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Homogeneity of Maternal Perception of Her Child's Weight in Northeastern Mexico

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ABSTRACT The objectives were to assess a maternal perception of her child's weight through two tests, words, and images, to validate tests; and to compare perception among Mexican populations. Participants 2,842 mother–child dyads; the child's body mass index measurement was the gold standard. Sensitivity, specificity, Kappa value, Z test and homogeneity of Kappas were calculated. By words found that 55.1%, 77.5%, 32.2% and 25.1% of mothers of underweight, normal, overweight, and obese children had an adequate perception. By images found that 76.4%, 92.9%, 73.0%, and 89% of mothers of underweight, normal, overweight, and obese children had an adequate perception. Sensitivity, specificity, and Kappa values for the words were 28.4%, 22.5% and 0.442 (p=0.000); for the images were 81.6%, 23.6% and 0.043 (p=0.001). A small proportion of mothers of overweight-obese children had adequate perception by words . The images had higher sensitivity. There are various levels of homogeneity across the States.

INTRODUCTION

Childhood obesity (OB) is one of the most serious public health issues of the 21st century. Obese children tend to continue being obese as adults and are more likely to develop non-communicable diseases, such as diabetes and cardiovascular disease, at a younger age (World Health Organization 2014). Transitional countries, with rapid industrialization are facing a growing

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epidemic of overweight – obesity (OW-OB) in children and adolescents. The increasing prevalence of childhood overweight/obesity is a likely consequence of behavioral changes, and accompanied with an increasing incidence of noncommunicable chronic diseases (Cai 2014).

It is therefore necessary to implement strategies from childhood to prevent and treat OW-OB paying special attention to parents, given that they not only act as behavior moderators, but also are responsible for the quality and quantity of food made available to their children. When parents are involved in interventions to prevent and treat weight problems in their children, there are more possibilities of achieving satisfactory outcomes (Camargo et al. 2013).

Mothers have a unique position to have a positive impact on their children's learned health behaviors and subsequent health (Camargo et al. 2013). However, mothers are less likely to engage in preventive behaviors if they do not perceive childhood obesity as an important issue (Doolen et al. 2009). Moreover 32.1% to 79.6% of mothers with OW-OB children do not adequately perceive the child's weight, considering it normal (Eckstein et al. 2006; Aparício et al. 2013). Maternal perception of the child's weight (MPCW) has been assessed using the following perception per words (PW) questions: a) I feel my child is underweight, a little underweight, about the right weight, a little overweight (OW) and OW (Eckstein et al. 2006), b) In your opinion, your child is…underweight, normal, overweight and obese (Binkin et al. 2013).

Images (PI) have also been used to assess MPCW, a tool that has shown higher sensitivity than the formulation of questions (Eckstein et al. 2006). Studies assessing MPCW have been carried out in the United States (Eckstein et al. 2006), Italy (Binkin et al. 2013), Israel (Kaufman-Shriqui et al. 2012), Germany (Warschburger et al. 2009) and Portugal (Aparício et al. 2013).

A pilot study was conducted in Mexico including the participation of 418 mother–child dyads from the State of Nuevo Leon. It was found that only 20.3% of mothers of children with OW and 7.4% of mothers of children with OB had an adequate MPCW according to the PW test and 62.7% of mothers of children with OW and 81.58% of mothers of children with OB had an adequate MPCW according to the PI test (Flores-Peña et al. 2009).

As it has been documented that the population residing in northeastern Mexico is genetically homogeneous (Cerda Flores et al. 1991), this group is considered suitable to conduct genetic and epidemiological OW-OB studies. In addition, as little is known about Mexican mothers' MPCW, and given that when mothers adequately perceive their children with OW-OB they are more likely to receive advice and take actions to prevent and treat their children's weight problems (Eckstein et al. 2006). This study was formulated with the participation of mother–child dyads from five States in northeastern Mexico (Coahuila, Nuevo León, Zacatecas, San Luis Potosí and Tamaulipas) (Fig. 1).

Objectives

1) To assess MPCW through two tests: using words (PW) and using images (PI)
2) To validate both tests
3) To compare MPCW amongst the populations from northeastern Mexico.

METHODOLOGY

This was a cross-sectional study with the participation of 2842 mother–child dyads from northeastern Mexico in the States of Coahuila, Nuevo León, Tamaulipas, Zacatecas and San Luis Potosí. The sample size was calculated afterward using the Epidat V4 package. The accuracy of the study was considered appropriate for a concordance test of 2517 mother–normal weight, OW and/or OB child dyads. The participating children attended public schools in each of the five participating States. Two preschools, two primary schools, two secondary schools and two preparatory schools were selected randomly in the urban area of each of the States. Children were selected by random sampling stratified by school type and sex, with allocation proportional to the stratum size from lists of students enrolled in the corresponding school, using the Minitab V15 package.

Measurements

To assess PW, the following question was posed: "I feel my child is (a) underweight, (b) a little underweight, (c) about the right weight, (d) a little OW or (e) OW." To assess PI, a poster showing seven body images according to age and sex of the child was presented. The left image

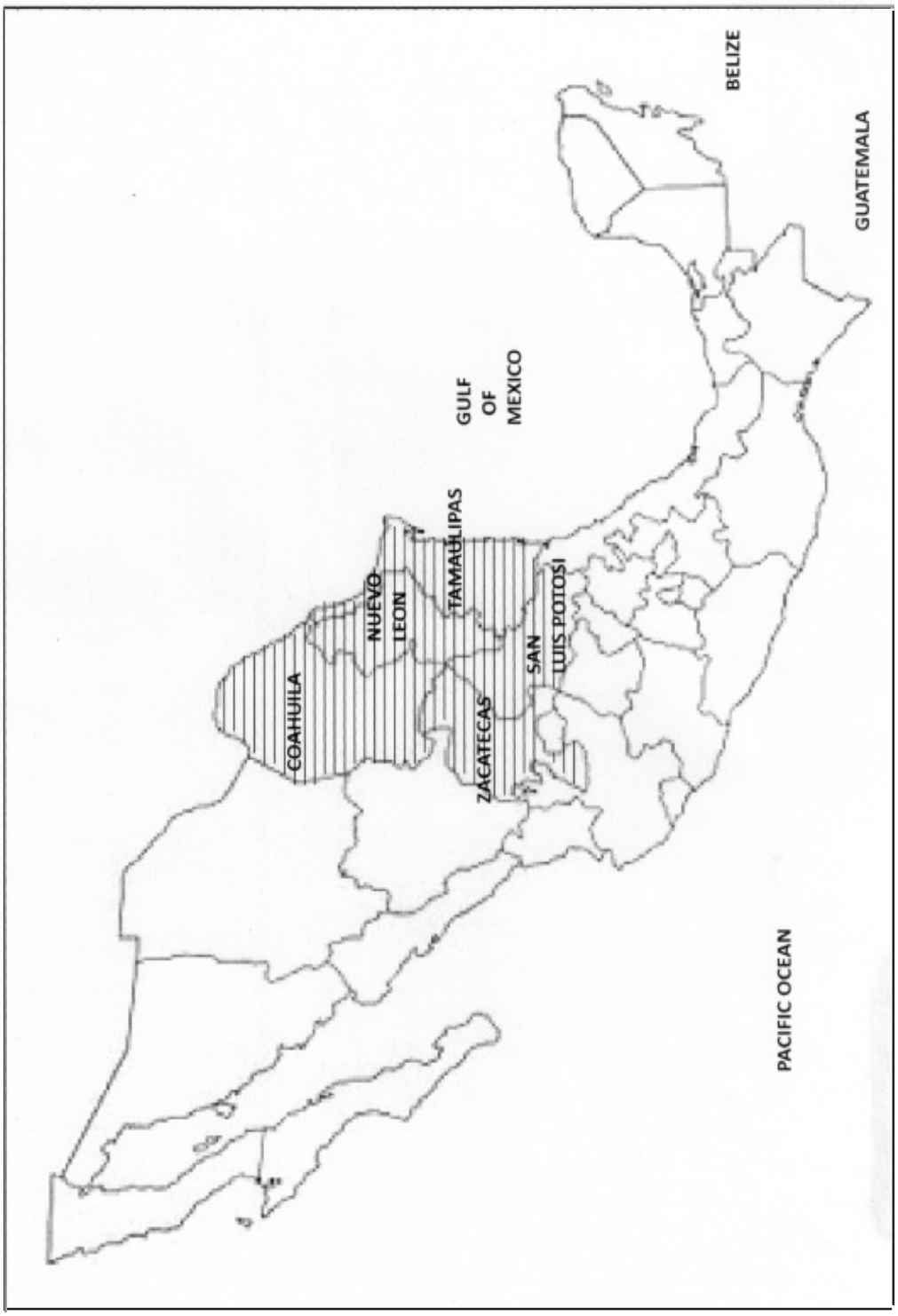

Fig. 1. States of Northeastern Mexico that participated in the study (highlighted)

shows a child with OB and the right image shows a child who is underweight; the mother is then asked to circle the image that better represents her child's shape.

The image in the center of each one of the series shows a child with a body mass index (BMI) in the 50th percentile; the rest represent no particular categories. Images correspond to the following age ranges: 2 to 5, 6 to 9, 10 to 13 and 14 to 17. Both the PW and the PI tests belong to the Physical Appearance and Health Perception Questionnaire in Spanish, supplied and authorized by its authors for use in the present study (Eckstein et al. 2006).

Trained and standardized staff measured each child's height and weight. Height was measured using a SECA 214 stadiometer to the nearest 0.1 cm. Weight in kilograms and BMI were measured with bioelectrical impedance analysis using the InBody 230 equipment using the Tetrapolar-8 point Tactile Electrode System. The BMI was classified afterwards as follows: BMI < 5th percentile = underweight, BMI > 5th but < 85th percentile = normal weight, BMI > 85th but < 95th percentile = OW, and BMI > 95th percentile = OB (Centers for Disease Control and Prevention, 2010), which was considered as the gold standard.

Information Collection Procedure

There was a person responsible for fieldwork in each one of the States and the information collection procedure was the same for all and was as described below. Authorization to collect the information was requested from the school principals. Once the participating students were identified, a meeting with the mothers was set up in the school where their children were enrolled in a hall or room provided by the principals. The study objectives and methodology were explained to the mothers and they were asked to authorize their children to participate, giving informed consent.

A maximum of three appointments were scheduled with the mothers of the selected students and up to two home visits were conducted; mothers who did not attend the third appointment or were not found at their homes were replaced by the mother of the next following child in the list of enrolled students. Mothers answered the questionnaire and supplied sociodemographic information. Weight and height measurements of their children were carried out afterwards according to established protocol. The study was approved by the Research and Ethics Committee of the Faculty of Nursing at the Autonomous University of Nuevo Leon and was adjusted according to the 1973 Declaration of Helsinki's Ethical Standards.

Data Analysis Strategies

Data were captured using the SPSS v17 statistical package for Windows. Contingency tables were used to assess the MPCW. According to the gold standard, an adequate MPCW (positive result) with the PW test was considered when: (a) mothers of underweight children referred to the underweight or a little underweight options, (b) mothers of normal weight children referred to their child's weight as normal, (c) mothers of OW children referred to them as with some OW, and (d) mothers of children with OB referred to them as being with OW.

With regard to the PI test, an adequate perception (positive result) was considered when mothers of underweight and normal weight children, according to the gold standard, selected an image smaller than the average image or when mothers of children with OW-OB according to the gold standard, selected the average or a larger image. Contingency tables of 2x2 (χ^2) were constructed afterward. This analysis only included (1) children with OW-OB and (2) children with normal weight according to the gold standard. The PW and PI test results were considered positive and/or negative and sensitivity and specificity were obtained using the Table for Epidemiological Calculations.

To verify whether there were MPCW differences associated with the State of residence, κ values, standard error, *Z* test value, probabilities, test of homogeneity of κ (χ^2_{HK}) and study accuracy were obtained utilizing the concordance module in the epidemiological analysis of the data program Epidat V4.0.

RESULTS

The study included the participation of 2842 mother–child dyads. Of those, 26.0% (n = 738) were from Nuevo León, 23.2% (n = 658) from Tamaulipas, 21.0% (n = 600) from Zacatecas,

Table 1: Total distribution of maternal perception by PW *versus* the Gold Standard

	Gold Standard							
	Underweight UW		*Normal*		*Overweight OW*		*Obesity OB*	
Words	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
UW/ Slightly UW	179	55.1	281	17.9	11	2.5	6	1.2
Normal Weight	145	44.6	1213	77.5	270	61.2	95	18.6
Slightly OW	1	0.3	65	4.1	142	32.2	281	55.1
OW	0	0.0	7	0.5	18	4.1	128	25.1
Total	325		1566		441		510	

p = .000006

15.5% (n = 440) from Coahuila, and 14.3% (n = 406) from the State of San Luis Potosí. Of all the mothers, 78.6% (n = 2235) were married; the occupation of the majority was house duties (65.0%, n = 1847), they were on average 36.54 years old (SD = 7.5) and had 10.31 years of schooling (SD = 3.7).

With regard to the children, 52.4% (n = 1489) were females and 47.6% (n = 1353) were males; 24.1% (n = 686) were attending preschool, 29.3% (n = 833) primary school, 26.4% (n = 749) secondary school and 20.2% (n = 574) preparatory senior secondary school. With regard to BMI in weight category, it was found that 11.4% (n =

Table 2: Distribution of maternal perception by PW by State *versus* the Gold Standard

	Gold Standard							
	Underweight UW		*Normal*		*Overweight OW*		*Obesity OB*	
State	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Coahuila								
UW/Slightly UW	40	58.8	51	19.3	5	8.5	0	0.0
Normal Weight	28	41.2	199	75.4	27	45.8	8	16.3
Slightly OW	0	0.0	13	4.9	26	44.1	23	46.9
OW	0	0.0	1	0.4	1	1.6	18	36.7
Total	68		264		59		49	
Nuevo León								
UW/ Slightly UW	38	56.7	64	16.7	2	1.7	4	2.4
Normal Weight	29	43.3	311	81.0	78	67.3	34	19.9
Slightly OW	0	0.0	9	2.3	34	29.3	90	52.6
OW	0	0.0	0	0.0	2	1.7	43	25.1
Total	67		384		116		171	
Tamaulipas								
UW/ Slightly UW	42	71.2	57	17.9	4	3.4	1	0.6
Normal Weight	17	28.8	238	74.8	69	58.0	26	16.0
Slightly OW	0	0.0	18	5.7	43	36.1	94	58.0
OW	0	0.0	5	1.6	3	2.5	41	25.4
Total	59		318		119		162	
San Luis Potosí								
UW/ Slightly UW	22	50.0	57	24.3	0	0.0	0	0.0
Normal Weight	22	50.0	172	73.2	52	71.2	10	18.5
Slightly OW	0	0.0	6	2.5	19	26.0	36	66.7
OW	0	0.0	0	0.0	2	2.8	8	14.8
Total	44		235		73		54	
Zacatecas								
UW/ Slightly UW	37	42.6	52	14.2	0	0.0	1	1.4
Normal Weight	49	56.3	293	80.3	44	59.5	17	23.0
Slightly OW	1	1.1	19	5.2	20	27.0	38	51.4
OW	0	0.0	1	0.3	10	13.5	18	24.2
Total	87		365		74		74	

325) of the children were underweight, 55.1% (n = 1566) were normal weight, 15.5% (n = 441) OW and 17.9% (n = 510) showed OB.

The MPCW by the PW test found that the majority of mothers of underweight and normal weight children had an adequate perception of their children's weights (55.1% and 77.5%, respectively), which was different in the case of mothers of OW and OB children, a low proportion of whom had an adequate perception of their children's weights (32.2% and 25.1%, respectively). The RxC test was applied with 50,000 simulations, and a significant difference (p = .000006) was found. Results are shown in Table 1.

This finding indicates that mothers of OW-OB children do not recognize this situation and underestimate their child's weight, which is more frequent among mothers of OB children.

Table 2 shows the distribution of the PW test per State of residence. It was found that the rate of mothers with underweight children who had an adequate perception of their children's weight was between 42.6% and 71.2%, for the mothers of children with normal weight the adequate perception was between 73.2% and 81.0%. On the other hand, the rate of mothers of children with OW who had an adequate MPCW was between 26.0% and 44.71%, and for the mothers of children with OB the adequate perception was between 14.8% and 36.7%.

As can be observed, the higher percentage of mothers who had an adequate MPCW was found among mothers of normal weight children, and the lowest percentage was linked to mothers of OB children.

MPCW by the PI test found that the rate of mothers with underweight and normal weight children who had an adequate perception of their children's weights was between 76.4% and 92.9%. The rate of mothers of children with OW-OB who had an adequate perception was between 73.0% and 89% respectively. The Chi-square test was applied and found significant differences (χ^2 = 1023.7, gl = 3, p = .001). Results are shown in Table 3.

The percentages of mothers who had an adequate MPCW were higher among mothers with UW and Normal Weight children, compared with those of mothers with OW-OB children; additionally, the percentages with an adequate MPCW obtained through PI are higher than the percentages obtained through the PW test.

Results of MPCW by the PI test according to the State of residence found that the rate of mothers of underweight and normal weight children who had an adequate perception of their children weights was between 73.4% and 97.7% and the rate of mothers of children with OW-OB who had an adequate perception was between 65.8% and 91.8% (Table 4). Once again, it was found that mothers with Underweight and Normal Weight children have higher percentages of adequate MPCW when compared with the percentages of mothers with OW-OB children.

With regard to the sensitivity and specificity of the tests, the PI test showed 81.6%, $IC_{95\%}$ (79.5; 83.6) sensitivity and 23.6%, $IC_{95\%}$ (22.3; 24.8) specificity. In assessing sensitivity and specificity per State, the PI test also showed sensitivity values between 75.6% and 87.2% (Tables 5 and 6).

Sensitivity (true positive rate) measures the proportion of actual positives, which are correctly identified as such (percentage of sick people who are correctly identified as having the condition). Based on this, it is possible to point out that PI is a test that can be applied to help mothers of OW-OB children to adequately identify this MPCW condition.

Table 3: Total distribution of maternal perception by PI *versus* the Gold Standard

	Gold Standard							
	Underweight UW		*Normal*		*Overweight OW*		*Obesity OB*	
Images	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Image smaller than average	302	92.9	1197	76.4	119	27.0	56	11.0
Average or larger image	23	7.1	369	23.6	322	73.0	454	89.0
Total	325		1566		441		510	

Table 4: Distribution of maternal perception by PI by State *versus* the Gold Standard

	Gold Standard							
	Underweight UW		*Normal*		*Overweight OW*		*Obesity OB*	
State	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Coahuila								
Image smaller than average	64	94.1	218	82.6	17	28.8	4	8.2
Average or larger image	4	5.9	46	17.4	42	71.2	45	91.8
Total	68		264		59		49	
Nuevo León								
Image smaller than average	60	89.5	299	77.8	32	27.7	23	13.5
Average or larger image	7	10.5	85	22.2	84	72.3	148	86.5
Total	67		384		116		171	
Tamaulipas								
Image smaller than average	56	94.9	224	70.4	34	28.5	15	9.3
Average or larger image	3	5.1	94	29.6	85	71.5	147	90.7
Total	59		318		119		162	
San Luis Potosí								
Image smaller than average	43	97.7	188	80.0	25	34.2	6	11.1
Average or larger image	1	2.3	47	20.0	48	65.8	48	88.9
Total	44		235		73		54	
Zacatecas								
Image smaller than average	79	90.8	268	73.4	11	14.8	8	10.8
Average or larger image	8	9.2	97	26.6	63	85.2	66	89.2
Total	87		365		74		74	

Table 5: Total distribution of sensitivity, specificity, Kappa and maternal perception accuracy by PW and by PI *versus* the Gold Standard

	Gold Standard							
	Perception by words				*Perception by image*			
	Underweight UW		*Normal Weight*		*Overweight OW*		*Normal Weight*	
Response	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Positive	270	28.4	1213	77.5	776	81.6	1197	76.4
Negative	681	71.6	353	22.5	175	18.4	369	23.6
Total	951		1566		951		1566	
$\div^2$	586.52 (0.000)				9.00 (0.003)			
Sensitivity	28.4, $IC_{95\%}$ [26.2; 30.7]				81.6, $IC_{95\%}$ [79.5; 83.6]			
Specificity	22.5, $IC_{95\%}$ [21.2; 23.9]				23.6, $IC_{95\%}$ [22.3; 24.8]			
Kappa	–0.442				0.043			
$IC_{95\%}$	–0.477; –0.407				0.016; 0.070			
Standard error	0.01790.				0137			
Z	–24.26				3.05			
Probability	0.0000				0.0023			
Accuracy[1]	0.03				0.03			

[1]Value obtainted using the Epidat V4.0 package

Regarding specificity (true negative rate), which measures the proportion of negatives that are correctly identified as such (percentage of healthy people who are correctly identified as not having the condition), it was found that both tests, PW and PI, showed sensitivity that can be considered low. Therefore, in order to adequately identify normal weight children, the

Table 6: Distribution of sensitivity, specificity of maternal perception accuracy by State and by PW and by PI versus the Gold Standard

	Gold Standard							
	Perception by words (PP)				*Perception by image (PI)*			
	OW-OB		*Normal weight*		*OW-OB*		*Normal weight*	
State	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Coahuila								
Positive	44	40.7	199	75.4	87	80.5	218	82.6
Negative	64	59.3	65	24.6	21	19.5	46	17.4
Total	108		264		108		264	
χ^2 (probability)	39.08 (0.000)				0.10 (0.755)			
Sensitivity	40.74, IC95%[33.1; 48.9]				80.60, IC95% [73.6; 86.7]			
Specificity	24.60, IC95% [21.5; 28.0]				17.40, IC95%[14.6; 19.9]			
Nuevo León								
Positive	77	26.8	311	81.0	232	80.8	299	77.8
Negative	210	73.2	73	19.0	55	19.2	85	22.2
Total	287		384		287		384	
χ^2 (probability)	195.33 (0.000)				0.71 (0.400)			
Sensitivity	26.8, IC95%[23.2; 30.9]				80.8, IC95%[77.1; 84.4]			
Specificity	19.0, IC95%[16.3; 2.2]				22.1, IC95%[19.3; 24.8]			
Tamaulipas								
Positive	84	29.9	238	74.8	232	82.6	224	70.4
Negative	197	70.1	80	25.2	49	17.4	94	29.6
Total	281		318		281		318	
χ^2 (probability)	119.45 (0.000)				11.40 (0.001)			
Sensitivity	29.9, IC95%[26.1; 34.0]				82.6, IC95%[78.8; 86.1]			
Specificity	25.2, IC95%[21.8; 28.8]				29.6, IC95%[26.2; 32.7]			
San Luis Potosí								
Positive	27	21.3	172	73.2	96	75.6	188	80.0
Negative	100	78.7	63	26.8	31	24.4	47	20.0
Total	127		235		127		235	
χ^2 (probability)	87.74 (0.000)				0.71 (0.401)			
Sensitivity	21.3, IC95%[15.5 ; 28.0] 7				5.6, IC95%[69.3; 81.6]			
Specificity	26.8, IC95%[23.7; 30.4]				20.0, IC95%[16.6; 23.2]			
Zacatecas								
Positive	38	25.7	293	80.3	129	87.2	268	73.4
Negative	110	74.3	52	19.7	19	12.8	97	26.6
Total	148		365		148		365	
χ^2 (probability)	162.14 (0.000)				10.59 (0.002)			
Sensitivity	25.7, IC95%[20.3; 31.9]				87.2, IC95%[81.4; 91.7]			
Specificity	15.1, IC95%[12.7; 17.7]				26.6, IC95%[24.2; 28.4]			

Positive-Adequate perception. Negative-Inadequate perception

use of the gold standard (test refers to a diagnostic test that is the best available) is recommended. In this study, it was the measurement of the children's BMI.

Finally, *k* values were obtained for the purpose of comparing MPCW of various Mexican populations. Table 7 shows the *k* values of the PW and PI tests per State. Considering the five Mexican states, there were minimal differences among them by PW (Coahuila = Zacatecas = Tamaulipas = San Luis Potosí = Nuevo León) and by PI (San Luis Potosí = Coahuila = Nuevo León = Zacatecas = Tamaulipas). However, given that the mothers of OW-OB children had adequate MPCW in lower percentages compared to mothers of normal weight children, the findings of this study support the evidence indicating that mothers are likely to misperceive the weight status of their OW–OB children. These differences in *k* values can be attributed to other factors that were not studied, such as the child´s gender, maternal BMI, the child´s healthy diet and physical activity (Mamun et al. 2008; Vanhala et al. 2011).

Table 7: Kappa values for the PW and *PI* tests by State

	Perception	
State	*Words*	*Images*
Coahuila		
Kappa	−0.253	−0.013
$IC_{95\%}$	−0.331; −0.167	−0.077; 0.043
Standard error	0.0437	0.0290
Z	−6.37	−0.46
Probability	0.0000	0.6453
Nuevo León		
Kappa	−0.519	0.027
$IC_{95\%}$	−0.58; −0.45	−0.032; 0.083
Standard error	0.0336	0.0284
Z	−14.06	0.94
Probability	0.0000	0.3486
Tamaulipas		
Kappa	−0.446	0.117
$IC_{95\%}$	−0.517; −0.369	0.048; 0.181
Standard error	0.0366	0.0331
Z	−11.01	3.47
Probability	0.0000	0.0005
San Luis Potosí		
Kappa	−0.459	−0.034
$IC_{95\%}$	−0.538; −0.368	−0.11; 0.037
Standard error	0.0460	0.0361
Z	−9.48	−0.97
Probability	0.0000	0.3302
Zacatecas		
Kappa	−0.438	0.092
$IC_{95\%}$	−0.495; −0.372	0.038; 0.134
Standard error	0.0411	0.0248
Z	−12.84	3.37
Probability	0.0000	0.0008
Total		
Kappa	−0.44	0.043
$IC_{95\%}$	−0.467; −0.401	0.017; 0.070
$\div^2_{HK}$ (probability)[a]	23.96 (0.0001)[b]	17.50 (0.0015)[c]

[a] $\div^2_{HK}$: Homogeneity test for Kappa
[b] Coahuila = Zacatecas = Tamaulipas = San Luis Potosí = Nuevo León

DISCUSSION

During childhood, parents play a main role in the behavior and lifestyle of their children and are responsible for their health care decisions. Mothers spend most of the time with their children and it has been found that they perceive themselves as more responsible for their children's health than do fathers. It must be very difficult for a mother to respond to the question of how she perceives her child, and to recognize that her child is OW-OB can be even more difficult.

Studies conducted in countries such as the USA (Chaparro et al. 2011; Eckstein et al. 2006), Italy (Binkin et al. 2013), Germany (Warschburger and Kröller 2009), Portugal (Lopes et al. 2013), Finlandia (Vuorela et al. 2010) and Malaysia (Muhammad et al. 2008), have assessed MPCW and found that the majority of mothers of children with OW-OB have misperceptions of their child's weight, and they underestimate it. In Mexico, childhood OW-OB prevalence has increased, so it is necessary to study the different factors contributing to this problem.

Results from this study showed that by the PW test, more mothers of underweight and normal weight children have an adequate MPCW, in contrast to mothers of children with OW-OB. Studies conducted in other populations have found that between 32.1% and 79.6% of mothers have an adequate MPCW (Eckstein et al. 2006; Aparício et al. 2013). In this regard, it has been documented that mothers experience inner conflict when they have to recognize that their children have health problems, as having a healthy child is an indicator of being a successful mother. Other studies have found that parents indicate that a moderate OW child is healthier (Southwell and Fox 2011).

On the other hand, based on the PI test, mothers of underweight and normal weight children selected an image smaller than the average (positive result) and mothers of children with OW-OB selected the average or larger image (positive result), which shows that images are a useful tool for Mexican mothers to perceive their children's weight adequately.

The published literature identifies at least three image series to assess MPCW: a) images to assess MPCW of children between 2 and 17 years old (Eckstein et al. 2006), b) images that estimate BMI in percentiles that were applied to mothers in Germany (Warschburger and Kröller 2009), and c) images to assess MPCW of children between 4 and 5 years old (Killion et al. 2006). This study used the Eckstein et al. (2006) image series for children between 2 and 17 years old, which showed agreement with sensitivity values reported by the authors. An advantage with this image series is that it can be applied to mothers or fathers of children within a wide age range.

However, one of its weaknesses is the wide success range for mothers of children with OW-OB to perceive them adequately (selection of the average or larger image, four of seven possibilities), which could be a source of inaccuracy when ranking the test results.

This is in contrast with the Body Image Table designed by Collins for preteen children, where the mother is shown seven images

grouped in four response options ranging from strongly adequate to inadequate (Collins et al. 1991).

In a comparative study conducted with Mexican mothers residing in California and Central Mexican States, Collins' images were applied and it was identified that Mexican mothers pointed to a normal weight image as their children's ideal image, but preferred that their children had a weight heavier than the weight preferred for children whose mothers resided in California (Rosas et al. 2010). However, although images are a useful tool to help mothers have an adequate perception of their children's weight, it is possible to point out that PW is what guides maternal decisions and behaviors; thus, PW becomes especially important in the formulation and implementation of interventions.

When comparing MPCW by State, various levels of homogeneity were found for PW (Zacatecas = Tamaulipas = San Luis Potosí = Nuevo León = Coahuila) and for PI (San Luis Potosí = Coahuila = Nuevo León = Zacatecas = Tamaulipas).

As far as we know, this is the first study that reports the homogeneity of a mother's perception of her child's weight. The participants in this study were mother-child dyads residing in Mexico's five Northeastern States. The children's age was between 2 and 17 years of age. Even though it was observed that the State of Coahuila was different from the other four States (Zacatecas, Tamaulipas, San Luis Potosi & Nuevo León) in the PW test, and that Zacatecas and Tamaulipas were different from the other States in the PI test, it is considered that Mexican mothers of OW-OB children who reside in Northeastern Mexico do no have an adequate perception of this situation. Consequently, there is a need to design and implement interventions aimed at this group of mothers so that they develop an adequate perception of said situation.

CONCLUSION

Given that populations in northeastern Mexico have a high non-adequate MPCW and that there exist various levels of similarity between States, it is concluded that MPCW is a factor that influences the high prevalence of OW-OB and that it is very likely that social and behavioral factors transmitted from generation to generation in Mexican families influence the non-adequate MPCW. Given similarities found between mothers according to the State of residence, it is feasible to design and implement interventions that can be replicated with higher success probabilities in mothers residing in northeastern Mexico.

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