

Original Investigation Reports

Survey of overweight and hypertension in schoolchildren aged 11 and 12 years in the city of Rosario during the second term of 2023

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ABSTRACT

The main **objective** of this study was to determine the prevalence of overweight and hypertension (HTN) in 11- and 12-year-old schoolchildren in the city of Rosario during the second half of 2023. The study aimed to assess how anthropometric factors such as weight, height, body mass index (BMI), and blood pressure (BP) contribute to cardiovascular risk in this population.

Materials and Methods: an observational, descriptive, cross-sectional study was conducted by convenience sampling. The sample consisted of 337 children from 6th grade in different public and private schools in Rosario. Anthropometric measurements (weight, height, waist circumference, etc.) and blood pressure measurements were taken by trained professionals. Data were analyzed using descriptive and correlational statistics with SPSS 23.0 software.

Results: out of 337 children evaluated, 61.4% were overweight or obese. The average systolic blood pressure (SBP) was 108 mmHg and diastolic blood pressure (DBP) was 68 mmHg, with 17.8% of children showing elevated BP. No significant differences were found in the prevalence of overweight and HTN between genders or types of schools, although some geographic differences were noted.

Conclusions: the study shows a high prevalence of overweight, obesity, and hypertension in schoolchildren. It is urgent to implement preventive programs in schools to promote healthy habits and reduce future cardiovascular risks, especially in vulnerable areas. Public policies should combine efforts in health and education to improve children's well-being.

INTRODUCTION

Chronic noncommunicable diseases, and among them, cardiovascular ones, represent the most common cause of death at world level.¹

Hypertension (HTN) is the main risk factor to experience cardiovascular diseases. Every year, 1.6 millions of deaths occur due to cardiovascular diseases (CVDs) in Latin America. HTN affects 20-40% of the adult population (approximately 250 million people); being a condition that can be reduced or postponed through multiple preventive interventions.¹

Just 57.1% in the adult population estimated to have elevated blood pressure (BP) is aware of having HTN, contributing to the low control level in the population: just 18.8% of hypertensive adults in Argentina, Chile, Colombia and Brazil have their BP controlled. Its measurement constitutes an important preventive practice for an early and timely detection in people who could benefit from effective interventions (like lifestyle or medication changes) and thus reduce the cardiovascular risk associated to HTN.^{2,3,4}

The prevalence of HTN can be assessed in different ways

according to the countries, through population surveys using questionnaires or making physical measurements, just as with the use of clinical or outpatient registries.³

Beyond all of these assertions based on scientific evidence and technological advancements from recent years, there is still a failure both in the detection and in the control of hypertensive patients, whether by essential and secondary etiology, which makes it not to be reduced efficiently even while in treatment for cardiovascular risk.

Cardiovascular evaluation in childhood should unavoidably include the measurement of BP since the third year of age, also with a full physical examination, and the values found should be categorized according to specific tables constructed according to age, gender, weight and height (percentiles).^{5,6,7,8,9,10}

Height and weight are obtained through anthropometry. This tool is used in different areas and disciplines with the aim of contributing useful data for medicine, sports, investigation, and so on.^{5,11,12,13} It provides data that enable evaluating lifestyle and nutrition to optimize competent interventions on them.¹⁴

TABLE 1.
Characteristics of the population studied

	n	%*	p
Total	337		
Female	175	51.9% (46.6-56.8)	>0.05
Male	162	48.1% (43.2-53.4)	
North area	85	25.2 (21.4-29.4)	
Northwest area	34	10.1 (7.1-13.2)	<0.05
West area	46	13.6 (10.1-17.4)	
Central area	51	15.1 (11.6-18.7)	
Southwest area	73	21.7 (17.3-26.1)	
South area	48	14.2 (10.7-17.7)	<0.05
State school	191	56.7% (51.5-62.3)	
Private school	146	43.3% (37.7-48.5)	

*% (95% confidence interval).

Anthropometry comprises a set of standardized procedures that are easy to apply, financially acceptable, reproducible over time, noninvasive, innocuous and reliable, as long as collection techniques are followed. Because of its historical and contextual character, if done properly, it allows to make diagnosis both in individuals and the population, turning it into a widely used tool.¹³

The problem of childhood health during the schooling stage, and mainly its relationship with public policies, usually concern those responsible for decision-making in different areas and levels of the state. This interest on the topic makes them part of the analysis and search for information actively.⁶

From these analysis, a significant aspect emerges, related to the need to learn about the anthropometric measures in this population. These data may be part of the individual medical history of children, but they are not part of an updated profile, available for the Ministry of Education.

For those in charge in governmental areas, this information would be important for the management of measures to implement by different sectors of the state.

OBJECTIVES

Surveying data on overweight and HTN in individuals in school of 11 and 12 years of age, from the city of Rosario, during the second half of 2023.

MATERIALS AND METHODS

An observational, descriptive, cross-sectional investigation was carried out, with convenience sampling according to the available resources. Sixth-grade students of 11 and 12 years of age were evaluated, because in this age group, pubertal development and underlying changes stand out, associated to more freedom of choice in diet patterns and physical activity. In turn, because of the changes in body surface, this stage is characterized by a higher cardiac output, which added to the prevalence of obesity described in previous studies, may increase the risk of hypertension. Two schools were chosen at random, from six districts of the city of Rosario in 2023: north, northwest, west, center, south and southwest. All the chosen schools received breakfast. In every district, a private management school and a public management school were chosen, evaluating 12 institutions in total. The choice of schools was determined by closeness between public and private ones in each district to decrease the difference in geographical determinants between them.

The study was approved by the Committee on Ethics of the School of Medical Sciences of the Universidad Nacional de Rosario, with regulation: 770/2023. The informed consent by parents and the agreement by the children were obtained.

Data were collected between September and November, 2023.

In all selected schools, there was an invitation to participate for 6th grade children, by formal communication

TABLE 2.
Weight, height, waist circumference and hip circumference according to gender, area and type of school

	n	Weight*	Height*	Waist circumference*	Hip circumference*
Total	337	49.97 ± 13.12	150.18 ± 7.27	74.56 ± 12.71	87.68 ± 13.84
Female	175	49.32 ± 11.73	149.98 ± 7.24	74.29 ± 11.61	87.07 ± 12.59
Male	162	50.66 ± 14.48	150.39 ± 7.30	74.85 ± 13.82	88.33 ± 15.08
North area	85	46.81 ± 11.60	148.99 ± 7.62	71.10 ± 13.09	84.28 ± 14.14
Northwest area	34	49.55 ± 11.23	150.97 ± 5.46	72.46 ± 10.62	87.17 ± 8.13
West area	46	51.71 ± 12.54	149.28 ± 5.41	77.22 ± 12.74	89.37 ± 15.69
Central area	51	49.40 ± 14.26	149.58 ± 7.85	73.90 ± 12.31	86.54 ± 9.66
Southwest area	73	51.02 ± 13.66	151.86 ± 7.24	75.63 ± 12.28	89.02 ± 13.89
South area	48	53.18 ± 14.69	150.65 ± 8.36	78.68 ± 13.04	91.61 ± 17.04
State school	191	49.42 ± 13.53	149.70 ± 7.78	74.21 ± 13.51	87.59 ± 15.79
Private school	146	50.69 ± 12.59	150.80 ± 6.51	75.01 ± 11.59	87.80 ± 10.81

*Mean±standard deviation.

TABLE 3.

Body mass index (BMI), waist-to-hip ratio (WHR), waist-to-height ratio (WHtR) according to gender, area and type of school

	n*	BMI*	WHR*	WHtR*
Total	337	21.96 ± 4.76	0.846 ± 0.087	0.496 ± 0.0786
Female	175	21.80 ± 4.56	0.849 ± 0.079	0.495 ± 0.0756
Male	162	22.13 ± 4.97	0.842 ± 0.095	0.497 ± 0.0823
North area	85	20.89 ± 4.13	0.829 ± 0.109	0.476 ± 0.0815
Northwest area	34	21.56 ± 3.84	0.831 ± 0.097	0.480 ± 0.0650
West area	46	23.12 ± 4.95	0.854 ± 0.088	0.518 ± 0.0856
Central area	51	21.85 ± 5.27	0.851 ± 0.071	0.494 ± 0.0760
Southwest area	73	21.90 ± 4.60	0.851 ± 0.066	0.498 ± 0.0706
South area	48	23.24 ± 5.50	0.863 ± 0.079	0.522 ± 0.0807
State school	191	21.79 ± 4.64	0.842 ± 0.095	0.495 ± 0.0810
Private school	146	22.18 ± 4.91	0.849 ± 0.076	0.498 ± 0.0756

*Mean±standard deviation.

through the school authorities. From all the invited subjects, 11 children were excluded as they were older than 12 years, with the sample being constituted by 337 children.

Anthropometric and blood pressure measurements were conducted by specialists in cardiology, investigators with an approach in anthropometry as their study goal and advanced students of medicine, previously trained both in anthropometric measurements and blood pressure collection. No intra- or inter-evaluator measurement error was observed ($p>0.05$).

Weight

Participants were weighed with standardized light clothes, with light gym sweatshirt and t-shirt, with no shoes and no personal ornaments; at the same time, before breakfast. The measurement technique was that advised by the Argentinian Society of Pediatrics.⁵ The reading was carried with the individual standing in the center of the platform of a single scale, with no contact of the rest of the body

with any other structure. In all cases, the same digital scale was used, verifying its calibration with witness weights.

Height

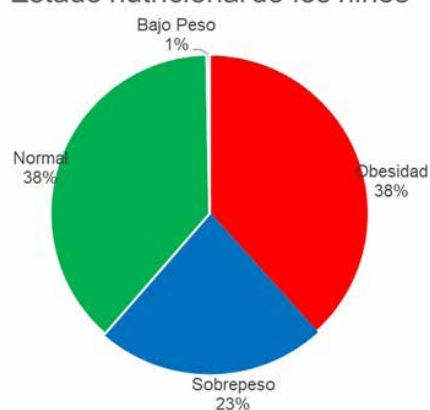
Height was measured with a single stadiometer; individuals were barefoot, with a few clothes to check the position of the body, hair arranged so that it would not obstruct measurement, with no ornaments. Children were standing on a flat surface in a right angle in relation to the vertical section of the stadiometer, with their ankles touching the base of the vertical section of it, shoulder blades, buttocks and back side of the cranium in the same vertical plane, and touching the instrument, and head in Frankfurt plane, arms hanging free at both sides of the body. As with the scales,

TABLE 4.

Systolic blood pressure (SBP) and diastolic blood pressure (DBP) according to gender, area and type of school

	n	SBP*	DBP*
Total	337	108.80 ± 12.29	68.22 ± 10.62
Female	162	109.20 ± 12.58	68.62 ± 9.82
Male	175	108.44 ± 12.04	67.84 ± 11.32
Menarche	98	110.60 ± 12.74	69.20 ± 11.59
No menarche	77	105.69 ± 10.52	66.10 ± 10.78
North area	85	108.49 ± 9.95	67.70 ± 8.93
Northwest area	34	108.79 ± 13.89	69.15 ± 12.26
West area	46	108.74 ± 15.27	70.30 ± 13.33
Central area	51	108.63 ± 11.81	66.18 ± 8.77
Southwest area	73	108.97 ± 12.85	68.34 ± 10.44
South area	48	109.35 ± 11.90	68.44 ± 11.36
State school	191	108.25 ± 13.26	68.62 ± 11.79
Private school	146	109.53 ± 10.89	67.69 ± 8.86

*Mean±standard deviation.

Estado nutricional de los niños**FIGURE 1.**

Nutritional state (BMI) of children with ages 11 and 12 in the city of Rosario

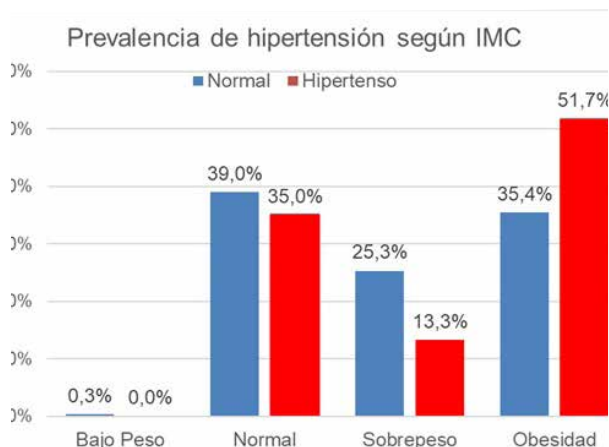


FIGURE 2.

Prevalence of hypertension according to nutritional state (BMI) in children with ages 11 and 12 in the city of Rosario.

for the measurement a single removable stadiometer was used, of graph paper and laminated, on a wall along with a mobile sliding piece in a right angle of 6 cm of width. A plumb was used to properly install it and the position was verified several times before starting the measurements.¹¹

Waist and hip circumferences

Waist circumference measurements were taken at umbilical level, at the end of exhalation and with the abdomen relaxed. Hip circumference measurement was made at the most prominent point of the buttocks. For this, a single flexible retractable measuring tape was used, calibrated in millimeters (1 mm accuracy) with individuals standing and the observer at the right.^{11,12,13}

Based on the abovementioned measurements, body mass index (BMI), waist-to-height ratio (WHtR) and waist-to-hip ratio (WHR) were estimated.^{11,12,13,14}

BMI was estimated using Quetelet's index: weight in kilograms divided by height squared in meters (kg/m^2); WHR as the quotient between waist circumference in centimeters and hip circumference in centimeters, and WHtR as the division of waist circumference in centimeters by height in centimeters.¹¹

Later, with weight and height data, each student was categorized from tables of percentiles of weight/age and gender, and height/age and gender of the Argentinian Society of Pediatrics 2011, into normal percentiles ($P > 3$ - < 97), elevated percentiles ($P < 97$), and low percentiles ($P < 3$).⁵ Also, they were categorized based on percentile tables from the WHO 2007 of BMI for gender and age, into low weight ($P < 3$), normal weight ($P < 3$ - < 85), overweight ($P 85$ - < 95), and obesity ($P < 95$).¹⁴

Blood pressure

To be able to unify data collection, due to the difficulties of collaboration by children, the first BP measurement was analyzed, carried out with aneroid sphygmomanometers,

following the steps indicated for a correct measurement by the Argentinian Society of Pediatrics and the National Program for School Health.^{6,15} Students were evaluated in a sitting position, with the back resting on the back of the chair, in a sound-free environment, at a comfortable temperature, with the right arm resting on the table and the cuff at the level of the heart, with their feet on the floor, not crossing. They followed the indication of resting before the measurement for 2 to 5 minutes. During all measurements, there was always a cardiologist present in charge of overseeing the procedure and its subsequent percentile analysis, as well as some school management members, and on occasions the parents of the students.

According to the recommendation from the last consensus on cardiovascular prevention in children and adolescents, HTN diagnosis was made based on percentiles until the age of 16 years, since from this age the classification proposed for adults is used.¹³

Blood pressure reference tables were used, created by the American Academy of Pediatrics/American Heart Association (AAP/AHA 2017).⁸ Hypertension criteria and its grades were estimated according to the percentiles: HTN stage 1 ($\text{SBP}/\text{DBP} > p95$ and $< p99 + 5$ mmHg) and HTN stage 2 ($> p99 + 5$ mmHg).

Statistical analysis

The data obtained were published on a database in the Repository of Academic Data of the Universidad Nacional de Rosario (RDA-UNR).¹⁶ The results of quantitative variables are expressed as mean $\pm$ standard deviation and the qualitative variables as absolute frequency, relative frequency and 95% CI. Chi-square test was used to evaluate the relationship between qualitative nominal variables and/or ordinal variables, student's t-test and Anova test to compare continuous quantitative variables. Spearman's correlations were conducted. The smallest level of significance used was $p < 0.05$. The statistical program SPSS 23.0 was used.

RESULTS

From the 337 individuals evaluated, 175 (51.9%) were women and 162 (48.1%) were men. There were 12 schools surveyed: 6 private ones and 6 public ones, two by each previously mentioned neighborhood (Table 1).

The average weight of all school students was 49.9 ± 13.1 kg. There were no differences observed between sexes ($p = 0.350$), between the types of schools ($p = 0.381$), or between geographical areas ($p = 0.099$) (Table 2).

When evaluating by weight percentiles, it was observed that from the 337 students assessed, 28.2% (23.6-33.2%) presented an elevated percentile ($p < 0.05$), 70.9% (66-75.4%) a normal percentile and 0.9% (0.0-2.1%) a low percentile ($p = 0.168$) (Table 2). Although there were no significant differences between areas ($p = 0.166$), it was possible to observe that the students from the southwest area were taller than the rest. When dividing students by gender, in girls

there was no significant relationship between height and area ($p=0.993$); unlike boys from the southwest area, who presented a significantly higher height ($p=0.023$) than their counterparts in other areas.

When classifying the height percentiles, it was possible to observe that 0% of children had a low percentile (<3), 87.8% (84.6-91.6%), a normal percentile ($>3<97$) and 12.2% (8.4-15.4%) a high percentile (>97) ($p<0.05$). There was no relationship between percentile and gender ($p=0.667$), or with the type of school ($p=0.797$). Instead, there were indeed differences by area ($p=0.000$), where once again the southwest presented a higher ratio of children with an elevated percentile.

The average of hip circumference in students was 87.6 ± 13.8 cm. There were no significant differences found between boys and girls ($p=0.405$) or between types of schools ($p=0.891$).

During the analysis by area, it was observed that in public school students in the northwest area there was a tendency in the limit of statistical significance to presenting a smaller hip circumference, while those in public schools in the southeast had a higher average.

The average BMI of all students was 21.9 ± 4.7 kg/m². There were no significant differences observed between gender ($p=0.528$), or type of school ($p=0.463$). In regard to areas, although there were no significant differences, there was a small tendency to be higher ($p=0.055$) in the south area (Table 3). When comparing the areas of state schools, it was observed that children in the west area presented a greater BMI in comparison with the north area ($p=0.018$). Between the private schools, the south area presented significantly higher differences of BMI in comparison with those from the southwest area ($p=0.013$) (Table 3).

When classifying BMI in percentiles, a marked excess in weight was observed between students (61.4% adding obesity and overweight). The proportions were the following: 23.1% (18.7-27.6%) overweight ($p\geq85<97$), 38.3% (33.4-43.6%) obesity ($p\geq97$), 38.3% (32.8-43.9%) normal weight ($p\geq3<85$), and a single case of low weight (<3). We should clarify that the student with low weight is under treatment for alterations in growth (Figure 1).

Although there was no relationship with gender ($p=0.801$), there was indeed a significant relationship between overweight and obesity in girls with menarche ($p=0.007$). There was no relationship between the percentile of BMI with the area ($p=0.614$) or the type of school ($p=0.591$). When combining both variables, it was possible to see that in the southwest area, the proportion of students with obesity is significantly higher in the state school in comparison with the private one ($p=0.003$).

The average waist-to-hip ratio (WHR) of all students was 0.84 ± 0.08 . There were no differences observed between sexes ($p=0.500$), type of school ($p=0.439$), and area ($p=0.240$) (Table 3).

The average waist-to-height ratio (WHtR) of all students was 0.49 ± 0.07 . There were no differences observed between

gender ($p=0.902$), or type of school ($p=0.729$). However, there was a significant difference between areas ($p=0.007$), where once again the children of the south area had a higher WHtR greater than in those of the north area ($p=0.017$) (Table 3).

The average SBP and DBP of all students was 108 ± 12 mmHg and 68 ± 10 mmHg, respectively. There was high BP in 17.8% of the population during the school evaluation. There were no significant differences in SBP and DBP according to gender ($p=0.887$) (Table 4).

The presence of menarche correlated significantly with elevated values of SBP ($p=0.018$); not so with DBP values ($p=0.3$).

The correlation between SBP and weight was also significant ($p=0.000$), as well as with BMI ($p=0.004$), WHtR ($p=0.007$), waist circumference ($p=0.035$) and hip circumference ($p=0.049$). There were no significant differences observed with WHR ($p=0.205$) (Figure 2).

In regard to SBP, a significant correlation was found with a greater waist circumference ($p=0.028$). A correlation tendency presented with waist circumference ($p=0.054$), but its relationship with BMI was not significant ($p=0.398$).

When analyzing by area, there were no statistically significant differences observed in regard to SBP ($p=0.999$) and DBP ($p=0.530$); although SBP was observed to be higher in the south and southwest areas and DBP was higher in the west and northwest areas.

Between private and public schools, it was found that DBP was higher in the latter, in a statistically significant manner ($p=0.04$). There were no significant differences observed in regard to SBP ($p=0.1$).

With the data obtained, we created and published a database, available in the free access and free-of-charge digital repository of the UNR.¹⁷

DISCUSSION

Overweight and obesity constitute a severe public health problem, that currently has reached characteristics of a pandemic. In 2022, there were around 390 million children and adolescents with overweight and obesity at world level.⁴

In Argentina, the problem of obesity is also concerning and has presented a sustained increase over years. It is argued that the increase in BMI observed would be the result of an increase in sedentary life associated to dietary patterns characterized by a high consumption of products with low nutritional value, high calorie content, and a habitual ingestion of sugar-sweetened beverages.^{4,14,17,18,19}

Childhood obesity is strongly linked to noncommunicable diseases like diabetes and coronary artery disease in adults.^{20,21,22}

The nutritional situation of the childhood and adolescent population can be characterized from the anthropometric information in relation to age and gender. In this report, the data come from registries of 337 children with ages 11 and 12 who are in 6th grade in public and private schools from different areas of the city of Rosario.

An approach to the problem of malnutrition is visualizing its distribution according to calorie deficit and/or excess, which would have an impact both on weight and height.

When evaluating the expected weight for age and height, 3 in every 10 children presented an elevated percentile; i.e. weight excess; although the remaining population presented normal weight, since the number of children with low weight was less than 1%. The evaluated variable should generate a warning about the possible relationship with malnutrition by excess in the evaluated children.

On the other hand, there were no children found with low height, which is a great advancement in regard to nutritional deficits affecting other provinces in the country.

In the case of the anthropometric variables mentioned previously, it seems that malnutrition in the city of Rosario is not as high in regard to world references. However, when evaluating the combined variables, malnutrition by excess is manifest with another magnitude.

A key result was the BMI obtained in this evaluated group. When adding children with overweight and obesity, weight excess is overwhelming in the evaluated population, where nearly 2 in every 3 children presented elevated BMI, regardless of the gender of the evaluated individuals.

As it was to be expected, due to the relationship described in the literature about weight excess and BP increase, a prevalence of HTN was found in 17.8% in the evaluated cohort. Therefore, 1 in every 5 children of the city of Rosario presented elevated BP at the time of the evaluation.

It is remarkable that only SBP and not DBP significantly correlated with weight, BMI, waist circumference and hip circumference. Although no significant differences were identified by gender; in the female students a positive relationship was found between SBP and menarche.

According to the Second National Survey on Nutrition and Health (Segunda Encuesta Nacional de Nutrición y Salud) from 2019, where children with ages from 5 to 17 years were evaluated, 41.1% of children and teenagers present overweight and obesity in Argentina, a proportion of 20.7% and 20.4%, respectively, with no differences by socioeconomic level.³

The present findings at anthropometric level in the city of Rosario not just coincide with the Argentinian data from 2019, but present an increase in the prevalence of overweight and obesity in regard to the findings from four years ago.

The relationship between obesity and HTN in childhood has been widely documented in previous studies. In particular, the prevalence of HTN in children with overweight or obesity may reach between 27% and 47%, with BMI being considered one of the strongest determinant factors for elevated blood pressure in children and adolescents.^{21,22,23} These findings coincide with the results of this study.

Puberty also plays a role in BP regulation, as shown in this study with the correlation between SBP and girls that had already had their menarche. Changes in hormone regulation influence fat-free mass and sensitivity to insulin,

which may have an impact on BP levels.⁶ These findings coincide with previous studies that suggest that during puberty, the relationship between fat-free mass and blood pressure is altered, contributing to an increase in blood pressure in this stage. It is necessary to analyze whether percentile tables for blood pressure are appropriate for this type of patient, that chronologically is categorized as pediatric, but biologically could be considered closer to adulthood.

The highest prevalence of HTN in the south and southwest areas could be related to socioeconomic factors, which, according to literature, may influence on the development of HTN since an early age.^{24,25,26}

Strengths and limitations

This study has as strength the wide sampling from different areas of the city, which allows obtaining a representative view of the school population. Nonetheless, within the limitations, we find the cross-sectional nature of the study, which prevents establishing causality relationships; the only measurement of blood measurement, which could be biased by hyperreactivity or "white coat" effect, the lack of information on other variables such as family history, diet, level of physical activity and hours in front of screens, which may also influence on results.

Although sampling was by convenience, since only 2 schools were tested in each district, the number of surveyed individuals is very close to the number we should have to get a probabilistic sampling. It is known that in such type of sampling there could be a selection bias, but by having such a high number of patients and as results coincided with literature, these conclusions could be extrapolated to the whole population.

Clinical and public health repercussions

These results highlight the significance of developing health care policies that reinforce education on healthy habits, both nutritional by promoting consumption of food with a low content of ultra-processed food, and physical exercise, particularly during growing and developing in children and teenagers.²⁷

In this regard, the schools that provide food through state programs play a key role in promoting health. Improving the nutritional quality of the food provided and supplementing these initiatives with education in nutrition and physical activity is essential to fight obesity and HTN in this population. Regular monitoring of blood pressure in childhood is crucial, particularly in children with overweight or obesity, due to the high risk of developing HTN and cardiovascular diseases in adulthood. The schools, both public and private ones, should be spaces where self-care should be promoted since an early age, integrating the educational community in this process.

CONCLUSIONS

This study reveals a high prevalence of overweight, obesity and hypertension in children in school age in the city

of Rosario, which displays the need of intervening early to prevent cardiovascular complications in adulthood.

Obesity is one of the main risk factors of HTN in childhood; for this reason, children with overweight and obesity present up to four times more possibilities of developing hypertension in comparison with their counterparts with normal weight.^{20,25,28,29} This fact reinforces the need for preventive interventions addressed to reducing child obesity to decrease the prevalence of HTN and its consequences in the long term, as HTN in childhood is a known predictor of cardiovascular disease in adulthood, particularly when children are found in the highest percentiles of blood pressure.

It is essential for health and education sectors to work coordinately to develop programs promoting healthy life habits and to make regular controls in schools, enabling an early detection of risk factors.

Therefore, public policies combining health and education efforts are essential to generate a positive impact on childhood health, particularly in more vulnerable areas.

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