

## Results of the Health Campaign Child Weight and Health in Community Pharmacies in the Province of Cádiz

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**Received:** March 09, 2020; **Published:** July 13, 2020

### Abstract

In the overweight/obese child and adolescent population, dietary intervention should not be an isolated intervention but must be carried out in the context of a change in lifestyle<sup>1</sup>. In 2016 the Official College of Pharmacists in Cádiz developed and launched a health campaign under the motto "Weight and children's health". The general objective of this campaign was to promote food eating habits and healthy lifestyles for children.

During the Campaign, 3,809 children in the province, aged 5 to 14 years, who were offered nutritional information, were measured and weighed in Cádiz pharmacies.

Upon analyzing the results, a prevalence of excess weight (overweight plus obesity) of 29.67% and obesity of 13.73% was observed, with the boys showing higher rates than girls, both in excess weight (33.11 vs 25.95%) and obesity (16.73 vs 10.49%).

Blood pressure measurement was recommended for the population with  $\geq 97$  percentile (obesity). Of the 523 individuals within this percentile, blood pressure was measured at 249, 135 of whom showed blood pressure values higher than those of reference.

In view of the results, this study raises the need to deepen the surveillance and prevention of cardiovascular risk in children.

The pharmacy is an ideal place to promote healthy lifestyles and prevention of overweight and obesity.

**Keywords:** Obesity; Overweight; Children; Blood Pressure; Pharmacy; Cádiz

### Introduction

Childhood obesity continues to be an important public health problem today, the prevalence of which increases worldwide. Specifically, the overall prevalence of overweight and obesity in children aged 0 - 5 years in 1990 was 4.2% and in 2010 6.7%. The World Health Organization (WHO) estimates that in 2020 it will be 9.1% [1,2].

In the child population, obesity is associated with the presence of various disease risk factors, such as prediabetes, type 2 diabetes mellitus, arterial hypertension (HT), dyslipidemia, metabolic syndrome or even sleep disorders, and may affect to the psychological well-

being of the child and his social relations. Not forgetting that overweight and obesity in childhood are associated with an increased risk of overweight and associated pathologies in adulthood. Some studies estimate that about 40% of overweight children at age 7 will become obese adults, and other studies estimate that 77% of obese children will be obese adults [3-5].

When talking about obesity and cardiovascular disease not only have to think about obesity in adulthood, but also at earlier ages. In childhood and adolescence, excess weight is directly associated with elevated plasma concentrations of insulin, lipids and lipoproteins and HTN, and can cause premature onset of cardiovascular diseases in adults.

Currently, the fight against childhood and adolescent obesity and the development of cardiovascular diseases is mainly focused on the development of prevention measures [6,7]. There are many initiatives carried out in this regard, both from the autonomous area (Junta de Andalucía [1,8], Castilla-La Mancha [9,10]), as well as national (NAOS Strategy [11]) and European (COSI Initiative [1], HELENA study [12]). However, the objectives of the action on modifiable risk factors, and present in the subject for a long time, have only been partially achieved so far. Therefore, the continuation of studies and projects that go in this direction and serve a new momentum is important.

There is no agreed criterion for establishing overweight or obesity based on the body mass index (BMI). The two criteria that enjoy greater international acceptance are the one proposed by WHO and the postulated by the International Obesity Task Force (IOTF) [2,8].

In Spain, in addition, there is widespread use of the tables published by the Faustino Orbegozo Foundation, used in the study in Kid, which assesses the eating habits and nutritional status of the child and youth population in Spain (1998 - 2000), and considers as cut-off points the values corresponding to the 85<sup>th</sup> (overweight) and 97 (obesity) percentiles, specific for age and sex [13].

In the child and adolescent population who are overweight/obese, dietary intervention should not be an isolated action, but should be carried out in the context of a change in lifestyle that includes physical exercise, behavioral treatment and approach family [1].

Malnutrition can also cause low weight, which can lead to delays in the child's growth and intellectual development, as well as a greater incidence of nutrient deficiency diseases. Malnutrition and low weight, often associated with less developed country contexts, may also be present in our society.

The pharmacy is the health establishment where the patient has the first contact with the health system, making it an ideal place to promote healthy lifestyles and the prevention of overweight and obesity. The pharmacist has the necessary training to carry out these types of prevention campaigns and has the confidence and proximity to the user [9].

Therefore, the Official College of Pharmacists of Cádiz (COFCA) organized a health campaign that took place in pharmacies in the province of Cádiz under the slogan "Weight and child health" (PySI).

### Objectives of the Study

The general objective of this study was to promote dietary habits and healthy lifestyles for children in the community. Two specific objectives are established: detecting changes in infant weight (low weight, overweight and obesity) from the community pharmacy, and detecting changes in parameters related to cardiovascular risk (CVR) (such as blood pressure [BP]) in children with obesity.

### Materials and Methods

This research has consisted of an epidemiological, observational and cross-sectional study, carried out on a population of children in the province of Cádiz, of an age range of 5 - 14 years, with direct measurement of weight and height, in the presence always of the accompanying adult. This age group was taken to be the one with the highest prevalence of overweight/obesity in the study in Kid and the Comprehensive Plan of Childhood Obesity of Andalusia 2014.

Anthropometric measurements were carried out in pharmacies in the province of Cádiz, by community pharmacists, using a calibrated pharmacy scale, and a height meter in case the scale could not determine the size.

Anthropometric measurements were taken directly in children, and not by surveys, as in other published studies on overweight and obesity [14-16]. Although the materials for the anthropometric measurements (scales, height gauges and tape measures) were not homogeneous (specific models), all scales and measuring devices exposed for public use in the pharmacy offices must be calibrated and verified.

In order to train pharmacists in the province, educational material on obesity and infant feeding (dossier, brochures on feeding patterns and healthy lifestyles [17], tutorial videos), and conducted a training session. Likewise, a poster and a diptych were prepared to publicize the campaign to the population. All this information was distributed to all pharmacies in the province, and it was also available in a web application created for the campaign, linked to the COFCA website, in which documents could be viewed and downloaded.

The campaign was presented to the population through the media (press, radio and TV) and social networks (collegiate website, Facebook and Twitter).

The field work was carried out from February 23 to April 1, 2016. The proposal to weigh the children was carried out actively in the pharmacy office (direct communication, posters, leaflets, screens...). Once the participation by the child and the family member was accepted, the anthropometric measurements were carried out according to the established protocol, registering, anonymously, the data (weight in kg [1 decimal] and height in cm) in a form housed in the web application of the campaign, also writing down the zip code, sex and age of the child.

The form was designed so that with the weight and height data the BMI was calculated, and from it the corresponding percentile was automatically obtained, being marked on a graph of percentiles.

The tables of the longitudinal study published by the Faustino Orbeagozo Foundation in 2004 [18] were used as a reference, which considers as cut-off points the values corresponding to the percentiles  $\geq 85$  (overweight),  $\geq 97$  (obesity), 3 - 85 (normal weight) and  $< 3$  (underweight), specific for age and sex.

After entering all the data on the web, the information of the measures obtained was printed and delivered to the family member, with the graph and the calculated percentile, and information was provided on advice to follow a healthy and balanced diet, orally and written.

If the percentile was  $\geq 97$ , the BP measure was also proposed. This data was also recorded on the form.

The pharmacists had, in the campaign dossier, the recommendations for the correct taking of the BP, by means of a sphygmomanometer with a specific cuff for children, as well as a simplified table with the BP values above which they should consult the reference tables to identify HT in the pediatric population [19,20].

In case of detecting obesity ( $\geq 97$  percentile) or underweight ( $< 3$  percentile), a pediatrician referral sheet was automatically printed. This document, and the sheet with the child's measurements, were given to the family members and the visit to the pediatrician was advised.

Prior to the start of the campaign, the application was piloted by a group of pharmacists in the province, in order to detect possible operational failures.

In this study, children and/or their families who refused to take anthropometric measures were not counted, nor was it recorded whether or not there were responses to referrals to the pediatrician, which is used for further studies.

For the quantitative variables the mean and standard deviation have been calculated. To analyze the difference between means, the Student’s t test and ANOVA were used.

The  $\chi^2$  test was used to estimate the difference between proportions. The level of statistical significance was established at a value of  $p < 0.05$ . The statistical analysis of the data was performed with the Stata 14 program.

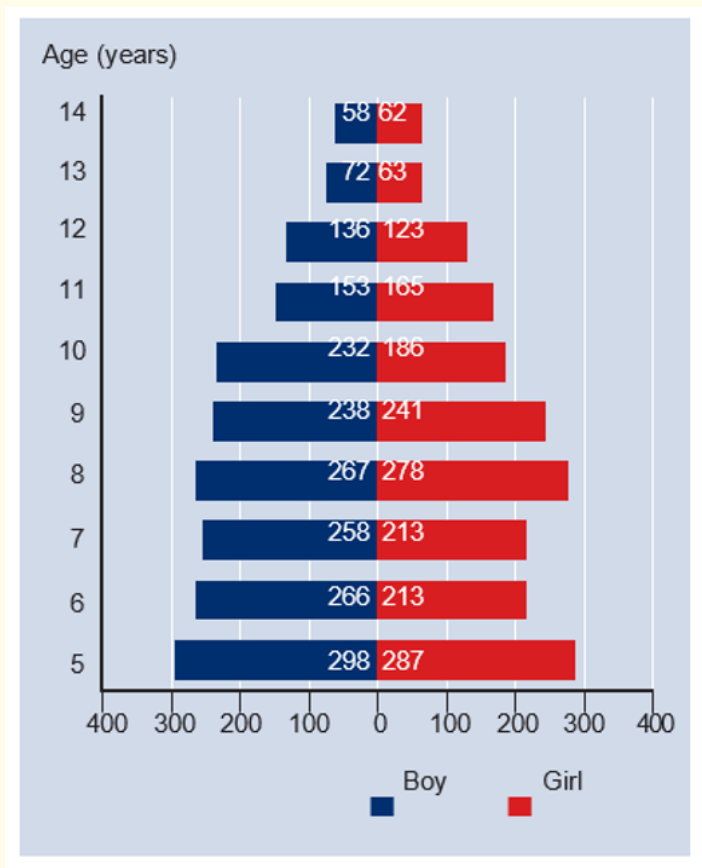
**Results**

**Population**

It is based on the data provided by 246 community pharmacies, which constitute 49.8% of those in the province of Cádiz, distributed in 93.1% of the municipalities.

3,814 individuals participated in the campaign, of which a total of 3,809 have been evaluated: 1,978 boys and 1,831 girls. The rest has been excluded for presenting erroneous values.

The distribution of the population by sex, age and geographical area is reflected in figure 1 and 2.



**Figure 1:** Sample age pyramid.

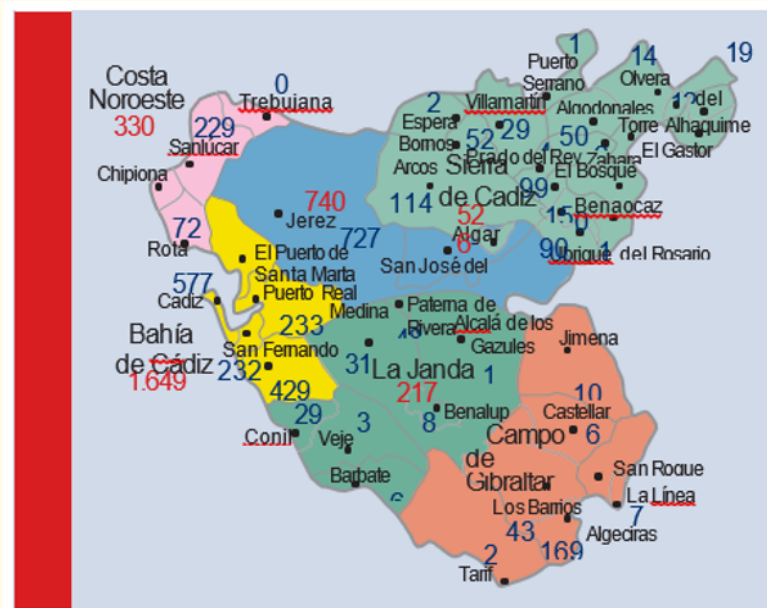


Figure 2: Map of the province of Cádiz by counties, with number of heavy children by population and by region.

**Body mass index**

In the study, as a whole, no significant differences in the BMI variable by sex are observed - the difference between groups (18.88 in boys versus 18.75 in girls) is not statistically significant ( $p = 0.27$ ) - but, of course, by age. Evaluating the influence of the two variables, sex and age, on the BMI, by simple linear regression, the influence of age and the influence of sex is confirmed: the model is significant ( $F = 359.29$ ;  $p \leq 0,0001$ ) and, of the variables evaluated, only age influences ( $t = 28.78$ ;  $p < 0.0001$ ), with an increase in BMI per year of 0.59.

When analyzing the weight situation of the general population, in particular from the values of BMI (Table 1), a prevalence of the sum of overweight and obesity (percentiles  $\geq 85$ ) of 29.67% is observed, and of obesity ( $\geq 97$  percentile) of 13.73%. There are significant differences with respect to sex, with a higher prevalence in boys than girls, both in excess weight (33.11% vs. 25.95%) and obesity (16.73% vs. 10.49%), the latter statistically significant (Pearson’s correlation coefficient  $c^2(3) = 34.4979$ ;  $Pr = 0.000$ ).

	Total					Children		Girls	
	Average BMI	95% CI		Frequency (n)	%	Frequency (n)	%	Frequency (n)	%
Low weight	11,56625	10,88162	12,25088	8	0,21	4	0,20	4	0,22
Standard weight	17,03981	16,96024	17,11938	2.671	70,12	1.319	66,68	1.352	73,84
Overweight	21,38035	21,2159	21,54479	607	15,94	324	16,38	283	15,46
Obesity	25,03201	24,74986	25,31416	523	13,73	331	16,73	192	10,49
Total				3.809	100	1.978	100	1.831	100

Table 1: Study of weight status and gender differentiation.

IC: Confidence Interval; BMI: Body Mass Index.

By age (Table 2), the differences are statistically significant (Pearson  $\chi^2$  (27) = 58.4194; Pr = 0.000), with a higher prevalence of obesity in the range of 8-10 years (15.05%) and a maximum value at 10 years (16.27%).

Age (years)	Low weight		Normal Weight		Overweight		Obesity		Total
	Frequency (n)	%	Frequency (n)	%	Frequency (n)	%	Frequency (n)	%	
5	5	0,85	434	74,19	76	12,99	70	11,97	585
6	1	0,21	354	73,90	67	13,99	57	11,90	479
7	1	0,21	332	70,49	69	14,65	69	14,65	471
8	0	0	383	70,28	81	14,86	81	14,86	545
9	0	0	308	64,30	103	21,50	68	14,20	479
10	0	0	272	65,07	78	18,66	68	16,27	418
11	1	0,21	226	71,07	51	16,04	40	12,58	318
12	0	0	168	64,86	49	18,92	42	16,22	259
13	0	0	94	69,63	24	17,78	17	12,59	135
14	0	0	100	83,33	9	7,50	11	9,17	120
Total	8	0,21	2.671	70,12	607	15,94	523	13,73	3.809
Pearson $\chi^2$ (27) = 58,4194; Pr= 0,000.									

**Table 2:** Weight situation by age.

The distribution by regions does not show statistically significant differences (Pearson  $\chi^2$  (15) = 16,0800; Pr = 0,377), although maximum obesity values are observed in La Janda (15.09%) and the Campo de Gibraltar (15.11%).

### Obesity

#### Sex, age and geographical situation

The prevalence of the population with a  $\geq 97$  percentile in the general population, by sex, age and region was studied. The difference with respect to sex, as previously mentioned, is statistically significant (16.73 in boys versus 10.49 in girls;  $p < 0.0001$ ).

Overall, although it varies with age, there are no statistically significant differences (0.339), nor with respect to the region ( $p = 0.356$ ).

To jointly assess the three variables considered (age, sex and district), a binary logistic regression (obesity outcome variable [yes/no]) was performed, and it was observed that the only variable with influence was sex (odds ratio [OR] = 0.58; 95% confidence interval [CI]: 0.48 - 0.70).

#### Blood pressure measurement

For the detection of risk factors related to CVR in the population with a  $\geq 97$  percentile, it was recommended to perform the BP measurement. Of the 523 individuals within that percentile, BP was measured at 249 (47.61%).

The diagnostic criteria for HT in children take into account the fact that BP increases with age and body size, which makes it impossible to establish a single cut-off value that defines HT in the same way as in adults.

There are simplified tables of BP values that facilitate the recognition of higher than normal figures [19] (Table 3) that may be useful in the initial screening of BP alterations, but for the definitive diagnosis the classic BP tables remain of reference Fourth Report on the

Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents, which take into account age, gender and height percentile [21].

**Results of the blood pressure measurement in the sample of 249 children**

Following the criteria of table 3, we can distinguish two groups: children with BP values above or within the reference values for their age range. The number of children with a  $\geq 97$  percentile with BP values higher than the reference values was 135, which is 54.22% in this sample.

Age (years)	Systolic BP (mmHg)	Diastolic BP (mmHg)
3 to < 6	$\geq 100$	> 60
6 to < 9	$\geq 105$	> 70
9 to < 12	$\geq 110$	> 75
12 to < 15	$\geq 115$	> 75
$\geq 15$	$\geq 120$	$\geq 80$
PA: blood pressure; Reference: Protocols on high blood pressure in children and adolescents of the Spanish Association of Pediatrics (2014) ( <a href="http://www.aeped.es/protocolos/">www.aeped.es/protocolos/</a> ).		

**Table 3:** A simplified table indicating the PA values above which the baselines to identify hypertension in the paediatric population.

Table 4 shows that there is a differentiation by sex. There is a higher incidence of BP values higher than normal in the male sex (59.62 vs. 45.16%), in a statistically significant way.

Sex	Pa values higher than those of reference for your age range				Total	
	No		Yes			
	Frequency (n)	%	Frequency (n)	%	Frequency (n)	%
Male	63	40,38	93	59,62	156	100
Woman	51	54,84	42	45,16	93	100
Total	114	45,78	135	54,22	249	100
Pearson Correlation Coefficient <sup>2</sup> (1)-4,9040; Pr. 0.027. PA: Blood Pressure.						

**Table 4:** Prevalence of gender-based PA disorders.

If we look at age (Pearson  $\chi^2$  (9) = 15.0917; Pr = 0.088) or geographical distribution, the differences are not significant.

When a logistic regression is made with the three variables (age, sex and district), it is observed that the only variable influencing the BP is sex, which confirms that the percentage of girls with altered BP values is lower (OR = 0.56; 95% CI 0.33 - 0.94).

**Discussion**

**Overweight, obesity and excess weight**

The campaign has been aimed at children 5 - 14 years of age, and their families, from all sectors of the population, without distinction of areas, through the entire network of pharmacy offices in the province, which an important impact on health is achieved on dietary habits and healthy living in the population.

The use of communication technologies for this campaign, through the collegiate website, facilitated the participation of pharmacists, as well as the collection and statistical treatment of the data obtained.

Although the participation of children has not been randomized, but voluntary and channeled through the pharmacies, a large population sample has been achieved. Data from 93.1% of municipalities in the province were collected. According to the latest data from the National Statistics Institute of 2015 [14], the province of Cádiz has a child population between 5 and 14 years of 143,986 inhabitants. The sample size adjusted to the losses to determine the weight overload in this population would be around 1,135 children (95% CI and 3% accuracy) [22]. The sample obtained in our study was 3,809 children.

The incidence of low weight has had little significance (0.2%) and is mainly concentrated in the age range of 5 - 7 years.

The results of the analysis of the overweight and obesity data are shown in figures 3 to 5.

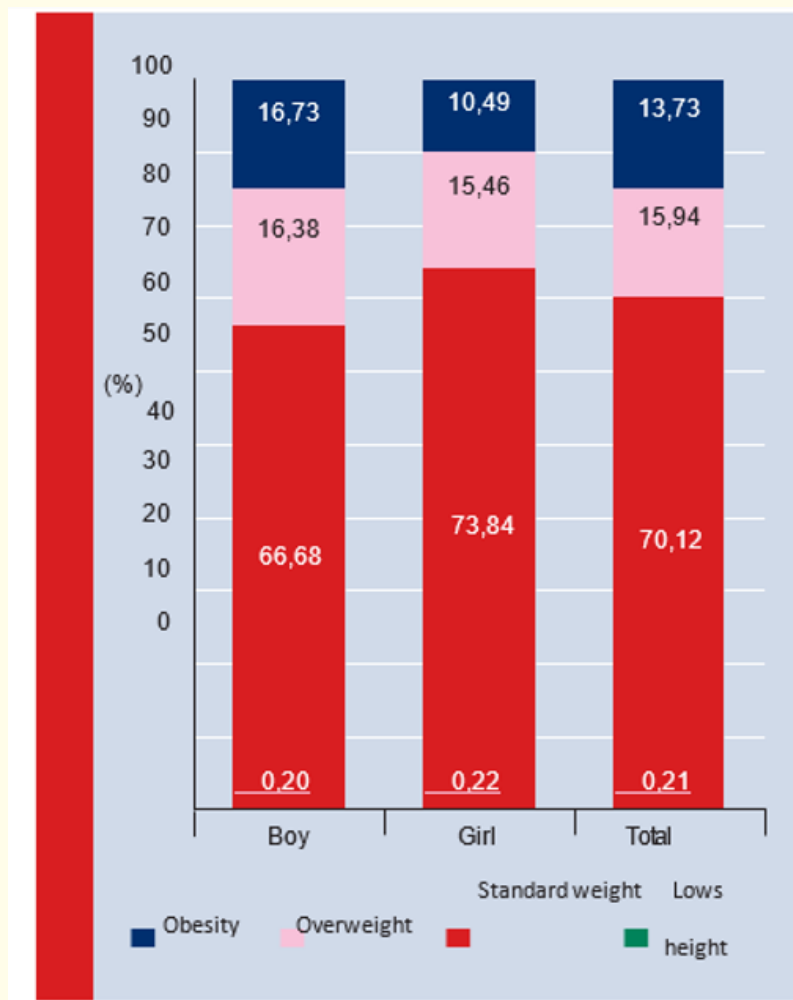


Figure 3: Sex weight situation.



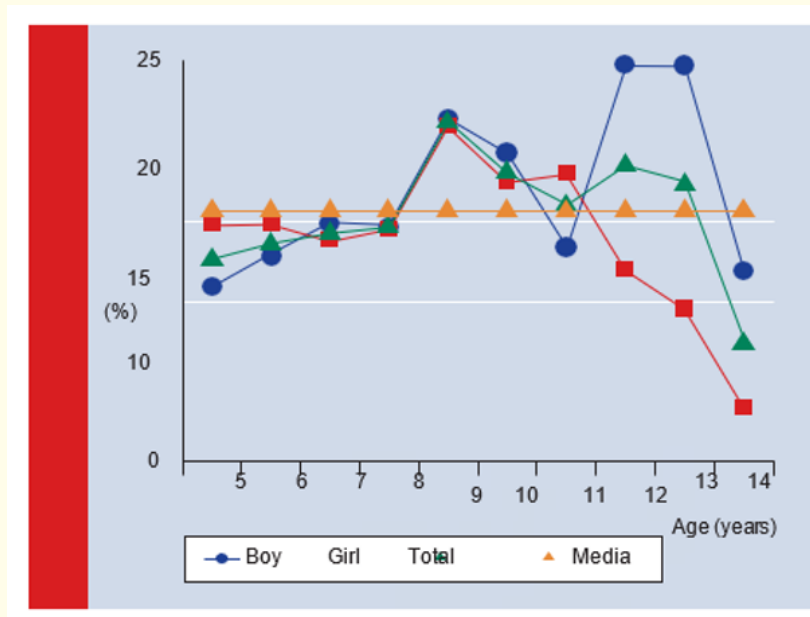


Figure 4: Percentage of overweight by age and sex.

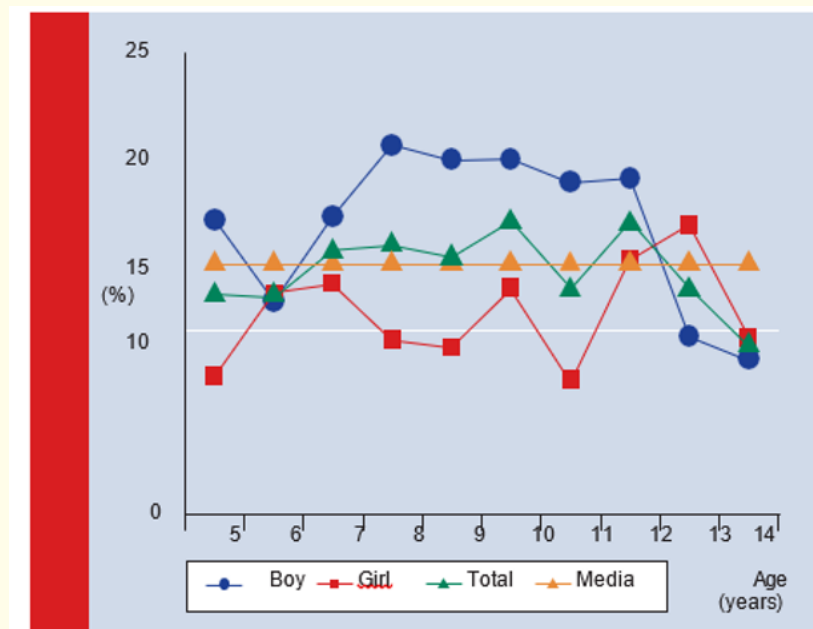


Figure 5: Percentage of obesity by age and sex.

We observe that, in children, the average value of overweight and obesity is similar (16.38 and 16.73%, respectively), but above the average of the general population (15.94 versus 13.73%), although obesity is 3 points above. Therefore, this difference is also reflected in excess weight (33.11%).

For girls, the average values of overweight are higher than those of obesity (15.46 versus 10.49%); Overweight is similar to the total average value (15.94%) and obesity approximately 3 points lower (13.73%). Therefore, this difference is also reflected in excess weight (29.67%). When we analyze the frequencies of overweight and obesity in boys and girls and by age, we observe in the general population a greater difference between 12 and 14 years.

The overweight values are above the average in the range of 9 - 13 years, and those of obesity in the range of 7 - 12 years.

The maximum values are also higher in overweight than in obesity, with a greater difference between both (3 and 5 points) at the ages of 8 and 12 years (maximum overweight at 9 years and obesity at age 10).

The maximum excess weight is over 35% (between 9 and 12 years old).

In general, both in total and by sex groups (boys and girls), the lowest values in overweight, obesity and excess weight corresponded to the age of 14 years.

### Obesity and alteration of blood pressure

The diagnosis of hypertension should be based on several BP measurements made in the consultation on different occasions. When dealing with a health campaign in this case, a single BP measure was carried out. The isolated intake of BP does not have sufficient clinical significance, but, on the contrary, it is an indicator of screening and can be important as an alert. In our sample, the percentage of  $\geq 97$  percentile children with systolic BP and/or diastolic BP levels above the reference values was 54.22%. In relation to the data reflected in other studies [23], they are very high results and, given their importance, more studies would be necessary.

After comparing in this population the BMI of boys and girls with BP figures higher or adjusted to the reference values for their age range, the average BMI of the first group was higher, with a statistically significant difference (26.05 vs. 25.21;  $p = 0.038$ ) with respect to the second group. When comparing these values by age, using the two-way ANOVA test, the difference was also statistically.

### enKid 1998 - 2000, ALADINO 2015 and PySI 2016. Population of children aged 6 - 9 years

significant, with a level of significance  $< 5\%$ . That is, boys and girls who had high BP values also had a higher BMI.

Comparison with other studies: overweight, obesity and excess weight (Figure 6).

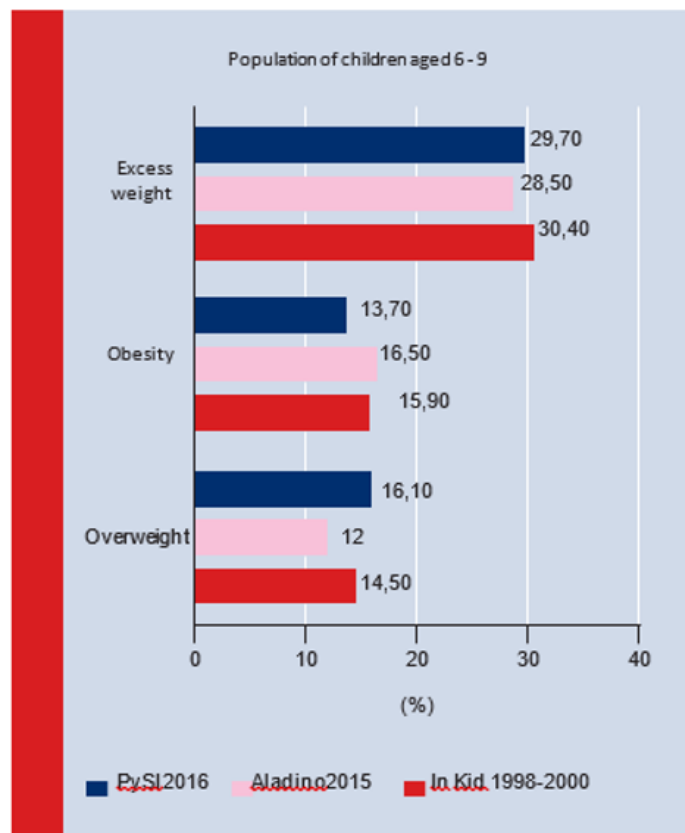
### PySI Cádiz versus enKid (1998 - 2000) [13]

The study in Kid was carried out in the Spanish population between 1998 and 2000, on a sample of 3,534 people (1,629 men and 1,905 women) aged between 2 and 24 years. Data on the prevalence of excess weight (overweight and obesity) of 26.3% (12.4% overweight and 13.9% obesity) were obtained. In this same study, the data on the prevalence in Andalusia were 29.4, 13.8 and 15.6%, respectively.

The study in Kid was important, as it showed the increase in the prevalence of childhood obesity in Spain between 1984 and 1998.

In our study, and for a population of 5 - 14 years of age, these values are 30.62% for excess weight, 16.89% for overweight and 13.73% for obesity.

In order to establish a better parallel between the two studies, we compare the values of overweight, obesity and excess weight for the same age range of the population, and based on the data published in the enKid, we choose the ranges of 6 - 9 and 10 - 13 years, in total and by sex.



**Figure 6:** Comparison chart between studies in Kid 1998 - 2000, ALADINO 2015 and PySI 2016. Population of children aged 6 - 9 years.

When comparing both studies, and for the total population of the same age range (6 - 9 years), excess weight is similar in both (30.4% in EnKid and 29.7% in PySI); however, the overweight and obesity data are practically inverted (14.5/16.1 and 15.9/13.9%, respectively). That is, in enKid obesity is greater and in the PySI is overweight.

By sex, in children aged 6 - 9 years, overweight is similar in both studies (16% in enKid and 15.8% in PySI), but obesity is lower in PySI (16.5 versus to 21.7%). The opposite is true in girls: obesity is similar (9.8% in EnKid and 10.6% in PySI), while overweight is higher in PySI (from 16.3 to 13.10%).

When we compare the age range of 10 - 13 years in the total population, excess weight is higher in PySI than in enKid, with a greater difference for overweight in PySI (approximately 5 points).

By sex, in children 10 - 13 years old, a lower percentage of obesity in the PySI should be noted, with a difference of 4 points compared to enKid. Excess weight is lower in the PySI (38.9% vs. 41.9%).

In girls, we highlight that overweight is almost double in PySI than in enKid (17.3 vs. 9.10%), and excess weight is greater in PySI (28.4 versus 20%).

### PySI Cádiz vs. ALADINO 2015 [2]

The Study of Food, Physical Activity, Child Development and Obesity (ALADINO) is an initiative of the Spanish Agency for Consumption, Food Security and Nutrition (AECOSAN) of the Ministry of Health, Social Services and Equality, within the Strategy NAOS for obesity prevention that began in 2005.

Several ALADINO studies have been carried out in several years. In 2015, a total of 10,899 children (5,532 boys and 5,367 girls) aged 6 - 9 years were studied in 165 schools in 19 autonomous communities. Data on the prevalence of excess weight of 28.5%, overweight of 12% and obesity of 16.5% were obtained (criteria of the Fundación Faustino Orbegozo).

In the same way as in the previous case, in order to establish a better parallel between these studies, we compare the values of overweight, obesity and excess weight for the same age range of the population, and based on the data published from the ALADINO 2015 study, we choose the range of 6-9 years, in total and by sex.

In the total, when comparing the results of the PySI with those of the Aladino 2015 study, excess weight is similar in both, although somewhat lower in the second (28.5%). However, as in the comparison with enKid, the overweight and obesity data are almost inverted (12/16.1 and 16.5/13.7%, respectively). That is, in ALADINO obesity is greater and in the PySI is overweight.

By sex, in children, excess weight is lower in ALADINO 2015 than in PySI (30.3% compared to 32.4%), but overweight is higher in PySI (15.8% compared to 11, 8%) and obesity is higher in ALADINO (18.5% compared to 16.5%). In girls, excess weight is similar in ALADINO 2015 and PySI (26.6% compared to 26.9%) and, as in boys, overweight is higher in PySI (16, 3 to 12.1%) and obesity is higher in ALADINO (14.5% vs. 10.6%).

### Conclusion

The community pharmacy is an ideal space to be able to develop health promotion campaigns, both for its geographical distribution and for its proximity and easy access for the population.

The PySI study, to date the only specific trial that provides data on the weight situation of the child population in the province of Cádiz, shows that in the children sample studied, excess weight affects almost 1 in 3 children the province, and that the prevalence, both of excess weight and obesity, is higher in boys than in girls.

In the comparison of PySI with the studies in Kid and ALADINO 2015, the data obtained from weight overload in children 6 - 9 years of age are similar.

With respect to obesity and CVR, regarding the anthropometric indicators analyzed in this study and their association with BP levels, it is observed that there is a relationship between BMI and BP values, since Children with BP figures higher than those of reference have the highest BMI values. Given the importance of the subject, this study raises the need to deepen the surveillance and prevention of CVR in the child population through new health campaigns in pharmacy offices.

The prevention of overweight and childhood obesity should be one of the priority objectives of public health in our community, due to its impact on possible diseases in adulthood.

We also highlight the essential role of the pharmacist as a health agent that guarantees the promotion of healthy lifestyle habits and the detection of possible health problems in the population.

## Thanks

To all the participants in the PySI campaign, children, parents and pharmacists from the province of Cádiz, to the COFCA staff, and to all the people who have collaborated and made this work possible.

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**Volume 9 Issue 8 August 2020**

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