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Parental Perception of Their Children's Weight Status

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PERCEÇÃO PARENTAL DO ESTADO DO PESO DOS FILHOS

Parental Perception of their Children's Weight Status

Faculdade de Ciências da Nutrição da Universidade do Porto

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Ao iniciar um grande trabalho

Você não pode querer terminar tudo de uma vez;

Portanto siga em frente,

E não deixe que nada o desanime

Até terminar tudo o que começou (...)

Quanto a mim, prometo prosseguir,

E mesmo quando ventos contrários sopram com força no meu rosto,

Continuarei em frente sem olhar para trás

E seguirei adiante até terminar.

Teedyuscung

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Resumo

Fundamentação e objetivos: Em Portugal, o conhecimento sobre os fatores que podem levar o progenitor a classificar erroneamente a categoria do peso do seu filho é escasso. Os objetivos deste estudo foram estudar a percepção parental do estado do peso dos seus filhos e os fatores que a influenciam, assim como, as atitudes parentais em relação ao peso e à saúde.

Métodos: Foram recolhidos dados de 568 estudantes da cidade de Chaves, com idades entre 6 e 18 anos. Efetuou-se a avaliação antropométrica do peso e da altura de todas as crianças. Foi entregue aos progenitores um questionário sobre a percepção da categoria de peso da criança, crenças sobre a saúde, hábitos alimentares e de exercício físico da criança e sobre a informação antropométrica da família (auto-reportada). Obtiveram-se dados de 424 mães e de 398 pais. Foram utilizadas as curvas do CDC para classificação do percentil de IMC das crianças.

Resultados: Verificou-se que 33,2% dos progenitores classificaram erradamente a categoria de peso da criança. Os principais fatores relacionados com a classificação errónea foram a presença de excesso de peso nas mães (OR: 4,08 IC a 95% 1,59-10,39), e nas crianças; a idade (OR: 0,80 IC a 95%: 0,68-0,95), a presença de excesso de peso (OR: 122,34 IC: 38,64-387,36) e obesidade (OR: 13,62 IC: 4,88-38,02). Cerca de um quarto (24,9%) dos progenitores referiram que não existia nenhuma relação entre peso e saúde, no entanto, a totalidade respondeu que existia uma relação entre alimentação e saúde.

Conclusões: Um terço progenitores não reconhecem a categoria de peso da criança, sendo esta percepção errónea maior nas crianças mais jovens. Os fatores relacionados com a percepção errónea do peso foram, a presença de excesso de peso e de um baixo nível educacional nas mães e o excesso de peso e obesidade nas crianças.

Palavras-Chave: percepção, pais, pediatria, peso, crianças

Summary

Background and aims: In Portugal the knowledge about the factors that can lead the progenitor's to misclassify their offspring's weight status is scarce. The aim of this study was to investigate the parental perception of weight status of their offsprings and related factors as well as analyze the parent's attitudes towards the relation between weight and health.

Methods: Data was collected from 568 school children aged 6 to 18 years in the city of Chaves. Weight and height of all the children were measured. A questionnaire was delivered for the parents to complete about their child's weight status and perception, health beliefs, eating habits, exercise habits, family anthropometric information (self-reported). Information from 424 mothers and 398 fathers was retrieved. The CDC growth charts were used to classify the children's BMI percentile.

Results: It was verified that 33.2% of the parents classified their child's weight status incorrectly. The major factors related with the misclassification were the presence of overweight in the mothers (OR: 4.08 95% CI: 1.59- 10.39), the child's age (OR: 0.8 95% CI: 0.68-0.95), overweight (OR: 122.34 95% CI: 38.64-387.36) or obesity (OR: 13.62 95% CI: 4.88-38.02). Circa one quarter of the progenitors (24.9%) referred that there was no association between weight and health but the totality answered that there was a relation between food and health.

Conclusions: One third of the progenitors do not recognize their child's weight status being the misperception higher in younger children. The factors that were related with misclassification were the presence in the mothers of overweight and their low educational level and the child's overweight or obesity status.

Keywords: perception, parents, pediatric, weight, children

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List of Acronyms and Abbreviations

World Health Organization (WHO)

International Obesity Task Force (IOTF)

Body Mass Index (BMI)

Centers for Disease Control and Prevention (CDC)

Statistical Package for Social Sciences (SPSS)

Interquartile range (IQR)

Odds ratio (OR)

Confidence Interval (CI)

General Practitioner (GP)

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Introduction

In modern society there is a crescent epidemic of obesity across all age groups being one of the most common diseases during infancy. It is a worldwide public health problem that affects all socio-economic classes.^{1,2}

In the last five decades many has been done to improve childhood health conditions thus this has not been the case in childhood overweight and obesity, which have spread widely around the globe affecting children in rich and poor countries, and are one of the world's most critical health issues nowadays.³

Since the 1970's there has been approximately 5% increase per decade of childhood obesity in developed countries.⁴ In Portugal the prevalence of this condition has escalated in the last decades,⁵⁻⁹ being observed in a sample of 5,511 children (ages ranging from 7 to 9), using the International Obesity Task Force cutoffs (IOTF), a prevalence of overweight between 19.1 and 21.4% and obesity being between 10.2 and 12.3%, respectively, for boys and girls⁵. A more recent study, published in 2013, involving 26,217 students, aged between 10 and 16 in Algarve region, has shown that 20.7% were considered overweight and 10.9% obese according to World Health Organization (WHO) classification.¹⁰ Lopes *et al.* using the same methodology in a group of 499 children, aged between 9 and 12, of the 4th grade showed a prevalence of 27.1% of overweight and 5.9% of obesity in boys and 24% and 8% respectively in girls.¹¹ These findings have lead to a raise of concern among public health authorities.^{3,4,12}

A better understanding of differences between normal weight and overweight/obese children's lifestyle characteristics is needed to reduce the negative behavioral and health effects of excessive weight in childhood.¹⁻³

Early childhood weight and nutritional status are broad indicators of health and several factors seem to contribute to overweight and obesity, namely the genetic predispositions, cultural and populational vectors, the authoritarian and restrictive parental styles, diet and exercise patterns, among others.¹⁻³. It is well recognized that since the last half of the 20th century towards nowadays the intake of caloric dense and nutritionally poor food rich in fat and sugar and deprived of vitamins, fiber and minerals has increased exponentially.^{2,6,11}

A child's eating behavior is strongly influenced by the family environment including parents eating habits and child feeding practices. On one hand parents foster the conditions that may lead to the development of healthy eating behaviors and weight, on the other they may promote aspects of chaotic and disordered eating inducing overweight and obesity in their offsprings.¹⁴ There is substantial evidence of bidirectional interactions between parenting, the diet and weight status of the children.^{13,14} Over-control of the offering of rewards and provision of nutrition information to their offspring's also appears to have negative effects on food preferences and patterns. Coercive and restrictive feeding practices have a negative impact on children's weight increasing the prevalence of obesity.^{13,14} These factors, paired with a rise of sedentary life style in which the children spend most of their days sitting in classrooms or at home in front of a screen, has lead to an almost uncontrollable overweight and obesity epidemic.^{2,12-15}

In children and adolescents the high rates of overweight and obesity are associated with several short and long term health consequences both medical and psychological like metabolic syndrome, orthopedic problems, non-alcoholic fatty liver disease, hormonal imbalances, obstructive sleep apnea syndrome, low self-esteem, internalizing and externalizing disorders and social stigmatization, among others.¹⁶ All of these comorbidities, many of them chronic, need medical treatment, which will lead to an unsustainable economical impact in healthcare in the next decades.^{1,2} In Portugal, it was estimated, in 1999, that the economic burden directly related to obesity represents 3.5% of total health expenses.⁶ Pediatric obesity usually perpetuates into adulthood and body mass index becomes more or less stable during adolescence.¹ The identification and treatment of pediatric overweight and obesity in an early stage is essential to the prevention of future complications.^{1,2,11}

The establishment of an adequate interventional program to address pediatric obesity should have into account the most effective interventions in prevention and treatment.^{1-3, 11-13} The continuous motivation to lose weight requires the mobilization of social support mechanisms, mainly at the family level. The interest in the key role that parents play in the development of obesity inducing eating habits in their offspring has been increasing worldwide.¹¹ Several studies show the relation between family environment and parental attitudes with

childhood obesity, being the latter ones the main factor in the development of healthy or unhealthy lifestyles.^{11-12,17,18} The active participation of the parents to the prevention and treatment of childhood overweight and obesity is the key in any successful nutritional and behavior intervention.^{2-4,11,12} The enrollment of parents in these interventions requires that they recognize that their offspring are overweight or obese. Golan *et al.*¹⁵ suggest that strategies to treat these conditions should always involve the parents who should be educated about healthy lifestyles, weight management and parental attitudes towards feeding and eating practices. It seems unlikely that parents take any action if their child's weight status is not considered problematic.^{2,3,18-22}

A number of studies have investigated the ability of parents to correctly categorize their child's weight status showing a high prevalence of misperception and a large variability in the factors that can contribute to an incorrect perception, probably due to populational specificities.^{1,3,12,17-31} Several aspects seem to influence the parents ability to classify their children's weight such as gender, age, body weight and educational level.^{11,31-37} This misinterpretation can also lead to a distortion of the family eating habits, physical activity levels and leisure time activities.⁶⁻¹⁴ Although there is a growing body of information, there is no clear evidence of the factors that influence the misperception of weight status when a child is overweight or obese.¹

To this day most of the studies about parental perception were conducted in the United States of America, Australia, the United Kingdom and some in Latin America.^{1,3,12,17-37} According to recent meta-analysis little data is available about southern Europe Countries, being one study done in Greece, one other in Italy and only one in Portugal.^{21, 28} Most of these countries have different social and cultural backgrounds being necessary more research, within the Portuguese population, to know if the associations found can be generalized. Nearly all of the research has been focused on children under the age of 12.^{21, 28} Most of these studies focused mainly on self-reported weight, the weight of the child and not the parents. Moreover, they have accessed the parental perceptions on overweight and obese children without considering how parents of normal children perceived their weight status.^{1, 2, 21, 28}

The importance of parental perception is of equal value in older children as they start to gain more independence and control over their eating habits and the

incidence of overweight and obesity continues to rise during teenage years.¹ Though there is high prevalence of obesity in Portugal, to our knowledge, there is only one published paper that investigated pre-adolescents (9-12 years old). In this study overweight and obese categories were merged and only maternal perception was studied. The researchers have importantly observed that 65.2% of underweight children and 61.6% of overweight/obese children were misclassified by their mothers.³⁸

There is no direct evidence that an increase of parents recognition of their offspring weight and health problems that can arise from a high body weight can lead to an increase of treatment efficacy. Nevertheless, there is evidence for children and adolescents that when parents are aware of the risk behaviors it can lead to its prevention.^{3, 12-15} This reinforces the utility of improving the knowledge about factors related to a good parental perception of their offspring weight status. To date, data about the awareness that parents have about the relation between weight and health and if that consciousness improves their perception of their child's weight is missing in Portugal.

To create and implement adequate programs to prevent and treat obesity in the Portuguese population it is important to improve the knowledge about the variables that can influence the perception of weight. It will be also important to evaluate if the parents recognize the relation of weight with health and what is the importance that they give to healthy eating. Furthermore, the knowledge about factors like the child weight or age can have any relation with the non response to the questionnaires, will be of major relevance.

Aims

With this research we seek to describe the parental perception of weight status of their offspring's and the related factors. Further objectives were to analyze the prevalence of overweight and obesity within the family, to analyze the parent's attitudes towards the relation of weight and health and to study factors related to non-response of the questionnaires applied to the progenitors.

Subjects and Methods

The cross-sectional data for the present study was collected between September of 2009 to June of 2010, on four public school groups of the city of Chaves which agreed to enroll the study, the “*Agrupamentos Nadir Afonso, Júlio Martins, de Vidago and Francisco Carneiro*”.

Schools were enrolled on a convenience base since they were already followed by the health school team of the local health center. No intervention regarding weight management and awareness had been done previously in these schools.

The children and their parents were invited to participate if the head teacher of the class agreed to be responsible to deliver and collect back the questionnaires. A written explanation form with the aims and study procedures and a form for informed consent were given to the parents and children over 12 years of age. For children under 12 the explanation was only given to the parents and their informed consent was requested. The following classes were enrolled in this study: three classes from the 1st grade (n=63), two classes from the 2nd grade (n= 51), ten classes from the 5th grade (n=225), six classes from the 7th grade (n=118) and six classes from the 10th grade (n= 111).

Exclusion criteria were defined as the existence of any comorbidity that leads to immobility or muscle wasting, known secondary obesity (obesity due to endocrine or other systemic disease), refuse of the children to participate and lack of informed consent. The caregiver informed consent was obtained prior to the start of all study procedures. All students whose parents agreed to take part in the study were asked if they would like to participate and they were also informed about the right to refuse to engage in the study or to give up at any moment.

A total of 589 children and their caregivers were sampled and invited to participate. Of these, 21 were excluded from assessment, because 6 children refused to undergo anthropometric assessment and 15 did not bring the signed informed consent. Of the 568 children evaluated, 63 were from 1st grade, 51 from 2nd grade, 225 from 5th grade, 118 from 7th grade and 111 from 10th grade, with ages ranging from 6 to 18.

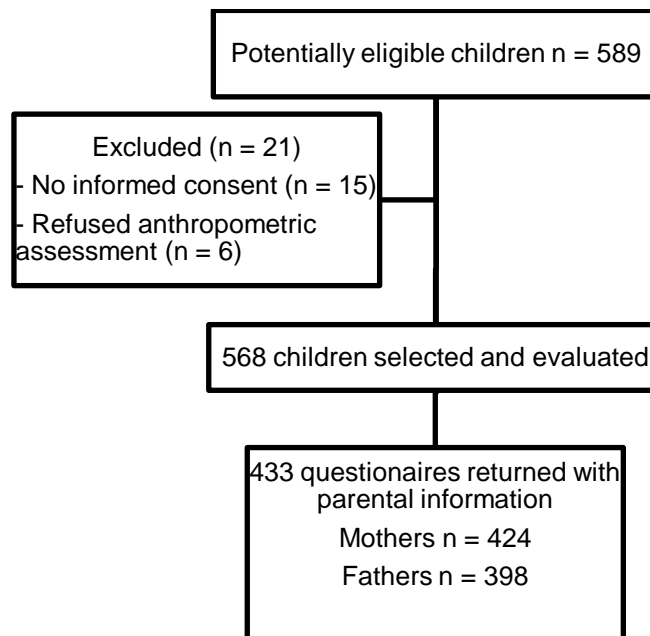


Figure 1. Flow chart of the selection of the sample of the study

Anthropometric Measurements

The anthropometric assessment was performed by the school health education team of the Health Center Chaves 1 composed by one nutritionist, specialized in clinical nutrition, and two nurses, one specialized in children's health and the other in community health, during regular scheduled physical education classes. The nurses received training on weight and height assessment as well on the remaining study protocol. Detailed information about the theoretical background and how to retrieve the data was provided to the nurses and all the procedures were rehearsed previously to data collection.

Anthropometrical parameters were assessed according to standardized procedures with the participants using light clothing, without shoes.³⁹ Children stood with their arms relaxed, in a neutral position.³⁹ Body weight was evaluated twice to the nearest 0.1Kg using a calibrated Seca® scale, on stable ground, and the average was analyzed. The height was measured with a Seca® stadiometer to the nearest 0.1cm with the head positioned according to the Frankfort horizontal plan.^(39, 40) Body mass index (BMI) was calculated as body weight (Kg) divided by height (m), squared. Children's weight was classified according to BMI percentile charts for age and gender of the Centers for Disease and Control Prevention (CDC) 2000⁽⁴¹⁾, the ones that were used at the date in the child Portuguese health bulletin, as following: underweight: BMI<5th, normal weight: BMI≥5th to < 85th,

overweight: BMI \geq 85th to < 95th and Obese: BMI \geq 95th. The software HealthWatch Pro 5.0. BVTech, 2013 was used to calculate the BMI percentiles.⁴²

Paternal and maternal weight and height were self-reported, from which the parent's BMI was calculated and classified according to WHO categories, being considered <18.5 Kg/m², underweight; \geq 18.5-24.9 Kg/m², normal weight; \geq 25.0-29.9 Kg/m², overweight and \geq 30 Kg/m², obese.⁴⁰ A family history of overweight or obesity was acknowledged as positive if one of the progenitors or the child were classified as obese by BMI category and percentile respectively, or if the parents reported in the questionnaire that they had someone in the family (this included themselves, their children and relatives) with overweight or obesity history.

Parents Questionnaire

On the same day of the anthropometric assessment a questionnaire in a closed envelope was given to the children and they were asked to deliver it to their parents. The parent responsible for the child education was asked to complete it. The questionnaire aimed to appraise several child and parental variables, divided in the following sections:

- Information regarding the child, including weight and height reported by the parents, physical activity, daily media usage, eating habits;
- Parental characterization: age, gender, weight, height, literacy level (number of completed school education years), occupation, number of people living in the household, relationship with to the child, opinion on weight and health beliefs, prevalence of overweight and obesity in the family;
- Parental perception of their child's weight with the question "do you think your child's weight status is: low, normal or excessive for their age".

The parents were considered to have a correct perception of weight if the status that they reported corresponded to the child's BMI percentile classification according to the growth charts on Portuguese childhood health bulletins

Statistical Analysis

The Statistical Package for Social Sciences (SPSS v. 20.0) of IBM corporation for Windows 7 was used for data processing and analysis. Normality of distributions was assessed by Shapiro-Wilk test. Simple descriptive statistic tests were conducted with frequency and percentage for categorical variables. For continuous variables median and interquartile range (IQR) were calculated.

We used bivariable associations using chi-square tests for categorical variables. For non dichotomic variables Kruskal-Wallis was used to test the differences between children age groups. Logistic regression was used to investigate the factors associated to misperception of weight status of the child by their parents.

Due to the low number of children who were underweight, underweight and normal weight children were considered in one category and the same was done for the parents.

Significance was considered when $p < 0.05$.

Results

We retrieved 433 questionnaires of the 568 delivered which corresponds to a 76.2% response rate. It was verified that there was no statistical difference between the gender, weight, height, percentile and percentile category of the children that returned the parental questionnaire *versus* those who did not ($p>0.05$), although the response rate from parents of older children was lower ($p<0.001$). The majority of the parent's questionnaires were completed by the mother (85.5%).

The characteristics of the children are presented in Table1. Participants were 56.9% male and 41.1% female; with age ranging from 6 to 18 years old and 98% lived with both of their biological parents. The majority of them presented a normal percentile of BMI, 61.3% ($n=348$), but 22.2% ($n=126$) were overweight and 15.1% were obese. Among the 6-8 year old group there was a higher prevalence of obesity (27.7%) compared to the group 9-13 (12.8%) and 14-18 group (10.1%) ($p<0.001$). Most of the children, (52.9%), did not have any programmed physical activity outside school, and they spent an average of 2.08 ± 1.32 hours watching and engaging with digital media activities such as television, personal computer, tablets and cell phones (Table1).

The anthropometric data of 359 fathers and 395 mothers were obtained (Table 2); 53.7% of the fathers were classified as overweight and 10.6% were obese. Most of the mothers (56.5%) reported having a normal weight, 31.9% were overweight and 9.9% were obese. A high percentage of fathers (56.3%) and of the mothers (42.6%) had a literacy level bellow 6 years and only 4.6% of the fathers and 10.7% of the mothers had completed a university degree (Table 2).

Table 1: Characteristics of the children (n= 568) by the child's age group.

Children Characteristics	Total (n=568)	Ages 6-8 (n=112)	Ages 9-13 (n=327)	Ages 14-18 (n=129)	p
Gender (%)					0.880
Males	56.9	58.0	56.0	58.1	
Females	41.1	42.0	44.0	41.9	
Weight (kg), median (IQR)	43.9 (23.9)	27.5 (9.0)	43.0 (15.3)	64.0 (17.5)	<0.001
Males	42.0 (26.5)	26.0 (9.0)	41.9 (14.9)	70.0 (18.0)	
Females	45.0 (20.2)	29.5 (8.0)	45.0 (15.8)	59.0 (12.5)	
Height (cm), median (IQR)	150.0 (24.0)	123.0 (10.5)	149.0 (14.0)	171.0 (12.0)	<0.001
Males	148.0 (28.0)	122.5 (10.9)	148.0 (12.0)	174.0 (9.0)	
Females	151.0 (20.5)	124.0 (9.5)	150.0 (13.8)	164.0 (11.2)	
BMI (kg/m²), median (IQR)	19.6 (4.8)	17.8 (3.5)	19.2 (3.5)	22.6 (4.4)	<0.001
Males	19.4 (5.4)	17.4 (2.9)	18.9 (4.3)	23.3 (4.6)	
Females	19.8 (4.1)	18.9 (4.3)	19.7 (4.2)	21.4 (4.4)	
BMI category (%)					<0.001
Underweight	1.4	-	2.1	0.8	
Normal	61.3	46.4	64.2	66.7	
Overweight	22.2	25.9	20.8	22.5	
Obesity	15.1	27.7	12.8	10.1	
Caregiver (%)*					0.044
Mother (n=353)	83.1	91.2	81.9	76.6	
Father (n=58)	13.6	4.4	15.2	20.3	
Other (n=14)	3.3	4.4	3.0	3.1	
Parents weight status perception (%) *					0.410
Underweight	6.9	7.5	6.9	6.2	
Normal	79.4	83.9	78.8	78.1	
Excessive	13.2	8.6	14.2	15.6	
Accuracy of parents weight status perception (%)*					<0.001
Correct	66.8	45.2	72.6	73.4	
Incorrect	33.2	54.8	27.4	26.6	
Excessive weight within the family members (%)*					0.536
Yes	34.3	29.7	35.2	37.5	
No	65.7	70.3	64.8	62.5	
Physical activity (%)*					<0.001
Yes	47.1	21.7	53.5	56.3	
No	52.9	78.3	46.5	56.2	
Daily TV/ videogame/ computer use *	2.08 (1.32)	1.69 (0.81)	2.11 (1.37)	2.47 (1.55)	0.009
Regular visits to the general practitioner (%) *					0.385
Yes	87.3	91.2	86.7	84.1	
No	12.7	8.8	13.3	15.9	
Fruit intake (number of pieces per day), median (IQR)*	1.4 (1.26)	1.5 (1.16)	1.4 (1.14)	1.4 (1.51)	0.441
Vegetables on the plate (number of times/day), median (IQR) *	0.6 (0.83)	0.5 (0.81)	0.6 (0.80)	0.9 (0.85)	0.059
Vegetable soup (number of times per day), median (IQR) *	0.9(0.77)	1.1(0.79)	0.6 (0.75)	0.5 (0.66)	<0.001

* Data from 425 questionnaires returned and completed by parents.

Parental Perceptions

Overall, 33.2% of the parents misclassified their child's weight status, 32.1% of the children were classified as belonging to a lower BMI category than the actual the case, and only 7 children were placed into a higher category. Younger children's parents were less likely to perceive correctly their child weight status, as more than half the parents (54.8%) of the children from 6 to 8 years of age classified they weight in the incorrect category ($p < 0.001$) (Table 2).

Though 65.7% of the parents referred that there were no overweight or obesity cases in their family still it was verified that amongst 70.4% of the children at least one of the parents was overweight or obese (Table 2).

Although all of the parents recognized that there was a relation between health and nutrition, 24.9% of the progenitors referred that there was no relation between weight and health ($n=273$) (Table 2). Most parents (79.4%) classified their child as being normal weight but a small number of parents, 13.2% classified their child as having excessive weight and only 6.96% reported low weight.

Table 2: Characteristics of the parents (n=425) by the child's age group

Parents characteristics by child's age	Total (n=568)	Ages 6-8 (n=112)	Ages 9-13 (n=327)	Ages 14-18 (n=129)	<i>p</i>
Age (years), median (IQR)					
Fathers (n= 398)	43.0 (9.0)	38.0 (9.5)	43.0 (7.0)	47.0 (9.2)	<0.001
Mothers (n=424)	44.0 (8.0)	36.0 (8.0)	40.0 (7.0)	44.0 (7.0)	<0.001
Weight (kg), median (IQR)					
Fathers (n= 363)	77.0 (11.0)	75.5 (8.8)	75.5 (12.0)	80.0 (10.5)	0.225
Mothers (n=402)	62.5 (13.2)	60.0 (14.0)	62.5 (13.2)	66.0 (15.0)	0.097
Height (cm), median (IQR)					
Fathers (n= 361)	172.0 (9.0)	173.0 (6.8)	171.0 (10.0)	173.5 (13.2)	0.369
Mothers (n= 399)	161.0 (7.0)	163.0 (7.0)	160.0 (7.0)	160.0 (8.0)	0.155
BMI (kg/m²), median (IQR)					
Fathers (n=359)	25.9 (3.8)	25.9 (4.3)	25.8 (3.8)	26.2 (4.0)	0.268
Mothers (n=395)	24.2 (5.3)	23.4 (4.5)	24.2 (5.2)	25.4 (5.4)	0.022
BMI category (%)					
<i>Fathers (n=359)</i>					
Underweight	0.6	1.2	0.4	0.0	0.872
Normal weight	35.7	39.5	35.1	32.0	
Overweight	53.8	49.4	53.9	60.0	
Obese	10.6	9.9	10.5	8.0	
<i>Mothers (n=395)</i>					
Underweight	1.8	2.3	2.0	0.0	0.282
Normal weight	56.5	64.0	55.9	47.3	
Overweight	31.9	29.1	31.1	40.0	
Obese	9.9	4.7	11.0	12.7	
Fathers education (n=394), Number of years, median (IQR)					
≤ 4 years (%)	6.0 (5.0)	6.0 (5.0)	6.0 (5.0)	4.0 (4.0)	0.004
5-9 years (%)	32.5	29.5	28.2	55.2	
10-12 years (%)	47.7	50.0	51.2	29.3	
> 12 years (%)	14.7	14.8	15.3	12.1	
	5.1	5.7	5.2	3.4	
Mothers education (n=418) Number of years, median (IQR)					
≤ 4 years (%)	9.0 (6)	9.0 (6)	9.0 (6)	6.0 (7)	0.051
5-9 years (%)	19.9	15.6	17.6	36.1	
10-12 years (%)	44.7	46.7	45.7	37.7	
> 12 years (%)	23.2	24.4	24.1	18.0	
	12.2	13.3	12.7	8.2	
Association between health and weight (n=273) (%)					0.030
Yes	75.1	85.9	73.6	62.9	
No	24.9	14.1	26.4	37.1	
Association between food and health (n=432)					
Yes (%)	100	100	100	100	

The misperception of children BMI category according to child and parents characteristics was explored using bivariable analysis (Table 3). The BMI category of the child was a major contributor for the risk of misperception by their progenitors, being higher in the overweight child (OR: 46.43, 95% CI: 23.51-91.69) than in obese child (OR: 9.32, 95% CI: 5.06-17.19), compared to the normal weight child. Overweight mothers showed an increased risk of underestimating their child's BMI category (OR: 1.82, 95% CI: 1.15-2.87) (Table 3).

Table 3: Risk of misperception of weight status by child and parents characteristics

Characteristics	Incorrect % (n)	Correct % (n)	Odds ratio	95% CI	P
Gender of the child					
Male	58.0 (83)	51.4 (148)	1		
Female	42.0 (60)	48.6 (140)	1.19	0.51-1.15	0.193
Relation between health and weight					
Yes	72.4 (71)	77.2 (132)	1		
No	27.0 (27)	22.8 (39)	1.29	0.73-2.28	0.385
Regular visits to the general practitioner					
Yes	85.0 (119)	88.6 (248)	1		
No	15.0 (21)	11.4 (32)	2.47	0.66-9.29	0.181
Excessive weight within the family members					
No	61.9 (86)	67.1 (190)	1		
Yes	38.1 (53)	32.9 (93)	1.26	0.83-1.91	0.285
Daily TV/ videogame/ computer use					
≤1.5h	39.7 (54)	39.5 (107)	1		
≥2h	60.3 (829)	60.5 (164)	0.99	0.65-1.51	0.965
Physical activity (%)					
Yes	40.7 (57)	50.9 (144)	1		
No	59.6 (84)	40.9 (139)	1.53	1.01-2.29	0.043
Children BMI category					
Under or normal weight	18.9 (27)	82.6 (238)	1		
Overweight	55.2 (79)	5.2 (15)	46.43	23.51-91.69	<0.001
Obese	25.9 (37)	12.2 (35)	9.33	5.06-17.19	<0.001
Fathers BMI category					
Under or normal weight	33.9 (39)	37.2 (90)	1		
Overweight	57.4 (66)	52.5 (127)	1.19	0.74-1.94	0.457
Obese	8.7 (10)	10.3 (25)	0.92	0.21-2.10	0.844
Mothers BMI category					
Under or normal weight	50.8 (66)	62.0 (163)	1		
Overweight	40.8 (53)	27.4 (72)	1.82	1.15-2.87	0.010
Obese	8.5 (11)	10.6 (28)	0.97	0.46-2.10	0.937

continued

Table 3 (continued)

Characteristics	Incorrect % (n)	Correct % (n)	Odds ratio	95% CI	<i>P</i>
Fathers age (Years)					
20-35	23.1 (31)	9.6 (25)	1		
36-45	47.0 (63)	55.6 (145)	0.04	0.19-0.64	0.010
≥ 46	29.9 (40)	34.9 (91)	0.62	0.19-0.68	0.002
Mothers age (Years)					
20-35	36.1 (51)	20.7 (58)	1		
36-45	48.9 (69)	65.4 (183)	0.43	0.27-0.68	<0.001
≥ 46	14.9 (21)	13.9 (39)	0.61	0.32-1-17	0.139
Children's age (Years)					
6-8					
9-13	35.7 (51)	14.6 (42)	3.36	1.69-6.69	0.01
14-18	52.4 (75)	69.1 (199)	1.04	0.56-1.93	0.896
	11.9 (17)	16.3 (47)	1		
Education fathers (Years)					
≤ 4					
5-9	33.6(44)	31.5 (82)	1.03	0.63-1.63	0.946
10-12	50.4 (66)	46.5 (121)	0.84	0.43-1.64	0.605
≥ 12	13.7 (18)	15.4 (40)	0.33	0.91-1.18	0.089
	2.3 (3)	6.5 (17)	1		
Education mothers (Years)					
≤ 4	16.2 (22)	21.1 (59)	2.00	0.82-4.93	0.130
5-9	55.9 (76)	39.8 (111)	3.68	1.64-8.27	0.020
10-12	22.1 (30)	23.7 (66)	2.44	1.02-5.82	0.440
≥ 12	5.9 (8)	15.4 (43)	1		

To better understand the main variables that were associated to the risk of BMI category misperception by the caregivers, a multivariable binominal logistic regression model was fitted (Table 4) (Nagelkerke $r^2= 0.649$). The major factors that contribute for the BMI category misperception were the weight status of the child, being the overweight child more likely to be misclassified than the obese and also their age. In this model, overweight and low education mothers also have a higher risk of misclassify their children's weight.

Table 4: Multivariable analysis of risk of weight status misperception among caregivers (n=359)

Risk Factor	Odds Ratio	95% CI	P
Gender of the child			
Male	1	1	
Female	0.64	0.29-1.41	0.27
Age of the child	0.80	0.68-0.95	0.010
Physical activity			
No	1	1	
Yes	1.80	0.77-4.18	0.172
Regular visits to the general practitioner			
No	1	1	
Yes	0.31	0.8-1.099	0.070
Excessive weight within family members			
No	1	1	
Yes	0.23	0.08-0.64	0.005
Daily TV/ videogame/ computer use			
≤1.5h	1	1	
≥2h	0.90	0.66-1.11	1.212
Children BMI category			
Under and normal weight	1	1	
Overweight	122.34	38.64-387.36	<0.001
Obese	13.62	4.88-38.02	<0.001
Fathers BMI category			
Under and normal weight	1	1	
Overweight	0.87	0.38-2.01	0.742
Obese	0.71	0.16-3.19	0.714
Mothers BMI category			
Under and normal weight	1	1	
Overweight	4.08	1.59-10.39	0.003
Obese	0.38	0.83-1.77	0.220
Fathers age (Years)			
20-35	1	1	
36-45	0.49	0.15-1.68	0.260
≥ 46	0.62	0.14-2.74	0.531
Mothers age (Years)			
20-35	1	1	
36-45	0.46	0.17-1.26	0.133
≥ 46	0.85	0.18-4.08	0.843
Literacy fathers (Years)			
≤ 4	1	1	
5-9	0.32	0.13-0.88	0.027
10-12	0.53	0.15-1.93	0.336
≥ 12	0.36	0.32-3.95	0.401
Literacy mothers (Years)			
≤ 4	1	1	
5-9	3.84	1.14-12.91	0.030
10-12	2.38	0.62-9.05	0.204
≥ 12	0.596	0.10-3.46	0.564
Household members (n)	0.797	0.47-1.34	0.393

Discussion

With this study we aimed to evaluate the ability of the parents to recognize their child's weight status and to identify factors that could be related to this perception.

The prevalence of overweight and obesity in the children and adults in this sample is similar to those described in previous studies conducted in the Portuguese population, except in the younger children (6-8 years old). In this age group the obesity rate reached the 27.7%, almost double than on previous reports.^{8, 44} This might be explained by the continuous increase of childhood obesity during the years, to this sample being only of the city of Chaves and not being representative of the national data or due to a non uniform use of weight status classification. Different references for weight status classification from IOTF to CDC and WHO growth charts were used across the studies.^{5-8, 10} To be in conformity with the health bulletin that parents receive from their doctor, the CDC growth charts were used.

Regarding the classification of weight status by the parents, the terminology excessive weight normal weight or low weight for their age was used. This option of not using the term obese or overweight in the parent's questionnaires was taken in order to minimize the stigma bias against that classification. This decision was based in previous publications showing that obese patients prefer the term "weight" was significantly more desirable than several terms physicians could use to describe excess weight, they rated "obesity", "excess fat" and "fatness" as most undesirable.^{45,46} These terms may be seen as hurtful or offensive to obese individuals because their derogatory connotations in daily life.⁴⁵ Parents of pediatric patients vastly preferred that physicians used the phrase "gaining too much weight" as compared with "overweight" when discussing child's weight (51.1% versus 25.9%, $p < 0.001$).⁴⁷ Vartarian *et al.* referred in their research that overall the term "obese people" evokes stronger negative evaluations than the term "fat people" and that researchers should be aware that the specific terms used to refer to overweight and obese people can impact study outcomes and interpretations.⁴⁸

More recently, in 2011, Puhl reported that for the parents the terms “weight” and “unhealthy weight” were rated as most desirable, and “unhealthy weight” and “weight problem” were rated as the most motivating to lose weight.⁴⁹ In a study conducted in Latino parent’s perceptions of weight, many Spanish and English terms were found to be confusing or offensive for the progenitors. Among the Spanish-speaking Latino parents, “demasiado peso para su salud” (too much weight for his/her health) was the only phrase for “excess weight” that was considered appropriate.⁵⁰ The expression “gaining too much weight” may appear less stigmatizing to families because it suggests a process, which can be changed rather than a label.⁴⁷

Our results indicate that overall 33.2% of the parents classified incorrectly their offspring’s weight; the misclassification was higher in the younger children’s group (54.8%). Most of the children were classified as belonging to a lower weight category and only seven were placed in a higher category. Furthermore it was observed that weight status of the child could undermine the caregiver perception. The presence of overweight was the variable that mostly contributed to the misclassification followed by obesity. Moreover, the presence of overweight and low education in the mothers also increased the risk of BMI categories misperception. Interestingly amongst the fathers’ group the low education seemed to protect against the misperception but that may be due to the small number of fathers directly responding the questionnaire. The acknowledgement of the overweight within family members is associated to a lower risk of misperception since it might show an acceptance of the problem by the progenitors. To our knowledge, the effect of this variable was firstly explored in present study.

In our results the parents did not only showed difficulties in recognizing their child’s weight status but also their own. It was verified that 66.7% of the parents referred that there were no overweight or obesity cases in their family yet our results show that more than two thirds of the children have at least one of their progenitors with overweight or obesity.

These findings are consistent with earlier studies that show that a large percentage of the parents do not recognize their child’s weight status. A recent meta-analysis of 69 articles conducted by Alyssa Lundahl and her colleagues has shown that 50.7% of the parents (95% Confidence Interval (CI) 31.1-70.2) underestimate their overweight/obese children’s weight.²⁹ Significant mediators of

this effect included child's age and BMI. Regarding the children with normal weight only 14.3% (95% CI 11.7-17.4) of the parents underestimate their children's normal weight status.²⁹

Several authors have postulated about the complex puzzle pieces that influence the perception of our own and others weight. There are socio-cultural factors within cultures that define what it is a desirable body weight, which, in the end, modulate lifestyles and awareness. As the population body mass index mean values are changing towards an obesity continuum, there is a need to investigate further if these cultural norms and consciousness of body image or weight are changing simultaneously.^{37,51,52} There is also the common belief in younger children that parents tend to presuppose that their child will outgrow being overweight once the child becomes older and becomes taller and more active.⁵³ As the child gets older maybe the mothers become less confident that when their older, overweight child will overcome their weight problem.

Present data confirms Maynard and Baughman^{54,55} results as they showed that parental perceptions of the child's weight status were related to maternal weight status and education. A higher level of education may reflect greater knowledge on health and childhood obesity and potential solutions; it can also be related to higher income and better socio-economic status and easier access to the health services. Although others found that socio-economic status did not influence parental perceptions that might be due to the small sample sizes or different cultural backgrounds of the studied population.^{28,56}

In previous studies like in Eckstein *et al.* it was shown that parents of overweight children did not rate their child as less active or less physical fit than the normal weight children, but those who were aware of their actual weight status reported their child less active than others.⁵⁷ We did not confirm these findings; there was no significant difference in the child's physical activity reported by the parents that had an incorrect perception compared to the ones that had correct perception.

There is a lot of variability between the studies that were published about the factors that can influence the accuracy of the weight status perception by their parents, like gender, child age, parent's race, education a social economical status probably due probably to population specificities.^{12,21,23,25,34.} In spite of these systematic erroneous classifications being not fully perceived they may be

explained by some social reasons. Campbell *et al.* refers that the increasing prevalence of child overweight may have normalized this condition in society and contribute for the inability of the progenitors to recognize when their child has a weight problem.⁵⁸ The stereotypes portrayed by the media regarding obesity and overweight tend to only show the severe cases of the spectrum and that may also distort the lay person perception of overweight. In fact, most of the overweight and obese young children in the community do not stand from the crowd.^{58,59}

As reported by Birch *et al.*, parents of younger children often tend to express anxiety about thinness and “picky eating” when this behavior is normal in their development.⁶⁰ In many parents views overweight children may seem better nourished and be perceived as better eaters hence causing them less concern.

To the date, as far as we know, this is the only study that verified if there were differences in the characteristics of the children of the caregiver’s questionnaires responders and non responders. We have only found differences regarding the age, being the older children less likely to return it. Weight, height, gender, BMI, percentile and percentile category did not influence the response rate and we can infer that there is not any bias created by weight status in the parents’ response but probably it was due to the teenagers not retrieving it back. This could be related to the low compliance of this age group or that they are more conscientious of their habits and do not want to be scrutinized by their parents.

Present study also highlights an important problem in public health that the general awareness of a population of a health problem does not translate into a concern into an individual level, 25% of the responders referred there was no association between weight and health, being that percentage higher, 37.1%, in parents of older children.

Even though we had the vast majority of our responders saying they attended regularly the general practitioner appointments it seems they were not informed about the relation between health and weight or the parents did not understand the information given. It has been reported that the underestimation of overweight may impair the incentive of the progenitors to engage in weight control lifestyles.^{61, 62}

Health care provider’s management or the lack of attention to early childhood may be contributing to the parental misperceptions. In our study the regular visits to the general practitioner (GP) doctor did not give any protection

against misclassification of the child's weight status in spite of 87.3% of the parents in our study reporting that their child had regular follow-ups.

Even though it has been issued recommendations referring that pediatricians should incorporate weigh assessment in their clinical routine practice this doesn't seem to occur regularly according to several studies.⁶⁵ In clinical settings, less than 20% of the health professionals use BMI percentiles chart to evaluate body weight status of the pediatric patients.^{3, 18,19} A review of the medical records reveals that only 53% of the obese children are identified by the clinicians.¹⁹ Barlow *et al.* in UK found that only 41% of the 557 children's growth charts were up to date from a sample diverse pediatrician practices, and only 6.1% of the children had their BMI charted.⁶⁴ In the United States, Klein *et al.* observed that 97% of the 677 primary care physicians in the survey reported visually assessing children for overweight, only 52% of the responders assess the BMI percentile for children older than 2 years.⁶⁵

In Portugal, in 2013, in "*Portugal Alimentação Saudável em Números 2014*" report, referred that only 5.09% users of the primary care were identified as obese and 3.98% as overweight due to the lack of data registered.⁶⁶ In our daily practice, as nutritionists in a primary care facility, none of the pediatric patients that were referred to us as overweight or obese over the period of 6 years (2008-2014), which accounted 85 children, had their BMI percentile charts completed in the child health bulletin. It is recommended by the Portuguese National Child and Juvenile Health program issued by the Ministry of Health, that from birth to adulthood, the child be accompanied regularly by the general practitioner and nurse in primary care facilities.⁶⁷ During this period it is recommended 18 appointments with the GP, being one of them at the age of 5 and another between 12 and 13 to perform a global health exam. In all appointments it is recommended to register the weight, height, BMI, percentile and to evaluate the eating habits of the child.⁶⁷ To our knowledge in our group of primary care facilities only 20% of the global health exams were registered on clinical files at the time the data was collected. Health professionals could help to improve the recognition of childhood overweight. The charting of child BMI should be encouraged as part of normal practice, not only to provide an objective measure of weight status, but also to reassure parents that are anxious about possible underweight and to start discussion and education for better lifestyles.⁵⁶

In Portugal there is a universal health care system, and GPs and pediatricians are the front-line health professionals that see overweight and obese children in a daily basis. These health care professionals should be informed of the potential high odds of misperception of weight status by the parents, especially those of younger children. Since the GP doctors closely follow the child since birth to adulthood, they are the physicians that are frequently seen as source of information about weight management, making them an important link in increasing parental awareness about their child weight status.⁶⁸

Still, Josephson *et al.* reported in their research that despite being previously informed by a physician about their children's weight being a health risk, the parents did not perceive this as an issue.⁶⁹ In 2011 in a study conducted by Jones *et al.* it was documented that parents showed a limited understanding of how childhood overweight is actually defined by the growth charts and their awareness of the measures used by the clinical and scientific community was vague.³⁵ A significant proportion of parents (26.5%) did not express any concern with the increment in the number of overweight children in their country. It was also verified that the progenitors questioned the statistics regarding the scale of the problem and also the methods (Growth Charts) by which the BMI is classified. Parents referred that such measures fail to take into account the range and changes in body shape seen in children.³⁵ More research is needed to identify the best ways to convey the information to the parents.

In gaining understanding of their weight status, the individuals will also gain the perception of risk leading to the possibility of taking action. Nevertheless, we have to take into account that the concept of risk for health professionals and the individual are different and the last ones often reconstruct the threat of the perceived risk denying its personal relevance.³⁷

Social cognition theory suggests that an individual is more likely to engage in a particular behavior if they believe that there are many benefits and few costs.⁷⁰ It is important to perceive in what state of change the parents are and if they are willing to accept the information that is given and take action. Despite their major role, a great percentage of parents, one third to just approximately three quarters, according to different studies, encounter difficulties in accepting their accountability for the child weight status and they report low levels of readiness and confidence to implement changes.⁵² In a recent study it was

reported that regarding their readiness for implementing life-style changes to manage their child's weight, 57.5% of the parents were in the preparation stage, 37.9% in the action stage and only 4.6% in the contemplation stage. Still this percentage was much lower when they were questioned about specific diet behaviors like organizing family dinners and helping children to self-control their diet, and physical activity actions.⁵²

Grimmet *et al.* showed that informing a family about a child's weight status in combination with providing information about healthy habits better prompts eating and physical activity changes within the family.⁷¹ Also Golam *et al.* observed that accurate maternal perceptions of the child weight can promote changes in unhealthy behaviors like the reduction in the hours that children spend in sedentary activities.¹⁵ Furthermore, a parental perception of a child being overweight is becoming the key variable in leading the family' readiness to change and modify the family and child's environment and lifestyles.³⁴ In a study conducted by Garrett *et al.* it was shown that the progenitors with higher health literacy, which entails both cognitive and social skills, were more likely to have accurate perceptions of their child's weight status.²⁷ Our data showed similar results regarding mothers but surprisingly, in the fathers, the low literacy protected against misperception.

Strengths and weaknesses

This study contributes to the existent literature increasing the knowledge about the Portuguese progenitor's perception of the weight status.³⁸ The strengths rely in the large sample and the high response rate achieved (76.2%). In addition, the weight and height of the children were measured by trained healthcare personal using standardized procedures, contrary to previous studies.^{21,29} The weight status of the parents was also evaluated into our study. It is the second study carried out in the Portuguese population being the one that comprises a wider range of ages, that includes both parents anthropometric and social data and the first time that a multivariable analysis was carried out.

There are, none the less, several limitations that should be acknowledged. To access directly all parents' weight and height and to individually administrate the questionnaire perhaps it would have reduced the rates of non response. There are recognized problems associated with self-reported height and weight, in that

the height is generally over-reported and the weight under-reported which can underestimate the extent of obesity within present sample.³⁷ Nevertheless, Kuczarski *et al.* refer that self-reported heights and weights can be used with younger adults (age < 60 years) yet we have to take into account that women underreport and men over-report their weight.⁷²

Moreover, BMI is also often criticized as an imperfect measure of adiposity and weight status, yet it is one of the most practical for large scale use. The is also the fact that we miss also BMI reference charts developed specifically for Portuguese children who probably largely differ from the American population, yet, to the date in which the study was carried out it was specified, by the Ministry of Health, the use of the CDC growth charts.⁶⁷ Up to the present time there is no uniform test or standardized tools to evaluate parental perceptions of weight status. Across studies we verified that there was a lot of discrepancy between the methodologies that are used and no golden standard is yet defined.³⁴

Another constraint with the present study is that children's dietary intake and physical activity behaviors were reported by parents. It is possible that parents are not completely aware of the school food environments to which the children are exposed and can also be prone to give socially desirable answers. A direct observation of children's meals during school recess and lunch would give us better data about their eating habits during the week. It can also happen that more educated people could be inclined to give the answers that conform to the social norms. The objective measurement of physical activity and the comparison to the parental perceptions would provide more valid data.

There is also the limitation of the lack of information regarding parent's socio-economic conditions, number of working hours, how they perceive their own weight, parenting style as well as the fact that a higher number of mothers rather than fathers answered the questionnaire. This study was also hindered by its cross-sectional nature, which describes relationships between the variables of interest in one point in time, but does not allow us to draw conclusive inferences about causality. Longitudinal studies should be undertaken to deepen the knowledge on how parental perceptions vary through time and which factors may influence them. A way to implement this research is to follow parents and children over an extended period of time and assess for changes in perceptions and factors or events that may be related to or trigger perceptual shifts.²⁷

These results cannot be generalized to all our country population since the sample of this study is predominant Caucasian and from only one city of the North of Portugal. Additionally the present study explores de data collected during the school year of 2009/2010 and may be not up to date to the current social circumstances due to the socio-cultural shifts within the population caused by the Portuguese economical crisis. Therefore more recent data is required to better understand the current state of parental weight perception.

Research and Intervention Perspectives

The data presented in this study presents challenges for future public health policies and interventions. Future studies could consider handing out a different questionnaire to each one of the progenitors and not only to the caregiver so we could take into account the different perceptions between genders and different parental styles.

More information preferably gathered through a longitudinal study about parental styles and their impact on weight status perception is required, as well as a more detailed family history. Also more detailed information about physical activity, eating habits and leisure time of the child is needed.

Additional recognition of the risk awareness and lay perspectives of obesity are needed to understand the complexity of this health problem in our population. Present results importantly highlight the need to educate parents about obesity and its health consequences in order to reduce misperceptions.

At the present moment population interventions for weight management are almost nonexistent in our country. Possible future weight management campaigns have to take into account that people do not perceive their weight as a problem delaying many times the implementation of preventive measures because they do not seek help. It would be also important to know if the parents that are aware that their child has a weight problem engage in any lifestyle changes or weight management program and seek professional help. It is imperative as well to know what is the most appropriate language to convey the information and what form of treatment parents prefer, group or individual interventions. It could also be interesting to see if these parental perceptions have any influence on eating habits across the lifespan of the child.

Currently, no intervention program addresses the issue of body weight misperception and lifestyle. Future research should address how to target interventions for weight management when parents are not aware that their child has a weight problem. It is also necessary to know if the body weight and lifestyle perceptions of the child and parents have an impact on future body weight status of the child, to whose perceptions should clinicians address, the ones from the child or the ones from parents. Improved efforts are needed to discern the progenitor's worries and needs, the factors that motivated or inhibit them from taking action if we want to successfully manage of the obesity epidemic either with public health interventions or in clinical settings.

From a public health perspective, the routes that are most likely to reach a greater amount of parents efficiently is primary care and schools. School based activities on recognition and evaluation of weight status and integration of healthy eating, physical activity habits by the child and their family also deserve a reflection for future interventions. Weight status should be communicated to all parents, regarding any status of weight, in a non judgmental way.

Conclusions

With this study it was verified that 33.2% of the parents classified incorrectly their child's weight status. This percentage was higher in younger children, 6 to 8 of age, where as 54.8% of the progenitors misclassified their offspring weight status. The factors that were related with misclassification were the presence of overweight in the mothers, the low educational level, the child's overweight or obesity status. The older age of the child and the recognition of the presence of overweight or obesity within the family members lowered the risk for misclassification.

There was a high prevalence of overweight and obesity within the family, 37.3% of the children were overweight or obese, with the highest prevalence in the ages 6 to 8, of 53.6%; 64.4% of the fathers were overweight or obese and 41.9% of the mothers.

We verified that 24.9% of the parents reported that there was no association between health and weight, that percentage increased with age, being 14.9% in younger children (6 to 8 years old) and reaching 37.1% in adolescents (14-18 years old). Yet all parents responded that eating habits were related with health.

The treatment of childhood obesity is a continuous challenge for all professionals working in pediatric care. Parental awareness of their child body weight status is far from being flawless, being the misclassification overweight and obese children highly significant. Inaccurate recognition and lack of parental concern may perpetuate unhealthy lifestyles. We have shown throughout observations that several children and parental characteristics are associated with the distortion of the perception and that this information should be taken into account to target future health interventions to a specific group at higher risk.

It is unquestionable the key role of the parents in the development of their offspring eating habits and attitudes towards physical activity and health. The understanding of their perceptions and behavior might help to implement better health politics and interventions.

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