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ORIGINAL ARTICLE

Epidemiological Condition of Obesity in Argentina

Situación epidemiológica de la obesidad en Argentina

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ABSTRACT

Background: Obesity might be defined as the result of people responding normally to the obesogenic environment they find themselves in.
Objective: The aim of this study was to describe the epidemiological situation of overweight and obesity in adults and adolescents in Argentina.
Methods: The prevalence of overweight and obesity and associated factors was estimated in adults and in 13 to 15 year-old students using data from the National Risk Factor Survey of non-communicable diseases (NRFS) and the Global School-based Student Health Survey.
Results: In 2013, the prevalence of overweight (37.1%) and obesity (20.8%) was higher than in previous NRFS. Both indicators were more frequent among males and older people. Level of educational attainment and income were independently associated with a higher prevalence of obesity in women. In 2012, the prevalence of overweight and obesity among adolescents was 22.8 % and 5.9%, respectively. Obesity was more frequently observed among students with mothers who had incomplete primary school (8.9 % vs. 4.6% in children of mothers with complete high school, p=0.002).
Conclusions: Large-scale multisector actions are needed to stop the growing trend of obesity epidemic. Although evidence is still scarce, strategies to improve dietary habits have been proposed: media and educational campaigns, tax and subsidy strategies to control food and beverage prices, food labelling and health warnings, regulation of publicity focused on children and adolescents, improvements in workplace and school food environments, reformulation of ultra-processed foods, among others.

Key words: Obesity - Overweight - Epidemiology - Health Inequalities - Public Policy - Argentina

RESUMEN

Introducción: La obesidad puede entenderse como el resultado de personas respondiendo normalmente al contexto obesogénico en el que se encuentran inmersas.
Objetivo: Describir la situación epidemiológica de la obesidad y el sobrepeso en adultos y adolescentes en la Argentina.
Material y métodos: Se estimó la prevalencia de obesidad y sobrepeso y factores asociados en adultos y estudiantes de 13 a 15 años a partir de datos de la Encuesta Nacional de Factores de Riesgo (ENFR) de enfermedades no transmisibles y de la Encuesta Mundial de Salud Escolar.
Resultados: En 2013, la prevalencia de sobrepeso (37,1%) y de obesidad (20,8%) fue mayor que la observada en ediciones previas de la ENFR. Ambos indicadores fueron más frecuentes en varones y en personas de mayor edad. El nivel educativo y de ingresos se asoció en forma independiente con una prevalencia mayor de obesidad en mujeres. En adolescentes, en 2012, la prevalencia de sobrepeso fue del 22,8% y la de obesidad, del 5,9%. Esta última fue mayor en estudiantes con madres con primario incompleto (8,9% vs. 4,6% en hijos de mujeres con secundario completo, p = 0,002).
Conclusiones: Son necesarias acciones multisectoriales de gran escala para frenar la tendencia en aumento de la epidemia de obesidad. Aunque la evidencia aún es escasa, se han propuesto varias estrategias poblacionales: campañas de comunicación y educación, regulación del precio de alimentos mediante subsidios o impuestos, etiquetado y advertencias sanitarias, regulación de la publicidad dirigida a niños y adolescentes, mejoras en el entorno alimentario escolar y laboral, reformulación de productos ultraprocesados, entre otros.

Palabras clave: Obesidad - Sobrepeso - Epidemiología - Desigualdades en la salud - Política pública - Argentina

Abbreviations

GSHS	Global School-based Student Health Survey	**BMI**	Body mass index
NRFS	National Risk Factor Survey	**WHO**	World Health Organization
NCD	Non-communicable diseases		

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INTRODUCTION

Overweight and obesity are currently among the main death risk factors and disease burden worldwide. It is estimated that each year approximately 3.4 million adults die as a consequence of excess weight and that 44% and 23% of disease burden for diabetes and ischemic heart disease, respectively, can be attributed to this cause. (1, 2)

In Argentina, it was calculated that if the prevalence of overweight and obesity had remained at the same levels of 2005, 5.5% of adult deaths, implicating 18,000 deaths, could have been avoided in 2013. (3) According to data reported in a study published in 2010, excess weight in our country represented 596,704 years of healthy life lost during that year. (4)

Existing evidence supports the association between increase in body weight and ultra-processed food consumption, regular intake of sweetened beverages and insufficient physical activity. (5) Although the beneficial effect of physical activity on health is unquestionable, the first two factors have been described as the prevailing clue of obesity. (6)

At a population level, global marketing promoting excess consumption of sweetened beverages and products with high calorie and low nutritional content was identified as the main instrument of obesity epidemic. The regulation (or not) of marketing, social and economic policies, the incorporation of women to the labor market, tax regimes and the level of social inequality establish the conditions in which individuals, institutions and companies operate, becoming distal determinants of obesity. Moreover, cooking culture, transportation systems, environmental architectural design, opportunities of recreational activities, body esthetic culture, among others, are modulators that increase or reduce the effects of these distal determinants. In this sense, some authors define obesity as the result of persons normally responding to the obesogenic context in which they are immersed. (7, 8)

For this reason, control of obesity requires a multidimensional approach to devise effective interventions aimed not only at the individual to generate healthy habits, but more importantly, to establish policies to modify the obesogenic context, which constitutes the main conditioning factor of this epidemic. (7)

The purpose of this study was to describe the epidemiological state of overweight and obesity in adults and adolescents in Argentina.

METHODS

Two previously reported sources of information were used: the 2005, 2009 and 2013 1st, 2nd and 3rd edition of the National Risk Factor Survey (NRFS) of non-communicable diseases (NCD) was analyzed in the case of adults and the 2007 and 2012 1st and 2nd edition of the Global School-based Student Health Survey (GSHS) to evaluate adolescents. Both surveys have been previously detailed and constitute prevalence or cross-sectional studies integrating the NCD Vigilance System in Argentina. (9, 10)

Briefly, NRFS included non-institutionalized subjects aged ≥18 years from a household sampling performed in cities of more than 5,000 inhabitants throughout the country. A multistage, stratified by conglomerate sampling design was used. The questionnaire was based on the vigilance NCD tool recommended by the World Health Organization (WHO). (11) All the information collected consisted in self-reports and no anthropometric or laboratory measurements were performed. The questionnaire was transculturally adapted and validated before conducting the NRFS. (12) Conversely, GSHS is a worldwide used vigilance strategy with standardized and validated methodology to assess data on the behaviour and protection factors in secondary school students regarding the main causes of disease and death in this population. A two-stage conglomerate sampling was used including 1st, 2nd and 3rd year students from secondary schools of the country, aged 13 to 15 years.

Overweight and obesity were the dependent variables, estimated from the body mass index (BMI) calculated from the self-reported body weight and height as: BMI=weight/[height]^2. Overweight for adults was defined as BMI≥25 and <30, and obesity as BMI≥30. In adolescents overweigh was defined as BMI above one standard deviation and below two standard deviations from the median value for sex and age. Independent socio-demographic variables analysed were: age, sex, maximum level of educational attainment and quintile of total household income per consuming unit (adults) and sex and maximum level of educational attainment of the mother (adolescents).

Statistical analysis

Complex sampling analysis was used for the statistical analysis of both sources of information. Point estimations with 95% confidence intervals (prevalence) were calculated. Sampling fractions were considered for each stage to obtain the corresponding weighting factors adjusting for non-response and calibration of the total population. (13) The chi-square test was used to compare survey editions and segments. The independent association of socio-demogaphic variables and obesity in adults was evaluated with multiple logistic regression analysis stratified by sex. Two-tailed tests were considered in all cases, and due to the large sample size, a p value <0.01 was considered statistically significant.

Ethical considerations

The NRFS is part of the epidemiological vigilance strategies and the Statistical Secret Law 17,622. It has also been incorporated as survey in the INDEC National Statistical System. This law guarantees the anonymity of the survey participant and the confidentiality of the information being processed. Moreover, each participant´s consent to take part in the survey was requested orally. To comply with the Declaration of Helsinki recommendations, the NRFS was approved by the Pan American Health Organization Ethics Review Committee.

RESULTS

Sample size selected for the 3rd NRFS was 46,555 subjects, among which 32,365 were effectively surveyed (response rate: 70.7%). In the case of GSHS, sample size was 36,000 students with an overall response rate of 71%. Thus, the 2012 GSHS was completed by 28,368 students, of whom 20,890 belonging to the 13- to 15-year age segment were included in the analysis. Table 1 describes the population characteristics of the

3rd NRFS and the 2nd GSHS and their comparison with previous editions.

According to the 3rd NRFS, overweight prevalence was 37.1%, 7.8%, higher than that observed in 2005 (p=0.0014). In 2013, 20.8% of subjects presented obesity, involving 42.5% increase compared with the 1st edition (p<0.001) (Table 2). Both indicators were higher in men than in women and increased with age. It was seen that persons with higher level of educational attainment presented less prevalence both of overweight as obesity. However, there were no significant differences in the prevalence of these indicators according to their income level (Table 3).

Table 4 shows that age is an independent predictor of obesity for both sexes. However, in women the level of educational attainment had greater effect on the prevalence of obesity than in men. Income level was an independent predictor of obesity in women with a lower frequency of obesity at higher income levels. Conversely, in men the income level was not significantly associated with prevalence of obesity.

In the case of adolescents, the prevalence of overweight and obesity was 22.8% and 5.9%, respectively, in 2012. No significant differences were observed compared with 2007 (Table 2). The incidence of both indicators was higher in boys than in girls. Although the educational level of the mother was not significantly associated with the prevalence of overweight (p=0.941), the incidence of obesity in students whose mothers had not completed primary education (8.9%) doubled that estimated in students of mothers with complete secondary school or higher level of educational attainment (4.6%; p=0.002) (Table 5).

DISCUSSION

In our country, six out of ten adults and three out of ten adolescents are overweight or obese. In adults, its prevalence is growing, affecting males to a greater extent and increasing with age. Differences were observed in the prevalence of obesity by educational level in both adults and adolescents. Income level was independently associated with a higher incidence of

Table 1. Sociodemographic characteristics of the 1st, 2nd and 3rd National Risk Factor Survey of non-communicable diseases and 1st and 2nd Global School-based Student Health Survey

		1st NRFS (2005)		2nd NRFS (2009)		3rd NRFS (2013)		1st GSHS (2007)		2nd GSHS (2012)	
		Non-weighted n	% weighted	Non-weighted n	% weighted	Non-weighted n	% weighted	Non-weighted n	% weighted	Non-weighted n	% weighted
Sex	Male	17,827	47.5%	15,028	46.7%	14,317	47.4%	957	48.0%	9,671	47.5%
	Female	23,565	52.5%	19,704	53.3%	18,048	52.6%	994	52.0%	11,026	52.5%
Age	18-24	5,957	18.1%	4,713	17.2%	4,341	16.5%				
	25-34	9,059	20.2%	7,625	21.1%	7,028	21.9%				
	35-49	11,714	25.9%	9,577	25.4%	9,013	26.6%				
	50-64	8,267	21.0%	7,066	21.1%	6,607	19.8%				
	65 and older	6,395	14.8%	5,751	15.3%	5,376	15.1%				
Level of educational attainment*	Incomplete primary education	5,876	12.9%	4,585	10.8%	3,561	9.9%	Not recorded		1,286	6.9%
	Complete primary to incomplete secondary education	16,576	43.0%	13,767	40.0%	12,287	38.3%	Not recorded		6,310	35.8%
	Complete secondary education and higher	18,940	44.1%	16,380	49.3%	16,517	51.9%	Not recorded		9,680	57.3%
Quintile of income per consumption unit	Quintile 1	10,465	24.6%	8,756	21.6%	7,121	21.4%				
	Quintile 2	8,897	20.3%	7,031	20.5%	6,292	20.1%				
	Quintile 3	7,629	19.6%	6,287	19.6%	6,246	20.6%				
	Quintile 4	7,267	18.3%	6,268	19.5%	5,936	19.3%				
	Quintile 5	6,878	17.2%	6,196	18.8%	6,669	18.7%				

*Level of educational attainment in the Global School-based Student Health Survey refers to the maximum educational level attained by the mothers
NRFS: National Risk Factor Survey. GSHS Global School-based Student Health Survey

	1st NRFS (2005) % (95% CI)	2nd NRFS (2009) % (95% CI)	3rd NRFS (2013) % (95% CI)	p	1st GSHS (2007) % (95% CI)	2nd GSHS (2012) % (95% CI)	p
Overweight	34.4	35.4	37.1	0.0014	20.3	22.8	0.104
	(33.4 – 35.5)	(34.6 – 36.3)	(36 – 38.2)		(17.4 – 23.5)	(21.5 – 24.2)	
Obesity	14.6	18.0	20.8	<0.0001	4.4	5.9	0.129
	(13.9 – 15.5)	(17.4 – 18.7)	(19.9 – 21.8)		(3.2 – 6.1)	(5.1 – 6.8)	

NRFS: National Risk Factor Survey. GSHS Global School-based Student Health Survey

Table 2. Prevalence of overweight and obesity in adults and 13 to 15 year-old students. 1st, 2nd and 3rd National Risk Factor Survey of non-communicable diseases and 1st and 2nd Global School-based Student Health Survey

		Overweight % (95% CI)	Obesity % (95% CI)
Total		37.1 (36-38.2)	20.8 (19.9-21.8)
Sex	Male	43.3 (41.7-44.9)	22.9 (21.5-24.4)
	Female	31.3 (29.9-32.7)	18.8 (17.7-20.0)
	p	<0.0001	<0.0001
Age group	18-24	25.4 (22.7-28.3)	7.7 (6.3-9.4)
	25-34	35 (32.6-37.4)	15.8 (14.3-17.5)
	35-49	39.8 (37.8-41.8)	24,3 (22.5-26.1)
	50-64	40.9 (38.7-43.2)	29.6 (27.5-31.9)
	65 and older	42.6 (39.7-45.6)	24.3 (22-26.7)
	p	<0.0001	<0.0001
Level of educational attainment*	Incomplete primary education	41.8 (38.5-45.1)	28.1 (24.7-31.8)
	Complete primary and incomplete secondary education	38.3 (36.5-40.1)	24.5 (23-26)
	Complete secondary education and higher	35.4 (34-36.9)	17 (15.8-18.2)
	p	0.0007	<0.0001
Quintile of income per consumption unit	1	35.5 (33.2-37.8)	21.4 (19.4-23.4)
	2	38.2 (35.8-40.5)	22.3 (20.3-24.5)
	3	38.1 (35.8-40.4)	21.5 (19.6-23.6)
	4	37.3 (34.8-39.9)	20.1 (18.1-22.2)
	5	36.3 (34.0-38.6)	18.8 (17.0-20.7)
	p	0.4341	0.1097

Table 3. Prevalence of overweight and obesity in adults in 2013 according to sex, age group, level of educational attainment and income level. Third National Risk Factor Survey of non-communicable diseases

		Women			Men		
Age		OR	95% CI	p	OR	95% CI	p
Level of educational attainment*	Incomplete primary education	1.02	(1.01-1.02)	<0.001	1.02	(1.01-1.02)	<0.001
	Complete primary and incomplete secondary education	1.59	(1.24-2.04)	<0.001	1.24	(0.91-1.68)	0.175
	Complete secondary education and higher	1.53	(1.30-1.81)	<0.001	1.29	(1.09-1.52)	0.003
		1			1		
Quintile of income per consumption unit	1	1.57	(1.23-2.00)	<0.001	0.83	(0.63-1.09)	0.172
	2	1.37	(1.07-1.74)	0.012	1.01	(0.80-1.28)	0.93
	3	1.39	(1.08-1.78)	0.01	0.85	(0.67-1.08)	0.178
	4	1.1	(0.85-1.42)	0.456	1.04	(0.83-1.30)	0.712
	5	1			1		

Table 4. Analysis of adjusted predictors of obesity in adult women and men in 2013. Third National Risk Factor Survey (NRFS) of non-communicable diseases

Table 5. Prevalence of overweight and obesity in 13 to 15 year-old students in 2012 according to sex and mother's level of educational attainment. Second Global School-based Student Health Survey

	Overweight % (95% CI)	Obesity % (95% CI)
Total	22.8 (21.5-24.2)	5.9 (5.1-6.8)
Sex		
Male	27.5 (25.2-30.0)	8.3 (7.1-9.8)
Female	18.5 (16.6-20.5)	3.6 (2.8-4.7)
p	<0.001	<0.001
Mother's level of educational attainment		
Incomplete primary education	22.2 (17.1-28.4)	8.9 (5.9-13.1)
Complete primary and incomplete secondary education	22.8 (20.8-24.9)	6.9 (5.3-8.8)
Complete secondary education and higher	23.0 (21.1-25.1)	4.6 (3.7-5.6)
p	0.941	0.002

obesity in women.

In the world and specifically in Latin America, the trend in the prevalence of obesity is clearly rising. Despite there are methodological differences in population or survey methods, the available information indicates that Argentina has an obesity prevalence similar to that estimated for the countries of the region. (3, 14)

The effect of education and income level on the frequency of obesity has already been described in our country. (15) On the one hand, although both are indicators of social class, they acted differently on obesity. On the other hand, women were more vulnerable to socioeconomic status. There may be other important variables that need to be explored to get a better understanding of this phenomenon.

The result of this analysis should be interpreted taking into account the following limitations: Firstly, the indicators are constructed from self-reported data that may differ from objective measurements. However, in the case of NRFS, the assessment of self-reported height and weight was validated in 2003, comparing the answers with anthropometric measurements. On the other hand, since the indicators are collected and similarly constructed throughout time, they provide accurate and comparable data that can detect trend changes. Secondly, since the profile of those who refuse to answer is unknown, there may be a selection bias. However, the response rate was acceptable and the calibration method of the sample tried to minimize this bias. Thirdly, since the surveys are cross-sectional studies, the causal association between some independent variables and the prevalence of obesity should be interpreted with caution.

Public policies to control obesity

WHO proposes as target to stop the rise in the prevalence of obesity by 2025. To this end, it developed together with the Pan American Health Organization the action plan for the prevention of obesity in childhood and adolescence, which through 5 strategic lines of action, mainly seeks to transform the current obesogenic environment into opportunities to promote higher nutritious food consumption and increased physical activity. (5) They also show that current trends in production and consumption of ultra-processed products, and the corresponding increases in BMI probably can be reversed through regulations and other actions such as those established for tobacco and alcohol. (16)

There is little evidence on the effectiveness of efforts to improve eating habits and to control and prevent obesity and its health consequences. First of all, there are methodological difficulties to assess the effectiveness of public policies. Moreover, most of the evidence comes from studies performed in high-income countries with feeding contexts different to ours.

The results of a systematic review on the effectiveness of population interventions on healthy eating are detailed below. (17) The progress made in countries of the region is also discussed.

1- *Communication and education campaigns at national, community or school level.* This type of strategies seems to be effective to increase awareness and consumption of healthy foods, especially when maintained for many years. They are focused on a particular product and use multiple communication and education media.
2- *Labeling:* There is limited evidence indicating that labeling or information strategies have significant effects on changes in consumers' feeding behavior, especially in the long-term. The effectiveness could be limited because people spend little time on food selection due to labeling complexity that requires a certain level of understanding, and because those who read the labels have already healthy eating habits. However, some natural experiments showed that this type of strategy could persuade the industry to reformulate products to make them healthier. This strategy is already being implemented in several countries of the region such as Mexico, Chile and Ecuador.
3- *Price of food and drinks (taxes and subsidies):* The change in the price of food and drinks could alter

their consumption and even seems to have effect in reducing risk factors related to diet and clinical events. The effect of the price increase is proportional to the change in the relative price: lower taxes would not have a significant impact on demand; larger increases (at least 10%) seem to be necessary to change consumption. On the other hand, evidence from studies in the Northern hemisphere indicates that subsidies on healthy foods such as fruits and vegetables are effective in increasing their consumption. In the region, the only country that has managed to change the price of ultra-processed foods and sweetened beverages so far is Mexico.

4- *Changes in the school environment:* There is supporting evidence that interventions in schools with multiple components aimed at improving the diet and increasing physical activity level are effective in reducing students' BMI. Several studies suggest that educational strategies in vegetable gardens, fruit and vegetable programs, changes in canteens and kiosks (such as limiting access to sweetened beverages or unhealthy products) and the provision of water or fruit could be effective in improving knowledge and attitudes towards food, the consumption of fruits and vegetables, decrease the consumption of sweetened beverages and reduce BMI. Several countries in the region such as Uruguay, Mexico and Chile are pursuing these strategies.
5- *Changes in the workplace:* Although the evidence is limited, provision of nutritional information in workplace canteens combined with changes in the environment (access to food and drinks) could have an impact on the eating habits of people.
6- *Changes in the local food environment:* The evidence seems to suggest that accessibility to food establishments such as supermarkets, grocery stores, fast food restaurants, etc., and the availability of healthy/unhealthy food in shops, could influence food choices of individuals and could have consequences in reducing obesity and health inequalities.
7- *Restrictions on advertising aimed at children:* There is consistent evidence showing that television advertising aimed at children influences their preferences and consumption of unhealthy products and sweetened beverages, and therefore its restriction is considered effective. In the region, there is currently restriction in the advertising aimed at children in Mexico and Chile.
8- *Restrictions on food components:* Examples of these measures are restriction of trans fats or palm oil for the production of processed foods. Argentina is the third country in the world free of trans fats (along with Switzerland and Denmark). It is a regulation that determines a restriction on the content of trans fatty acids of industrial production which should not exceed 2% of total fat in vegetable oils and margarines and not more than 5% of total fat in the rest of food products. The law came into force in December 2014. (18)

CONCLUSIONS

In conclusion, the prevalence of obesity in adolescents and adults is a major public health problem in our country. However, there is still a long way to go in order to control this problem. While there is no strong scientific evidence about the effectiveness and impact of interventions to follow, there are some strategic lines of action recommended. Some countries of the region have already begun to develop substantial actions to address the obesity epidemic. Although some interventions have been implemented in Argentina, they should be deepened.

Conflicts of interest

No author had financial direct or indirect conflicts of interest in the subjects, matters or materials discussed within 3 years of study initiation that could affect the conduction or report of the submitted work.
(See authors' conflict of interest forms in the web/Supplementary material)

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