	3 (1.6)
Overweight (n= 90)	11 (12.2)	46 (51.1)	10 (11.1)
Obesity (n= 55)	40 (72.7)	51 (92.7)	40 (72.7)
<i>Girls</i>			
Normal weight (n= 241)	0 (0.0)	28 (11.6)	0 (0.0)
Overweight (n= 98)	18 (18.4)	71 (72.4)	17
Obesity (n= 45)	42 (93.3)	45 (100)	42

Values show the mean  $\pm$  standard deviation.

BMI: body mass index.

weight subjects have generally been oriented to younger children,<sup>26</sup> this reality markedly contrasts with that reported in another region of Argentina among adolescents of similar age.<sup>28</sup> Taking into account that, by and large, healthcare aide programs conducted in the region have been focused on the detection of subjects at risk of undernourishment, the small prevalence of low weight and particularly short stature for age could reflect measures implemented in this sense.

It is interesting to point out that both overweight as well as obesity recorded prevalences are above those reported nationally for the age range from 12 to 13.9 years old by Kovalskys et al. in 2003 and over those reported by the same group for the Patagonia region for the age range from 10 to 19 years old. It is worth noting that having included in our study subjects from urban and rural areas, overweight prevalence was higher than that reported in 10-11 year old children attending schools in the metropolitan area of Buenos Aires.<sup>29</sup> These discrepancies could reflect the growth of this nutritional problem at a national level in recent years (considering that the study in the metropolitan area was conducted in 2007). However, the influence of characteristics of the region that could be favoring weight gain cannot be ruled out. In this sense, data from a preliminary study carried out in General Acha (province of La Pampa) in 2013 indicated a prevalence of 40% of sedentary life in children, a low fruit and vegetable consumption and a high intake of sugar sweetened beverages (Martínez and Mayer, unpublished data), aspects that should be evaluated at a regional level in future studies.

Taking into account that, in the Province of La Pampa, at present, there are different ongoing strategies oriented towards obesity prevention (including the implementation of three national programs and two provincial programs of physical activity and healthy diet promotion, and the program Healthy Districts, among others), these results underscore the importance of assessing, in future studies, the influence of present risk factors and of adjusting prevention programs on the basis of the design of new strategies more specifically focused on the local reality.

Another aspect to be pointed out from the study was the assessment of waist circumference. Considering that central obesity is significantly correlated with an increase in the risk of metabolic and cardiovascular complications,<sup>30-32</sup> waist

circumference evaluation would enable to identify a subset of subjects particularly at risk. There are pieces of evidence that indicate that the prevalence of central obesity has increased in some regions in the last decades to a level beyond the BMI.<sup>7</sup>

For the present study, body fat percentage was estimated with the Slaughter formula.<sup>21,22,33</sup> Although this approach presents a good correlation with the percentage of body fat evaluated with DXA (Dual-energy X-ray Absorptiometry), it also has limitations, particularly when used in the evaluation of obese adolescents in whom fat excess is usually overestimated.<sup>22</sup> Apart from these limitations, the presence of body fat percentages over the cut-off points suggested by Williams et al. (1992) have been proposed to be significantly associated with a higher presence of cardiovascular risk factors.<sup>26</sup>

Aiming at improving the specificity of the methodology used to diagnose obesity in our sample, data were reevaluated by developing an arbitrary diagnostic criterion, demanding the coexistence of high BMI, waist circumference and body fat percentage values. This diagnostic approach, based on the compound analysis of body composition proposed by the Canadian Society of Sports Physiology<sup>34</sup> enabled us to confirm that, even though resorting to a methodology of lower sensitivity than the BMI *per se*, obesity prevalence in our province was still significantly higher than that reported in other regions of Argentina.<sup>10</sup>

It is worth pointing out that the assessment of a single age segment in our study renders the extrapolation of these results to the pediatric population difficult. However, we consider that this study also has important strengths, like obtaining anthropometric data by means of the direct examination in the hands of qualified evaluators and sample selection based on data from the National Census of 2010. Finally, the evaluation of subjects in the school setting is, according to our understanding, another advantage, given that the level of school attendance in this age group is 96.9%.<sup>3</sup>

## CONCLUSIONS

Contrary to the small low weight prevalence in the region, overweight and obesity are significant problems in the studied population of La Pampa. This fact is consistent with the growing obesity epidemic worldwide and stresses the importance of reformulating current prevention policies. ■

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