The Relationship between Mexican School-Age Children Obesity and the BMI of their Parents: A Comprehensive Prevention Strategy

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1 Introduction

The prevalence of obesity in children has increased drastically worldwide (WHO, 2003); the majority of the 150-200 million children with excess weight live in developing countries. Pediatric obesity raises public health concerns because it causes a wide range of serious complications, including increasing the risk of premature illness and death in later life (Lobstein et al., 2004; Ludwig, 2010). In addition, obesity in children and adolescents causes low self-esteem, depression, social discrimination (Erickson, 2000; Swallen, 2005) and health problems such as metabolic syndrome, pulmonary disorders and severe asthma (Han, 2010).

Mexico has the highest and alarming rates of childhood obesity among nations worldwide. Data from the 2006 National Health and Nutrition Survey revealed that 26% of Mexican school-aged children (5 to 11 years) have an unhealthy weight (Olaiz-Fernández et al., 2006), defined as either overweight or obese according to body mass index (BMI) cut-points established by the International Obesity Task Force (Cole et al., 2000). Moreover, two years later, the prevalence increased 4 percentage points. The 2008 National Health Survey of school children in Mexico revealed that one out of three children presents overweight or obesity (Shamah-Levy, 2010).

Though the problem of overweight and obesity in children has been researched for several decades and addressed with different kinds of approaches (Barlow, 2007), there is little research describing the parents’ role. And although it is known that parents’ decisions about the diets and physical activity of their children are determinants (Pérez-Morales et al., 2009; Ciudadanos en Red, 2010; Bonvecchio et al., 2009; Golan et al., 1998), many prevention strategies focus on children and consider parents as a complementary element. Nevertheless, it is clear that the majority of interventions suggest that involving the parents in the strategies is key to improving the effectiveness and impact of interventions (Durá, 2005; Singh, 2006; Sahota, 2001; Perry, 1997).

Strategies that involve parents in the management of overweight and obesity in children include a range of activities, such as talks to increase knowledge, providing recipes and reading labels, as well as creating commitments to changes in lifestyles and in the home. These interventions conclude that the active participation of parents is key to the success of programs implemented to address the problem, since the pedagogy is improved and practical applications by the facilitator are validated.

Some studies report that for childhood obesity interventions to be effective, they need to include different stakeholders (children, parents and health professionals). Staniford et al. (2001) suggest that for the intervention to succeed, it should be family-based and incorporate physical activity, nutrition and psychological components, and be delivered to recipients in familiar environments. Parents and children reported the need for ongoing support to sustain behavioral changes made during treatment, while health professionals suggested that interventions should aim to create autonomous individuals who complete treatment and independently sustain behavioral changes. Collaborations through community initiatives are also important (Pagnini, 2009).

Parents’ roles are crucial in families, since they can significantly influence the increase or decrease in body weight (Brown, 2004; Chiang, 2003). The eating behaviors of children have various components, such as responding to the perceived risk of the child’s weight or the weight of the parents themselves, as well as the socio-emotional environment created in the home (Rhee, 2008). Children of parents with obesity have a greater probability of being obese (Vogels et al., 2006) and children of overweight mothers may become more obedient to the mother’s urging them to eat (Rhee, 2008). A significant
influence on the development of childhood obesity can be observed when taking into account socio-economic factors and the family environment (Wang, 2001; Strauss & Knigth, 1999), especially in developing countries, many of which have increasingly high prevalence of overweight. This notable variation may indicate that social, economic and environmental contexts significantly influence overweight and obesity. Different relationships between socioeconomic factors and obesity can occur as a result of particular lifestyles, diet and physical activity (Wang, 2001).

The present study aims to describe the association between parents’ and children’s BMI and the parents’ perception about diet, physical activity and the school environment of their children. The study of these factors allows for the creation of specific parent-focused strategies to support the prevention of childhood obesity.

2 Methodology

This study is based on the ecological model, which considers the environment to be a set of a series of structures: family, school, close surroundings and socioeconomic and cultural components that influence the behaviors of individuals (McLeroy et al., 1988). This study involves two independent phases, a quantitative and a qualitative phase, that are part of the design of a broader strategy conducted by the National Institute of Public Health (INSP, Spanish acronym) to prevent obesity among Mexican children. The study was conducted in a random sample of 60 elementary public schools in the 125 municipalities in the State of Mexico during 2010 – 2011.

A blind, cluster-randomized field trial was conducted with fifth-grade school children. The sample was representative of the fifth-grade population attending elementary schools in the State of Mexico. Subjects were beneficiaries of a school breakfast program in both federal and state educational systems with morning and evening shifts. Fifth-grade children were chosen for the study because of the ability to provide follow-up one year later and observe their progress. The baseline assessment was conducted in early November 2010; the strategy was implemented between November 2010 and the first half of May 2011 and the final evaluation was conducted between late May and early June 2011. Baseline and final measurements were conducted during the study. Children with disabilities for whom anthropometric measurements could not be performed were excluded.

A sample size of 1,000 children was calculated (Murray, 1998). Sixty schools were selected at random, of a total of 2,969 public schools in the State of Mexico that receive school breakfasts. Thirty were randomly assigned to the intervention group (IG) and 30 to the control group (CG). The average size of the groups in the schools was 40 students. Within each school, 17 fifth-grade children and their parents were also randomly selected, resulting in a total of 510 parent/child pairs per intervention group in order to have a sufficient sample size at follow-up. The non-response rate was ≤ 13% at follow-up. Participants in the focus groups included fathers, mothers or caregivers of the fifth-grade children in the 60 participating public elementary schools, who responded to the invitation to participate in the study. The study was approved by the Ethical and Research Committees of the INSP. The quantitative component of the mixed design allowed for observing the variable distribution, and the qualitative component enabled conducting a dialogue between experts and lay people, as well as understanding the participants’ experiences (Johnson & Onwuegbuzie, 2004) and facilitating the cultural adaptation of the
intervention; thus, this type of mixed design enables observing the phenomena in a comprehensive manner.

2.1 Quantitative phase

The first part of the study was to determine the association between parents’ and children’s BMI, for which we measured weight and height (Figure 1). The promoter, who was previously standardized, asked the children and their parents to remove their shoes, wear minimal clothing, and unbraid hair that could interfere with the height measurement. Anthropometric data was obtained using weight and height measurement techniques recommended in the INSP Nutrition Project Procedure Handbook (Cuevas-Nasu et al., 2006). Personnel were trained to follow these standardized recommended procedures and protocols (Lohman et al., 1998; Habicht, 1974).

![Figure 1: Methodological model](image.png)

Weight was determined with Tanita electronic scales with an accuracy of 100 g and height was measured using Dynatopstadiometers with a capacity of 2 m and an accuracy of 1 mm. Weight and height of the children who participated in the survey were measured by a trained and standardized field team (Lohman et al., 1998; Habicht, 1974). BMI (BMI = kg/m$^2$) was determined for all students to classify them as adequate BMI, overweight or obese, or underweight based on the distribution and cutoff points proposed by the World Health Organization (WHO) (Onis et al., 2007); BMI was adjusted by sex.
and age. In addition to the anthropometric measurements, we also obtained specific information from the parents interviewed regarding the age of their children and their date of birth, as well as the current age of the parents.

Anthropometric measurements (weight and height) were obtained from adults 20 years and older using internationally accepted procedures. Field personnel were trained and standardized using conventional and internationally accepted protocols. BMI (kg/m²) was calculated and the nutritional status of survey participants was determined based on their BMI and WHO cutoff points: normal BMI 18.5 – 24.9 kg/m²; overweight BMI 25 – 29.9 kg/m²; obesity ≥ 30 kg/m².

Agreement and consistency of the standardization process was obtained using the Cohen’s Kappa test (Fleiss, 1981) with a coefficient of 0.76 (95%CI 0.54, 0.83) for height and 0.87 (95%CI 0.78, 0.90) for weight, which indicated acceptance of the measurements. For the standardization of obtaining information using the questionnaires, field workers underwent repeated practice and were evaluated on an ongoing basis.

The data analysis included a socioeconomic index, modified by weighting different predictors using the principal components method according to that proposed by Bronfman (1988). This method was used in Mexico by the 1999 and 2006 National Nutrition Surveys (Resano-Pérez, 1999). To this end, a socio-economic questionnaire was administered to parents, which included housing features and household goods, thereby obtaining the information to create the socio-economic index (SL). The index includes six predictor variables: floor and roof building materials; number of bedrooms and bathrooms; number and type of household goods (refrigerator, washing machine, stove and boiler) and; number of appliances (television, home video or DVD player, radio, phone, cellphone and computer). The index selected was the first component that reflected 41.4% of the total variability, with a lambda value of 2.482. The index was then stratified into three levels using distribution tertiles as cutoffs.

We calculated means and proportions in order to present characteristics of both parents and children, such as: sex, age, weight, height, socio-economic level (SL) and the weight status of children and their parents. We built a logistic regression model to identify factors associated with overweight or obesity (O/O) in children. For this analysis we excluded children with low weight, including only children with normal weight and overweight and obesity. The dependent variable was the prevalence of overweight and obesity in children and the independent variable was the weight status of the parents. In addition, the model was adjusted for covariables, such as sex, age and socio-economic level of the children and other characteristics of parents such as age and sex. Sex of parents was taken into account here because it has been observed that the magnitude of the relationship between the nutritional status of parents and that of children also depends on the sex of the parents. (Whitaker et al, 2010). We adjusted all of the analyses by school conglomerate, using the statistic software STATA version 12.

2.2 Qualitative phase

For the second part, we performed a qualitative health study based on a phenomenological approach in a convenience subsample of the 60 public elementary schools, with parents of children from 4 urban and 3 rural schools. This approach was chosen to fulfill the need for information about social factors and processes from the parental perspective (Figure 1) (Silva et al., 2008). We used focus groups as a tool of inquiry. Sample size was determined by theoretical saturation of the data. The duration of each focus group was between 60 to 90 minutes. The dynamic of the focus groups was developed based on a thematic guide designed to investigate knowledge, perception and practices related to eating, physical
activity and childhood obesity, taking into account the context of fifth-grade children who attend public schools in the State of Mexico.

Each focus group was led by two previously-trained professionals in behavioral sciences; one served as the principal facilitator and the other as an observer. All the sessions were tape-recorded, with prior parental consent, and transcribed using a Microsoft Office text processor. The data was then analyzed according to thematic categories, with the help of N-vivo®, version 2.0 software for qualitative analysis. Five categories were previously defined for the analysis of the information:

1. Family and school environment: Space where healthy eating and physical activity are promoted.
2. Nutritional intervention: Programs or activities to promote healthy eating and to modify eating practices in the home and school.
3. Physical activity intervention: Programs or activities to promote physical activity in the home and school.
4. Facilitators: Foster possibilities to increase the consumption of healthy foods or to perform physical activity at the school and at home.
5. Barriers: Potential limitations that prevent the consumption of healthy foods or performance of physical activity in the school and at home.

3 Results

3.1 Quantitative Results

Data were obtained from 1019 child/parent pairs (either the mother or father) out of a population of 1020 children and 1020 parents from the 60 randomly-selected schools in the State of Mexico. The population analyzed included only those with complete and valid data for weight, size, date of birth and socioeconomic characteristics; therefore, data was included from a total of 888 child/parent pairs. The results showed that slightly more than 50% of the children and over 90% of the parents studied were women and 35% of the study population belonged to the middle socio-economic level (SL). Roughly 35% of children and 72.3% of parents were overweight or obese (O/O), with no observable differences between sex. The average age was 10.6 years old for the children and 34.9 for parents (Table 1).

Table 2 shows the characteristics of the children with O/O as compared to the characteristics of children with normal weight. Here it is clearly seen that for children with O/O, there is a greater proportion of parents with O/O (84.9%) as compared to children with normal weight (66.5%). In addition, significant differences were observed among sex, SL and average weight and size; children with O/O weighed more and were larger in size than those with normal weight and were primarily in the high SL (41.4%), while children with normal weight were primarily in the low SL (38.7%).

Table 3 shows the factors associated with O/O in children using logistic regression analysis. After adjusting for age, sex and SL of the children, as well as age and sex of the parents, it was observed that the children whose father or mother were overweight or obese were more likely to present overweight or obesity with respect to children whose father or mother were of normal weight (odds ratio (OR) 2.96; 95% CI: 2.02, 4.28; p < 0.01]. In addition, a strong positive association was observed between SL and the presence of overweight or obesity in children, as indicated by an OR of 2.74 for the children from high
SL (95% CI: 1.83,410; $p < 0.01$) and an OR of 1.84 for middle SL children (1.18,2.86; $p < 0.05$), as compared to children from low SL.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Children</th>
<th></th>
<th>Parents</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>439</td>
<td>49.4</td>
<td>64</td>
<td>7.3</td>
</tr>
<tr>
<td>Female</td>
<td>449</td>
<td>50.6</td>
<td>817</td>
<td>92.7</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>293</td>
<td>33.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Middle</td>
<td>311</td>
<td>35.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>High</td>
<td>284</td>
<td>32.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Nutritional status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>520</td>
<td>58.6</td>
<td>237</td>
<td>26.7</td>
</tr>
<tr>
<td>Overweight or obese</td>
<td>309</td>
<td>34.8</td>
<td>642</td>
<td>72.3</td>
</tr>
<tr>
<td>Low weight</td>
<td>59</td>
<td>6.6</td>
<td>9</td>
<td>1.0</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>246</td>
<td>56.0</td>
<td>16</td>
<td>25.0</td>
</tr>
<tr>
<td>Overweight or obese</td>
<td>169</td>
<td>38.5</td>
<td>47</td>
<td>73.4</td>
</tr>
<tr>
<td>Low weight</td>
<td>24</td>
<td>5.5</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>274</td>
<td>61.0</td>
<td>220</td>
<td>26.9</td>
</tr>
<tr>
<td>Overweight or obese</td>
<td>140</td>
<td>31.2</td>
<td>589</td>
<td>72.1</td>
</tr>
<tr>
<td>Low weight</td>
<td>35</td>
<td>7.8</td>
<td>8</td>
<td>1.0</td>
</tr>
<tr>
<td>Age (Years)</td>
<td>10.6</td>
<td>0.02</td>
<td>34.9</td>
<td>0.3</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>35.7</td>
<td>0.58</td>
<td>74.7</td>
<td>1.86</td>
</tr>
<tr>
<td>Size (m)</td>
<td>1.4</td>
<td>0.00</td>
<td>1.6</td>
<td>0.01</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>35.5</td>
<td>0.51</td>
<td>64.9</td>
<td>0.56</td>
</tr>
<tr>
<td>Size (m)</td>
<td>1.4</td>
<td>0.00</td>
<td>1.5</td>
<td>0.00</td>
</tr>
</tbody>
</table>

N = 888 parent-child pairs

Table 1: Characteristic of the study population, Mexico 2010
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Children with overweight or obesity&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Children with normal weight&lt;sup&gt;2&lt;/sup&gt;</th>
<th>P&lt;sup&gt;3&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td><strong>Sex of child</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>169</td>
<td>54.7</td>
<td>246</td>
</tr>
<tr>
<td>Females</td>
<td>140</td>
<td>45.3</td>
<td>274</td>
</tr>
<tr>
<td><strong>Socioeconomic level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>67</td>
<td>21.7</td>
<td>201</td>
</tr>
<tr>
<td>Middle</td>
<td>114</td>
<td>36.9</td>
<td>180</td>
</tr>
<tr>
<td>High</td>
<td>128</td>
<td>41.4</td>
<td>139</td>
</tr>
<tr>
<td><strong>Nutritional status of parent</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>45</td>
<td>14.6</td>
<td>169</td>
</tr>
<tr>
<td>Overweight or obesity</td>
<td>262</td>
<td>84.8</td>
<td>346</td>
</tr>
<tr>
<td>Low weight</td>
<td>2</td>
<td>0.6</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Error</td>
<td>Mean</td>
</tr>
<tr>
<td>Age of children (years)</td>
<td>10.5</td>
<td>0.03</td>
<td>10.5</td>
</tr>
<tr>
<td>Weight of the child (kg)</td>
<td>43.8</td>
<td>0.50</td>
<td>31.7</td>
</tr>
<tr>
<td>Size of the child (m)</td>
<td>1.40</td>
<td>0.00</td>
<td>1.36</td>
</tr>
</tbody>
</table>

1: N=309 Children
2: N=520 Children
3: Comparison between children with overweight or obesity versus children with normal weight using the chi-square test
4: Comparison between children with overweight or obesity versus children with normal weight using the Student’s t-test

**Table 2:** Characteristics of children with overweight or obesity and children with normal weight, Mexico 2010

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal weight (parents)</td>
<td>1.00</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Low weight (parents)</td>
<td>1.65</td>
<td>(0.32, 8.53)</td>
<td>0.54</td>
</tr>
<tr>
<td>Overweight or obesity (parents)</td>
<td>2.94</td>
<td>(2.02, 4.28)</td>
<td>0.00</td>
</tr>
<tr>
<td>Sex, female (children)</td>
<td>0.68</td>
<td>(0.46, 1.00)</td>
<td>0.05</td>
</tr>
<tr>
<td>Sex, female (parents)</td>
<td>0.75</td>
<td>(0.40, 1.40)</td>
<td>0.35</td>
</tr>
<tr>
<td>Age, years (children)</td>
<td>0.96</td>
<td>(0.74, 1.25)</td>
<td>0.76</td>
</tr>
<tr>
<td>Age, years (parents)</td>
<td>1.00</td>
<td>(0.99, 1.02)</td>
<td>0.77</td>
</tr>
<tr>
<td>Low SL</td>
<td>1.00</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>High SL</td>
<td>2.74</td>
<td>(1.83, 4.10)</td>
<td>0.00</td>
</tr>
<tr>
<td>Middle SL</td>
<td>1.84</td>
<td>(1.18, 2.86)</td>
<td>0.01</td>
</tr>
<tr>
<td>Constant</td>
<td>0.65</td>
<td>(0.02, 18.13)</td>
<td>0.80</td>
</tr>
</tbody>
</table>

N=823 parents and children
SL: Socioeconomic level

**Table 3:** Factors associated with overweight and obesity amongst children, Mexico, 2010
3.2 Qualitative Results

By analyzing the discourses of the parents about childhood obesity, it was possible to show that they perceive it as a very important problem that requires immediate treatment. The parents showed interest in this situation and an attitude of solidarity in promoting healthy habits, such as eating properly and performing physical activities. The participants recognized that the practice of these two activities is the key to prevent and control overweight and obesity in school children. They consider both the school and the home as strategic places to promote healthy practices and behaviors.

Table 4 presents the main results, including the obstacles identified by the parents that prevent them from having healthy lifestyles. Some suggestions are also presented that, from their perspective, help them personally as well as their family to lead an active and healthy life.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Place</th>
<th>Category</th>
<th>Content</th>
</tr>
</thead>
</table>
| Eating | Home | Obstacles | • It is difficult for the parents to change their habits and therefore they do not consider themselves a good example for their children.  
• There is little availability of fruits and vegetables in the homes (difficulty storing them and high cost)  
• Families encourage purchasing unhealthy foods by giving the children money to spend at school.  
• At parties, most of the food served is rich in fat and carbohydrates, rather than nutritional foods.  
• The lack of time on the part of parents prevents them from preparing food and they prefer to eat out, including eating fast food. |
|       |       | Testimonies | • Testimony of a mother: "...I don’t give them money to spend; however, they have a grandma, an aunt, and dad who do end up secretly giving them money and their packed lunch ends up at the bottom of their books..." |
|       |       | Suggestions | • Motivate the children to consume fruits and vegetables through attractive presentation of dishes (include yogurt, granola, honey).  
• Teach the parents to manage their time (create space to prepare lunch)  
• Avoid buying "junk" food and encourage them to save money.  
• Advise the parents about proper management of emotions, such as anxiety, stress, anger or sadness, since these can create eating disorders in children. |
|       |       | Testimonies | • Testimony of a parent: "... it could be feasible to make a weekly lunch plan, right? On Monday kids are going to eat this, on Tuesday, let’s say a sandwich... every previous night prepare what they will take...” |
| School | Obstacles | • The children do not like homemade lunches (some children give them away or throw them out)  
• Children prefer buying foods rich in calories, such as potato chips and sodas. |
|       | Suggestions | • Provide workshops for parents about eating (food groups, nutritional tables, proper amounts and portions of each food)  
• Permit only one food cooperative in the school, to avoid multiple providers.  
• Prohibit the sale of unhealthy foods in the school.  
• Place water jugs in each classroom (sponsored by the parents)  
• Promote playing a role in lunches (once a week each child brings healthy food for all their classmates) |

Continued on next page...
Testimonies

Testimony of a mother: "...sometimes we think the children do not have problems, that they eat to satisfy a physical need, but it is because they are nervous or stressed and don't know how to handle that and so they get violent or eat a lot or do not eat at all..."

<table>
<thead>
<tr>
<th>Physical Activity</th>
<th>Home Obstacles</th>
<th>School Obstacles</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Parents have little time for performing physical activity</td>
<td>• Lack of safety does not permit children to go out to play in the street, parks or sports centers.</td>
<td>• Lack of professional physical education in the schools.</td>
</tr>
<tr>
<td>• Lack of participation by parents (males) during leisure time (fun and active)</td>
<td>• No participation by parents (males) during leisure time (fun and active)</td>
<td>• Lack of space (patios, courts, etc.) to perform physical activity.</td>
</tr>
<tr>
<td></td>
<td>Parents (males) do not see physical activity as an option for resting and relaxing.</td>
<td>• They avoid physical activity because of the possibility of accidents.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Little interest and motivation of teachers for performing extracurricular activities with children and parents.</td>
</tr>
</tbody>
</table>

Suggestions

• Parents have to learn to organize their time to perform physical activity.
• Encourage physical activity (parents and children going out to walk, run, play or ride their bicycles to school)
• Hold workshops to provide information about the benefits of physical activity (physical, social, emotional)
• Organize sports days.
• Promote increasing physical education to an additional hour.
• Implement an hour of dance class for children (creating a balance of cognitive and artistic activities)
• Promote dance classes for mothers.
• Motivate professors to perform physical activity with school children.
• Use sports materials in the physical education class.
• Encourage children with less physical abilities to participate in sports.
• Promote traditional games during recesses.
• Implement two recesses, improve the use of spaces and avoid accidents (one for small children and the other for older children)

Testimonies

• Testimony of a Mother: "...to promote physical activity programs at school, we consider it viable to do physical activity about 15 minutes before classes begin. I don’t know, maybe children can stretch before starting their activities..."

• Testimony of a mother: "...another option would be to let them out for break with different schedules... the first from 9 to 10, others from 9:30 to 10 and so on..."

Table 4: Perception of parents: obstacles and suggestions to promote healthy eating and physical activity.
4 Discussion

The present study aims to describe the association between parents’ and children’s BMI, and the parents’ perception about the diet and physical activity of their children. First and foremost, it is necessary to consider that the parents are the primary role models for their children and their behavior can positively or negatively influence their children’s health.

The results obtained showed a close relation between the weight status of both parents and children, since more than 80% of children with O/O had parents with O/O. This has been observed in several studies, where it is noted that the presence of O/O in parents is a determinant factor in the etiology of the development of O/O during childhood (Santiago et al., 2012; Danielzik et al., 2004; Moraeus et al., 2012; Mushtaq et al., 2011; Jääskeläinen et al., 2011; Toschke et al., 2005; Maddah & Nikooyeh, 2010). Another study shows that children of obese and overweight parents have an increased risk of obesity. Subjects with two obese parents are fatter in childhood and also have a stronger tracking pattern from childhood to adulthood. As the prevalence of parental obesity increases in the general population, child to adult tracking of BMI is likely to increase (Lake et al., 1997).

Unlike reports by other studies, we observed that the middle and high SL were positively associated with O/O in the population studied (Danielzik et al., 2004). Nevertheless, it is important to recall that we did not inquire about the educational level of parents, therefore a high SL could also reflect strong purchasing power, but not necessarily a high education level, a factor which has been observed to be negatively associated with the development of obesity (Santiago et al., 2012; Moraeus et al., 2012).

For the case of parents’ perception about obesity, nutrition and physical activity of children, we observed that parents understand important factors related to the prevention of childhood obesity. They perceived themselves as fundamental actors in interventions, but they were not able to carry out specific proposals for actions that influence the eating behavior and physical activity of their children. Thus, we believe that parents need to understand how children gain significant weight, until they finally become obese. This is an important step toward breaking the cycle, since it has been documented that the Mexican population of parents with overweight children tend to perceive them as having normal weight (Guevara-Cruz, et al., 2012). Parents can help prevent obesity in their own children only if they feel motivated (because they appreciate the health risks of obesity), know what to do (because they understand healthy eating and exercise habits) and comprehend that their children are at risk (because they recognize obesity when they see it). In this regard, Etelson, et al. (2003) demonstrated that parents, in general, do appreciate the health risks of childhood obesity, as evidenced by the manner in which respondents ranked these risks relative to other possible health risks.

Child interventions should include special events that target families. Because parents confer more responsibility to the school to promote healthy feeding and physical activity rather than addressing it themselves at home, future interventions need to target Mexican homes with education about eating habits, physical activity and parental feeding styles. As has been previously observed, the parenting style and care provided may be related to the presence of overweight or obesity in children (Golan, 2006; Pearce et al., 2010).

Based on parents’ views, their time availability limits their participation in school activities; they could partially accept their responsibility to solve the problem, but justified their lack of participation and commitment. Recognizing time as a limitation while justifying not being sufficiently involved is an obvious contradiction. The parents acquire their information through their experiences in the local
environment, mention barriers to the interventions and receive contradictory messages from different media about strategies to prevent childhood obesity.

It is necessary to start working to proactively develop parental involvement in their children’s health, promoting their social roles and modeling healthy eating and physical activity (Hesketh et al., 2005). As has been observed, adolescents who perceive these behaviors in their parents more easily adopt them (Crawford et al., 2010). Moreover, the family is the child’s closest social system and provides significant opportunities to help to prevent or treat overweight and obesity (Nowicka et al., 2007; Kalarchian et al., 2009). It is also important to improve environmental conditions to promote physical activities, active recreation, and access to balanced foods, in order so that not only children but the entire family have proper nutrition (Hesketh et al., 2005; Pocock et al., 2010).

An important advantage of our study is the parents’ desire to participate in an eating and physical activity intervention for children. Their suggestions affirmed those of both children and teachers to support the implementation of strategies in the school community and family environment (Sacher et al., 2010; Chen et al., 2010). The main strength of family interventions is to advise them to stay together and make collective decisions among every one to bring about results for all (Flodmark & Ohlsson, 2008). This is a critical step that has not been taken with the Mexican population; herein lies the importance of this study.

We also considered that it is critical for parents to be aware of the risk of an impaired quality of life for these Mexican children, as noted by other studies from different countries (Schwimmer et al., 2003). These general interventions seek to improve parental habits rather than bring about changes in children (Golan & Weizman, 2001), which can be challenging because of the resistance and limitations expressed by parents in this study, coinciding with others studies. Pocock et al. (2010) emphasize that the need for information and the parent’s motivation to prevent child obesity are the main factors in facilitating interventions, while a lack of time, motivation and commitment to encourage their children to exercise and to prepare healthy meals are the most difficult barriers to solve, considering the socioeconomic status of the populations.

A notable aspect of the interventions proposed is that they attempt to promote healthy lifestyles rather than to reduce weight. They implement behavioral interventions, social learning and the inclusion of the family system, with particular emphasis on parental knowledge about health and nutrition, thereby ensuring their “presence”, i.e. encouraging continual daily contact, serving as an authority figure and as a model for children’s health-related behaviors within the family atmosphere in order for children to become familiar with healthy habits, personal responsibility and taking control over their own health (Golan & Weizman, 2001).

One suggestion for further research is to complement the information with interviews and observations from the home, as well as to inquire about the educational levels of parents. In addition, further research could consider the possibility of triangulated information that includes data from children as well as other family members.

Awareness of the parents’ perspectives about alternative ways to prevent obesity in children in the school community supports the suggestions made by both the teachers and the children themselves. In addition, with knowledge of the parents’ perspectives, it was possible to identify their limitations to participate in health campaigns within the school context and to explore potential solutions to resolve such barriers.
Lindsay et al. (2006) suggests that preventing and controlling childhood obesity will require multifaceted and community-wide programs and policies, with parents playing a critical role. They argue that successful intervention efforts must involve and work directly with parents from the earliest stages in the child’s development to support healthy practices both in and outside the home.

Another factor that would be important to consider is recuperating Mexican cultural aspects of family eating. The UNESCO recently named Mexican food as a Cultural Humanity Heritage, which recovers healthy and nutritional foods such as beans, corn, leafy green vegetables and amaranth, all of which contribute to proper eating. This is one line of action we recommend for eating and nutritional education.

The results obtained show the need of future research to adequately assess changes made on behalf of entire populations, such as improvements in the types of foods available at schools and in the availability of safe places to run and play, as well as health effects and costs over several years. Since family members serve as models and reinforce and support the acquisition and maintenance of eating and exercise behaviors, family-based interventions are needed to modify these factors. It is essential that parents and children work together to prevent overweight, so as to respond to the need for effective tools to facilitate this cooperative effort.

**References**


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