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By Flores-Peña, Yolanda, Avila-Alpirez, Hermelinda, Trejo-Ortiz, Perla M., Mercedes Gutiérrez Valverde, Roxana Araujo Espino & Gustavo Gutiérrez Sánchez

Autonomous University of Nuevo Leon (UANL)

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Results: The CFQ obtained a 0.75 Cronbach's alpha coefficient, 283 children (36.01%) were overweight or obese, BFP mean was 25.90 (SD = 9.92) for boys and 27.20 (SD = 8.79) for girls. Related to MCFP, the perceived responsibility factor obtained the highest score (Mean = 84.35, SD = 16.99), while the lowest scores were for perceived child weight (Mean = 50.06, SD = 8.38) and concern about child weight (Mean = 44.69, SD = 29.34). The factor, perceived child weight was associated with the child's BMI ($r_s = .564$, $p = .001$) and BFP ($r_s = .535$, $p = .001$).

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MATERNAL CHILD FEEDING PRACTICES RELATIONSHIP WITH THE BMI AND BODY FAT PERCENTAGE OF MEXICAN CHILDREN

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Maternal Child Feeding Practices: Relationship with the BMI and Body Fat Percentage of Mexican Children

Flores-Peña, Yolanda ^α, Avila-Alpirez, Hermelinda ^σ, Trejo-Ortiz, Perla M. ^ρ, Mercedes Gutiérrez Valverde ^ω, Roxana Araujo Espino [¥] & Gustavo Gutiérrez Sánchez [§]

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Conclusions: The internal consistency of the CFQ was acceptable. The mothers considered themselves responsible for their child's feeding, although the child's weight didn't represent a concern. Interventions are recommended to help the mother accurately perceive their child's weight.

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I. INTRODUCTION

Childhood obesity is one of the most severe public health problems of the 21st century(1). Its prevalence has increased at an alarming rate. Around the world, 41 million children suffer from overweight (OW)-obesity (OB). The problem is global and is steadily affecting many low- and middle-income countries, particularly in urban settings (1).

Author α ^α: Ph. D., Autonomous University of Nuevo Leon (UANL). School of Nursing. Mexico. e-mails: yolanda.florespe@uanl.edu.mx, juana.gutierrezv@uanl.mx

Author σ ^σ: Ph. D., Autonomous University of Tamaulipas (UAT). College of Multidisciplinary Knowledge. México.

e-mails: havila@docentes.uat.edu.mx, ggutierrez@docentes.uat.edu.mx

Author ρ ^ρ: Ph. D., University of Zacatecas (UAZ). Health Sciences Department. México. e-mails: perlu11@yahoo.com.mx, araujo_navar@hotmail.com

The increased prevalence of childhood OW-OB is a situation with multiple intervening factors, including genetic factor, reduction of physical activity, increased calorie intake, in addition to parents' traditional false beliefs about health and nutrition (2). On the other hand, research findings have indicated a correlation between maternal behavior and children's adiposity levels (3), as well as a correlation between the maternal child-feeding practices and children's food preferences (4), energy intake, and weight status (5).

The Domain Specific Parenting Styles Model and its impact on the development of childhood OB support the understanding of parents' child feeding practices (6). The authors proposed that parents do not have a single and consistent style to raise their children and suggest that child rearing styles differ among the parents, across the child's development phases and among children in the same family.

Moreover, they assure parents practice higher levels of control on their child's feeding when: a) the parent is concerned with the child's development, b) is closely involved in the child's health, physical wellbeing or weight, c) perceives that the child is at risk of developing feeding and/or weight problems based on the family history and other risk factors, and d) does not believe that the child is capable of self-controlling his diet (6).

To assess parental child feeding practices, different questionnaires have been used, including Comprehensive Feeding Practices Questionnaire (7), Preschooler Feeding Questionnaire (8) and Child Feeding Questionnaire (CFQ) (9). The last one has been used more frequently in research, which consists of 31 items, grouped in seven factors. Four of these factors pertain to parental perception of child and parent weight, and concern about weight, which may elicit parental control in feeding, and three additional factors assess parents' attitudes and practices regarding their use of controlling child feeding strategies (9).

Fathers and mothers of children between two and eleven years of age can answer the CFQ; it's internal reliability coefficient of 0.75 has been found for the total scale (9). Studies conducted in different countries, including China (10), Spain (11), Portugal (12), Sweden

(13) and Turkey (14) have applied. Until date, any study in Mexican population have applied CFQ.

The literature has reported the association between parental child-feeding practices and child's body mass index (BMI), which is the most frequently used indicator, as well as body fat percentage (BFP). A study involving African-American mothers, and white boys and girls documented that parental child-feeding practices explained up to 15% the child's BFP variance (15).

Given the global increase in the childhood OB prevalence, different factors that could contribute to childhood OW-OB need to be identified, to design effective interventions to reduce and treat this problem. Also, considering that has not been found research that explores the relationship between maternal child feeding practices and child weight in Mexican population, this study was an undertaken, involving pairs (mothers and their preschoolers and schooler children) residing in the northeastern area of Mexico. The objectives were: 1) To assess the reliability of the CFQ, 2) To describe maternal child-feeding practices (MCFP) and 3) To associate the MCFP with child's BMI and BFP.

II. METHODS

We conducted a cross-sectional correlational study. Participants were pairs (mother and preschooler / schooler child). The children were healthy, without any growth problems referred by their mothers, and enrolled at six public educative institutions (three kindergartens and three elementary schools). The institutions were randomly selected among the 538 educative institutions of Monterrey, Nuevo Leon metropolitan area. 915 mothers were invited to participate with their child, and 786 pairs (mother - preschooler / schooler child) provided the complete information.

a) Measurements

To assess the maternal child feeding practices, the CFQ (9) was applied, which consists of 31 items in seven factors. Four factors are: a) perceived feeding responsibility (PFR), b) perceived parental weight (PPW), c) perceived child's weight (PCW), d) concern about child's weight (CCW). Three additional factors evaluate parental attitudes and practices regarding use of control child feeding strategies: a) monitoring of food intake (M), three items. This factor assesses the extent to which parents oversee their child's eating, supervise the consumption of sweets, snacks, and foods with a high-fat level. Scores range from 1 to 5, low to high monitoring; b) food restriction (R), eight items. This factor assesses the extent to which parents restrict their child's access to foods. The scores range from 1 to 5, low to high restriction; c) pressure to eat (P), four items. This factor assesses parents' tendency to

pressure their child to eat more food, typically at mealtimes. Scores range from 1, for low pressure, to 5 for high pressure.

Reported Cronbach's alpha coefficients for CFQ factors to range between 0.60 and 0.93 (9-11). The CFQ was designed for application to parents of children between two and eleven years of age. Before to applying, the questionnaire was translated into Spanish using a translation-back-translation method.

b) Anthropometric Measures

The maternal and children height was measured using a SECA 214 stadiometer. Maternal and, child's weight was measured using SECA 813 scale, with a capacity of 200kg and precision level of 0.1 gr. Then, the maternal BMI was calculated by applying the formula weight/height^2 and classified according to WHO determinations (16) as low weight (<18.5), normal weight (18.5 to 24.9), overweight (25.0 to 29.9) and OB ($\text{BMI} > 30.0$). The child's BMI was classified in percentiles according to WHO standards (17) as malnutrition (percentile <3), low weight (>3 y <15), normal weight (>15 and <85), OW (>85 but <97) and OB (>97), and the child's BFP was measured by bioelectric impedance using Inbody 230 equipment.

Maternal sociodemographic data were obtained, including age and education in years, occupation, and marital status. Regarding the child, age and gender were obtained.

c) Data Collection Procedure

After administrative process, were recruited the participants through meetings, flyers, and take-home letters. The mothers who agreed to participate signed a consent form and answered the CFQ, the time needed to complete it was approximately 15 minutes. Also, socio-demographic data were collected in a self-administered questionnaire, e.g., age, education level, marital status, monthly family income and the child's age and sex. Finally their weight and height were measured. We measured the weight, height, and BFP child' in the educative institution, previous authorization from the teacher responsible for each classroom

This project was approved by School of Nursing Ethical Committee at the Autonomous University of Nuevo León. Mothers gave their informed consent and authorized the participation of their children.

d) Data Analysis Strategies

The data were collected and analyzed using the Statistical Package for the Social Sciences (SPSS), version 23. We calculated the Cronbach's alpha for the factors and the total CFQ, and obtained descriptive statistics of the participants' socio-demographic data. The score of each factor and score of the total questionnaire were transformed into rates between 0 and 100, in which a low score indicate a worst MCFP

and high a better MCFP. The data showed no normal distribution. Therefore Spearman's correlation coefficient was applied to associate the MCFP with the child's BMI and BFP.

III. RESULTS

The internal consistency of the CFQ was verified using Cronbach's alpha for the factors and the total questionnaire. The coefficients for the factors ranged between 0.68 and 0.86; and 0.75 for the total questionnaire (Table 1).

786 pairs (mother and child) participated. The mean maternal age was 34.18 years (SD = 6.79), 62.21% (n = 489) of the mothers had finished junior high school or high school, and 43.89 (n = 345) referred they worked out the home. The 36.77% (n = 289) of the mothers had OW and 28.37% (n = 223) OB.

Concerning children, the mean age was 7.20 years (SD = 2.53), 49.10% (n = 386) were male and 50.90% (n = 400) female, 21.88% (n = 172) was OW and 14.13% (n = 111) OB. The BFP mean was higher among girls (Mean = 27.20, SD = 8.79) than among boys (Mean = 25.90, SD = 9.92), the information is displayed in Table 2.

We calculated rates for the factors and the total questionnaire. Table 2 shows that the highest mean score was found for perceived responsibility (Mean = 84.35, SD = 16.99), followed by monitoring factor (Mean = 71.94, SD = 25.88). The lowest scores were found for concern for child's weight (Mean = 44.69, SD = 29.34) and perceived child's weight (Mean = 50.06, SD = 8.38). The highest correlation was found between child's BMI and perceived child's weight ($r_s = 564$, $p = .001$), and between perceived child's weight ($r_s = 435$, $p = .001$) and child's BFP, data shown in Table 4.

IV. DISCUSSION

The CFQ is one of the most used questionnaires to assess parental child feeding practices. In a study involving fathers and mothers living in the United States, internal consistency levels were superior to 0.70 for the seven factors (9). On the other hand, the questionnaire was administered to 490 participants in a study conducted in Turkey; the reliability was tested by Cronbach's alpha coefficient, results showed higher internal consistency, Cronbach's alpha between 0.80 and 0.91 (14). Our study found a Cronbach's alpha coefficient for the seven factors between 0.67 to 0.86, and 0.75 for the complete questionnaire. Therefore, the CFQ could be useful to assess MCFP in Mexican mothers with similar characteristics to the participants in the present study.

The highest MCFP scores were found for perceived responsibility and monitoring, while the lowest scores were for concern about child weight and

perceived child weight. These findings coincide with the research findings founded in a study conducted in Turkey (14).

As it was mentioned, among the seven factors of MCFP, perceived responsibility have the highest mean score, probably cultural implications attributed to maternal role may have influenced this result, given that, although almost half the mothers referred worked out of home, they decide how much food your child eat. Resulting in questioning about how this happens in daily life if the mother is working and another person is taking care of her child. Therefore, it is interesting to clarify this finding, to know details about how the mother decide how much food her child consumes if she is working.

The lowest MCFP scores were found for concern about child's weight and perceived child's weight. It should be noted; that the mothers are not concerned with their child's weight as long as their child is physically active (18), also the mothers tend to underestimate it (19). Other authors even indicate that the mothers are unable to perceive accurately her child's weight (20), and a study performed in Italy found an association between high prevalence levels of childhood obesity and inaccurate maternal perception of child's weight (21).

It is important to highlight that the perceived child's weight factor of CFQ assesses the parental perception of the child's weight across their lifetime, during the child's first year of life, between one and two years of age, between three and four years of age and so forth until the sixth year of elementary school. The mean score found in this study indicates the mother perceived her child's weight as right, however 36.01% of the children were overweight or obese, which was not recognized for the mothers. Therefore, a first step of the interventions to reduce or treat the child's excess weight is to help the mother to perceive accurately her child's weight.

This study demonstrated that perceived child weight was positively related (moderate and strong) with child's BMI and BFP. This finding is similar to result found in the study conducted in Italy that documented the relationship between inaccuracy MPCW and the high prevalence of childhood OW and OB(21).

On the other hand, given the increased prevalence of childhood obesity worldwide, including Mexico, is relevant to assess the body composition, especially the body fat mass, which is related to adverse health outcomes (22). However, given that we not found published studies about the BFP in Mexican children, further research about the body composition is recommended, including measurements of BFP and body fat distribution.

Finally, more than half of the mothers were pre-OB or OB, and the literature suggest that parents who are overweight, with problems controlling their food intake, or are concern about their child's risk for

overweight, may adopt controlling child feeding practices in an attempt to prevent childhood OW. Unfortunately, research reveals this parental control attempts may promote the development of unhealthy eating styles and childhood OB(23).

Finally, the study limitations are that only mothers participated. Also, we not evaluated the relationship between variables such as education level, economic income, mother work status, or hours that mother works out the house with child's BMI and BFP.

In conclusion, the CFQ is an acceptable measure to assess MCFP in Mexican mothers. Also, mothers consider themselves responsible for feeding their children, but they do not have an accurate perception of her child's body weight, in addition, they trend to underestimate it; moreover an association was identified between the child's BMI and BFP, and perceived child's weight. The recommendation is to help the mother to recognize her child's body weight status before enrolment in interventions that target the child's excess body weight.

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Table 1: Internal Consistency of the Factors and the Child Feeding Questionnaire

Factor	Items	Cronbach's Alpha
Perceived Responsibility	1, 2, 3	0.78
Perceived Parent Weight	4, 5, 6, 7	0.67
Perceived Child Weight	8, 9, 10, 11, 12, 13	0.68
Concern About Child Weight	14, 15, 16	0.82
Restriction	17, 18, 19, 20, 21, 22, 23, 24	0.72
Pressure to Eat	25, 26, 27, 28	0.75
Monitoring	29, 30, 31	0.86
CFQ	1 - 31	0.75

Table 2: Characteristics of the Participants

Continuous Variables	Mean	Sd
Age		
Mother	34.18	6.79
Child	7.20	2.53
Bmi		
Mother	27.25	5.21
Child	17.79	3.60
Bfp		
Boy	25.90	9.92
Girl	27.20	8.79
Categorical Variables	N	%
Child Sex		
Boy	386	49.10
Girl	400	50.90
Mother Education		
No School	8	1.02
Elementary	78	9.92
Junior High School	190	24.17
High School	299	38.04
College	211	26.85
Mother Employed		
No	441	56.11
Yes	345	43.89
Maternal Weight Category		
Underweight	10	1.27
Healthy Weight	264	33.59
Overweight	289	36.77
Obesity	223	28.37
Child Weight Category		
Underweight	90	11.45
Healthy Weight	413	52.54
Overweight	172	21.89
Obesity	111	14.12

Table 3: Descriptive Statistics of CFQ Factors

Variable	\bar{X}	SD	Value	
			Min	Max
Perceived Responsibility	84.35	16.99	16.67	100.00
Perceived Parent Weight	55.79	10.65	0.00	93.75
Perceived Child Weight	50.06	8.38	0.00	75.00
Concern About Child Weight	44.69	29.34	0.00	100.00
Restriction	60.86	20.26	3.13	100.00
Pressure to Eat	59.24	27.61	0.00	100.00
Monitoring	71.94	25.88	0.00	100.00
CFQ	61.00	10.44	28.54	86.31

Table 4: Association between the CFQ Factors and the Children's BMI and BFP

Factor	1	2	3	4	5	6	7	CFQ
BMI								
R _s	-.107	.175	.564	.250	.065	-.262	-.059	.051
P	.003	.001	.001	.001	.071	.001	.097	.156
BFP								
R _s	-.126	.180	.535	.242	.080	-.234	-.065	.053
P	.001	.001	.001	.001	.026	.001	.069	.139

1) Perceived responsibility, 2) Perceived parent weight, 3) Perceived child weight, 4) Concern about child weight, 5) Restriction, 6) Pressure to eat, 7) Monitoring BMI) Body mass index, BFP) Body fat percentage r_s) Spearman rank-order correlation coefficient, p) Level of significance.