Risk Factors for Overweight in Five- to Six-Year-Old Hispanic-American Children: A Pilot Study

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ABSTRACT *The objective of this study was to determine the prevalence of and possible risk factors for overweight in a sample of 5- to 6-year-old Hispanic (predominantly Mexican American) children in Chicago, Illinois, to see if overweight is more common in more highly acculturated immigrant families. There were 250 kindergarten students (92% of those eligible) attending two public elementary schools serving primarily Mexican American neighborhoods measured for height and weight. Consenting mothers were interviewed (n = 80) and measured (n = 38). The interview tool covered demography, acculturation, infant and toddler feeding practices, current eating patterns and food preparation habits, physical activity, and psychosocial family characteristics. Overweight was conservatively defined as weight-for-height at or above the National Center for Health Statistics 95th percentile. The data were used to describe the prevalence of overweight. Overweight and nonoverweight children were compared on all survey variables using appropriate statistical tests, with significance set at .05. There were 23% of the total sample of children (n = 250) and 26% of the subsample of children (those whose mothers were interviewed) who were overweight. Analysis limited to children in the subsample explored risk factors. The median score on the Acculturation Scale was 4.0 (range 2.4–10.4) on a scale of 2.4 (entirely not acculturated) to 12 (fully acculturated). There was no significant association between overweight and Acculturation Scale score. Overweight children were more likely than those not overweight to watch television for more than 3 hours during weekend days (48% vs. 22%, $P = .03$). Overweight children were also more likely to consume sweetened beverages (powdered drinks, soda pop, atole) daily (67% vs. 39%, $P = .03$). There was a trend indicating that free access to food at home increased the risk of overweight ($P = 0.06$). No other family- or child-level variables were related to overweight. Only 40% of mothers with an overweight child correctly assessed these children as overweight. Approximately one quarter of the children in the study were overweight. Our hypothesis that their obesity was linked to acculturation was not confirmed. Longer hours of child television viewing on weekends and higher levels of sweetened beverage consumption were important behaviors associated with the occurrence of overweight. These data should be considered when designing future studies in this population.*

KEYWORDS *Acculturation, Children, Hispanic, Obesity, Overweight.*

Presented in part at the 11th meeting of the Sociedad Latinoamericana de Nutrición (SLAN), Guatemala City, Guatemala, November 1997.

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INTRODUCTION

Childhood overweight has become a serious health concern in the United States.¹⁻⁷ Its prevalence has increased during the past 25 years, especially among poor children.⁸⁻¹¹ This is true even among children first entering school. When using the definition of overweight as weight-for-height of equal to the 95th percentile or above of the National Center for Health Statistics reference, approximately 8% of US 4- to 5-year-old children in 1994 were overweight.^{12,13} Hispanic 4- to 5-year-old children in the United States have a higher prevalence of overweight than those in other racial/ethnic groups.^{10,12} Although genetics are a strong influence on body habitus, rapid changes in the prevalence of overweight make it clear that, in most cases, it is the interaction between genetics and environment that results in clinical overweight. The contributing environmental factors merit increased investigation because they may lead to prevention opportunities.

After treating many overweight Hispanic children from families that recently immigrated to the United States, we hypothesized that young children from Hispanic families with a high degree of acculturation (i.e., families closest to the American culture) were the most likely to be overweight. The pilot study reported here was undertaken to (1) determine the prevalence of overweight among kindergarten-age predominantly Mexican American children in two Chicago, Illinois, elementary schools and (2) describe the relationship between child and family factors—including acculturation—and overweight in those children.

METHODS

Design and Subjects

A cross-sectional survey study design was used. The child participants were 5- to 6-year-old children in the kindergarten program in two inner-city Chicago public elementary schools, which serve mainly Mexican immigrant families. Data were collected at school during September–November 1996. The study was approved by the Children's Memorial Hospital Institutional Review Board.

Procedures

Child Data Collection Measurements in children were obtained according to recommended anthropometric protocols¹⁴ by a physician (A. J. A.) and two registered dietitians. For each subject, weight and height were obtained twice by the same measurer, and the results were averaged for use in analyses. (Triceps skinfold thickness was also measured in the 80 children for whom maternal data were collected, but these measurements were not used in the analyses presented here). Ages of the children were obtained from school records.

Maternal Data Collection We invited 250 mothers of children in the kindergarten program from both schools to participate in the study. Data regarding factors possibly related to obesity were obtained from the 80 mothers who agreed to be interviewed in person. Six Spanish-speaking trained (unblinded) interviewers administered the survey, which took an average of 40 minutes per interview. Height and weight of the 38 mothers who consented were measured at the time of the interview.

Questionnaire Components A new 81-item survey tool was compiled for use in the parent interviews. Whenever possible, questions were drawn from previously validated survey tools. Some new items were developed. Survey validation was planned using test-retest methods, with the second interview conducted by telephone. The survey was translated with Spanish and checked, using standard back translation methods. The study survey tool probes for risk factors for overweight in eight domains, described next.

The demography section requested information on the child and family. There were 15 items on the child (age, gender, country of birth, etc.) and 6 items concerning the mother (age, race/ethnicity self-identification, educational level, marital status, country of birth, and participation in financial aid programs).

The acculturation section included a 12-item validated Acculturation Scale,¹⁵ which describes language, media use, and social relations using Likert responses for each item. The scale ranges from 2.4 (entirely nonacculturated) to 12 (fully acculturated). It has a Cronbach α coefficient of .90, indicating very good reliability.¹⁵ The country of origin of the parents and grandparents of each child was obtained using questions adapted from the 20-item Acculturation Rating Scale for Mexican Americans. This scale¹⁶ has an α coefficient of .88. In this report, we use the term *more acculturated* to describe a person whose level of acculturation (as measured by the scale) indicated that the values, norms, attitudes, and behaviors may be more characteristic of the American culture.

Physical activity was covered in 12 questions about daily active and rest periods, the child's time spent at various levels of activity, and parents' participation in physical activities with the child. The time children spent on television viewing was assessed using the following question: "On average, how many hours per day does your child watch TV or videotape during weekdays?" and "On average, how many hours per day does your child watch TV or videotape during weekend days?" Mothers selected a response from the following options: never, ≤ 1 hour, 2–3 hours, 4–5 hours, 6–7 hours, ≥ 8 hours. Because reliable survey methods for assessing physical activity levels for young children were not available,^{17,18} the questions used were new.

Infant/toddler feeding practices were covered in nine questions related to breast-feeding history, introduction of solid foods, and the use of a bottle.

Current eating and food preparation habits were explored with 12 questions on food purchases, food preparation styles, and frequency of consumption of commonly used foods and beverages. We assessed consumption of sweetened beverage by asking "How often does your child drink each of the following beverages: regular soda, Kool-Aid, fruit punch, or atole [a typical sweetened beverage from Mexico]?" Possible answers were every day, 3–4 days a week, 1–2 days a week, and never. To assess children's access to food at home, we used the following question: "How often do you let your child get food or drink without asking permission?" Answer options were often, sometimes, and rarely.

Maternal attitudes and beliefs about obesity were covered in a section that evaluated the mother's perception of her own and her child's body habitus, mother's weight and height, and mother's opinions concerning obesity as a health problem. Five questions were included to evaluate maternal attitudes toward infant and child feeding practices; these used an adaptation of the 10-item questionnaire developed by Kramer et al. (its test-retest correlation coefficient is .95).¹⁹

Psychosocial family characteristics included 12 new questions. Data were collected on household composition, family problems, and social and familial interactions.

Perceived self control over body weight was explored by focusing on the mother and using the Weight Locus of Control Scale.²⁰ This instrument has an acceptable test-retest reliability of .67.

Definitions

Overweight for children was based on the original National Center for Health Statistics, Centers for Disease Control and Prevention weight-for-height reference growth curves.^{13,21} *Overweight* was defined as weight-for-height equal to or greater than the 95th percentile of the respective gender as used and recommended for pre-schoolers.^{22,23} Weight-for-height percentiles were calculated for each child using the anthropometry module in Epi Info software.²⁴ Children were divided in two groups for analysis: the overweight group, with children with weight-for-height equal to or greater than the 95th percentile; and the nonoverweight group, with children with weight-for-height less than the 95th percentile. Overweight and obesity for mothers were defined by body mass index (BMI) categories (BMI = weight in kilograms/height² in meters).²⁵ Overweight was defined as a BMI of 25–29.9 and obesity as a BMI of 30 or greater.

Data Analysis

Data were analyzed using SPSS for Windows (release 10.0.5, SPSS Inc., Chicago, IL). Statistical significance was defined as $P < .05$; a statistical tendency was defined as $.05 < P < .10$.

Prevalence of overweight in the kindergarten children and mothers is described. The representativeness of the maternal subsample (those whose mothers were interviewed) was assessed based on child weight, height, age, and gender using χ^2 and t test. Comparisons of overweight and nonoverweight children on survey variables were done using t test, Mann–Whitney test, Fisher exact test, and χ^2 test. Spearman's or Pearson's correlation coefficient, as indicated, was used to measure the relationship between continuous variables. Accuracy of perception of mothers about their own weight category was examined using the kappa statistics.

Variables significantly associated with child overweight status (overweight vs. nonoverweight) were considered in a logistic regression model. The forward stepwise method was used, with variables entering and remaining in the model at $P < .05$. Interaction terms were examined. We further used one-way analysis of variance (ANOVA) models to examine the relationship of these same independent variables with child weight-for-height percentile (dependent variable).

RESULTS

Of the 271 children from 270 families attending the two kindergarten school programs, 250 children (92%) were measured. Overall, 23% of the children were overweight (Table 1).

We interviewed 80 mothers (32%); 38 (48%) of these were measured for height and weight. One mother with two children in the total sample was interviewed. Data regarding only one of her children, randomly selected, were included in subsample analysis. Test–retest reliability data were not analyzed because of low response.

Representativeness of Subsample

Children with and without interviewed mothers were comparable on gender (50% male vs. 51% male, respectively, $P = .89$), mean weight (22 ± 5.1 kg vs. 22 ± 4.5 kg, $P = .9$), and prevalence of overweight (26% vs. 21%, $P = .37$). Their median ages differed statistically, but not clinically (5.5 [range 5.0–6.9] vs. 5.2 [range 5.2–6.9] years, MWU $P < .05$). The mean height was statistically different (112 ± 5.2 cm vs.

TABLE 1. Weight distribution of children

Indices and percentiles	Boys (n = 127), %	Girls (n = 123), %	Total (N = 250), %
Weight-for-height*			
<5th percentile	2	1	1
5th to <95th percentile	78	74	76
≥95th percentile	20	25	23
Median percentile	69	81	75
Weight-for-age*			
<5th percentile	3	2	3
5th to <95th percentile	78	76	77
≥95th percentile	19	22	20
Median percentile	56	76	64

*Using National Center for Health Statistics percentiles.¹³

114±4.8 cm, *t*-test *P*=.02); however, the mean weight-for-height percentile was similar (69.5±28 vs. 66.2±27, *P*=.37).

Family Characteristics

Characteristics of respondent families are shown in Table 2. Among the 80 survey respondents, 86% were not born in the United States. Among the 11 children with a mother born in the United States, 10 had a father or grandparent born in Mexico, Puerto Rico, or Guatemala. In contrast, most children (79%) were born in the United States. Most mothers did not complete high school, were married, and received public aid. The median number of household members was 5 (range 2–12).

Relationships With Child Overweight Status

The prevalence of overweight children was similar regardless of mother’s birthplace (36% US-born mothers vs. 25% not born in the United States, *P*=.31). The prevalence

TABLE 2. Psychosocial characteristics of interviewed subsample (N = 80)

Attribute	%
Mother’s country of birth*	
United States	14
Mexico	79
Puerto Rico	4
Guatemala	4
Child’s country of birth	
United States	79
Mexico	19
Puerto Rico	2
Mother married	70
Mother with <12 years education	71
Family receives public aid	81
Mother is a main caretaker	95

*Percentages do not total to 100 because of the effects of rounding.

of overweight children was also similar in groups defined by other family characteristics (married, maternal education, receipt of public aid, number in family, mother as primary caretaker).

There was no significant correlation between acculturation score and child weight-for-height percentile (Spearman's $r=0.08$, $P=.49$).

Responses to 22 survey items for the sample are shown in Table 3. Mothers of overweight and nonoverweight children had responses that differed significantly for only 3 items. Overweight children were reported to watch more than 3 hours of television during weekend days more often than nonoverweight children (48% vs. 22%, $P=.03$). Overweight children were more likely than the nonoverweight children to consume a sweetened beverage on a daily basis (67% vs. 39%, $P=.03$). There was a trend suggesting that overweight children more often had free access to food at home (86% vs. 64%, $P=.06$).

Mother's Opinions

Overall, 96% of mothers assigned their child to the nonoverweight group. Of mothers of children in the nonoverweight group 95% correctly assessed their child as not overweight, and only 40% of mothers of overweight children correctly assessed

TABLE 3. Survey, responses (N = 80)

Survey items	Responses
Physical activity patterns of children	
Watch TV >3 hours weekend days, % yes	29%
Spend >3 hours/day in outdoor activities, % yes	42%
Watch TV >3 hours week days, % yes	11%
Number of months parents participate in outdoor activities with children (median, range)	6 (0–12)
Number of days/week parents participate in outdoor activities with children (median, range)	3 (0–7)
Mean hours asleep (SD)	10.9 (1.2)
Infant/toddler feeding practices	
Age at stopping bottle feedings, months (median, range)	24 (6–48)
Age at solid food introduction, months (median, range)	7 (3–24)
Ever breastfed	41%
Eating habits of children	
Drinks milk every day	89%
Daily fruit juice consumption	70%
Child drinks whole milk	69%
Daily intake of sweetened beverages (excluding fruit juice)	46%
Mother prepares food in style of country of origin	56%
Calorie-containing additives are added to milk	60%
Child prefers food in style of country of origin, % yes	26%
Daily milk intake, ounces (median, range)	21 (4–60)
Maternal feeding attitudes and beliefs about obesity	
Children with free access to food	70%
Food used as a reward	66%
Overweight viewed as a major health problem	64%
Mother encourages food intake	44%
Always allows between-meal eating	18%

their child as overweight (Fisher exact test, $P = .001$). Among mothers with a child in the overweight group, 40% did not consider overweight to be a child health problem.

There was a tendency suggesting that more acculturated mothers were more likely to perceive themselves as overweight (86% vs. 62%, Fisher exact test, $P = .050$). Mothers who perceived themselves as overweight were more likely to have an overweight child (35% vs. 9%, $P < .01$). Questions exploring mother's sense of self-control over body weight were not analyzed because of a small sample size.

Multivariate Modeling

We examined the relative importance of associations with overweight using logistic regression. Three factors were considered in the models: hours of television viewing on weekends (more than 3 hours vs. 3 hours or less), consumption of sweetened beverages (daily vs. less than daily), and maternal perception of their own weight (normal or low vs. overweight or very overweight). Among the three factors considered, two entered and remained in the final model: consumption of sweetened beverages and maternal perception of personal weight. Children with daily consumption of sweetened beverages were more likely to be overweight than those with less-than-daily consumption of sweetened beverages (adjusted odds ratio [AOR] 3.7, 95% confidence interval [CI] 1.2–11.0). Children of mothers who perceived themselves to be heavier were more likely to be overweight than children of mothers who perceived themselves as having normal or low weight (AOR 5.9, 95% CI 1.2–29.0). There were no significant interactions.

We further examined the relationship of these three same factors (hours of television viewing on weekends, consumption of sweetened beverages, and maternal perception of their own weight) to the range of weight-for-height percentiles using ANOVA. In one-way ANOVA analyses, only television viewing on weekends was significant, explaining 4% of the variance ($F = 4.5$, $P = .04$).

Exploratory Assessment of the Relationship of Child Overweight to Maternal Weight Status

These data on the relationship of child overweight to maternal weight status are only exploratory because they are limited to the responses of the 38 mothers who were measured. Most mothers were overweight or obese (13% normal weight, 43% overweight, and 44% obese). Among normal weight mothers, 60% correctly classified themselves as not overweight, and 76% of overweight/obese mothers considered themselves overweight or obese (kappa $P = .134$).

The accuracy of the perception was tested among the 17 mothers who estimated their own height and weight and had measurements obtained. Self-reported BMI and actual BMI were significantly correlated (Pearson correlation, $r = 0.79$, $P < .001$).

Other Findings

The distributions of other survey responses, although not related to overweight in this study, are potentially relevant for clinical nutritional management to promote child health. These include the frequent use of calorie-containing additives in milk (60%) and the frequent use of food as a reward (66%).

DISCUSSION

This pilot study examined associations with overweight in very young Mexican American children. It did so using established and new data instruments and careful

measurements. Although it was a pilot study, it provides new information about how these suspected contributors interact, which should be useful in future research.

Approximately one quarter of this group of predominantly Mexican American preschool-aged children were overweight. This is consistent with previous studies, in which Hispanic children living in the United States were found to have the highest prevalence of overweight when compared to other population subgroups.^{12,26} Genetic, demographic, dietary, and behavioral factors have been implicated as contributors to this pattern.^{10,11,27-29}

Child Habits and Dietary Patterns

In agreement with other studies,^{30,31} we found a statistically significant positive association between long hours of television viewing and prevalence of overweight. Although the exact amount of television viewing was not assessed, the finding of a positive association between prevalence of overweight and television viewing during weekends is new and bears further study.

Daily fruit juice consumption was reported for a majority of overweight and nonoverweight children, and daily consumption of sweetened beverages was significantly higher among overweight children. This suggests that consumption of sweetened beverages might be a contributing factor to high rates of overweight among young Hispanic children. Because we did not separately assess the volume of juice or sweetened beverage intake, this study does not add to the current controversy regarding the contribution of fruit juice intake to childhood obesity.^{32,33} The data also suggested an association between free access to food and overweight, a trend that merits further study.

To our surprise, we did not identify physical activity factors that contribute to overweight. Indeed, reported activity levels of overweight and nonoverweight children were similar. This is consistent with the current state of knowledge; that is, the linkage between physical activity and overweight in young children is not yet clear.³⁴⁻³⁶ This may reflect still-weak means to measure activity levels in growing children.

The data showed that most children spent most of the day indoors. This may be related to two local factors. First, Chicago weather conditions are often adverse for outdoor play, especially for immigrants from warmer climates. Second, poor safety conditions in the city neighborhoods in which these children live often lead to restricted outdoor activities. It has been previously suggested that physical activity can be increased by encouraging children to spend more time outdoors,³⁷ but this may be difficult to accomplish for children such as those in this study. More detailed information on indoor and outdoor activities is needed to clarify the role of specific patterns of activity in the development of overweight.

The use of calorie-containing additives in milk and the use of food for rewards were both frequently reported and have not been previously reported among Hispanic children. Further study is warranted to describe and understand these patterns and their health implications (related to weight, nutritional sufficiency, caries, and other outcomes), as well as their ethnic content, if any.

Maternal Perceptions and Acculturation

The study data did not support our hypothesis that the acculturation of mothers is related to the prevalence of overweight in their children. The finding that most mothers of overweight children did not recognize their child's current overweight status suggests that the inability to recognize child overweight accurately could affect a mother's desire to make changes to reduce their child's rate of weight gain.

Mothers who perceived themselves as overweight were more likely to have overweight children, and there was a trend for more acculturated mothers to see themselves as overweight. This suggests a possibility that merits further study, that mothers who are in the process of becoming acculturated apply the thin adult female body ideal of the US modern/postmodern culture to themselves and at the same time apply the chubby child body ideal from their traditional (old) culture to their children. To assess this, it would be necessary to do repeated acculturation measures on the mothers and to relate changes in (or slopes of change in) acculturation levels to child overweight.

It may be that perception of child and maternal weight are unmeasured aspects of maternal acculturation that include the acquisition of a thin ideal body image for themselves before they lose their traditional chubby body ideal for their children.³⁸ This would be a more complex and subtle explanation for excessive overweight in young Hispanic American children.

There are some other data that lend credibility to this notion. The inability of mothers to recognize overweight accurately was also found in a different subpopulation in a recent study by Baughcum et al.³⁹ In that study, maternal perceptions of overweight in preschool children of low-income non-Hispanic black mothers were evaluated. The main result was that nearly all mothers regarded themselves as overweight, and most low-educated mothers did not perceive overweight in their children.³⁹ Jain et al.⁴⁰ showed that low-income African American mothers did not perceive or define overweight or obesity according to the medical standards. Rather, these mothers viewed a child as overweight when the child was teased about his or her weight or when overweight limited physical activity. When taken with the results reported here on predominantly Mexican American mothers, these studies suggest that distorted perception of children's overweight merits further assessment among all low-income mothers.

There are few studies examining the relationship between obesity and acculturation among Hispanic immigrants in the United States. In a study to determine the association of acculturation with risk factors for obesity in Peruvian immigrants, Lizarzaburu et al.⁴¹ found a significant linear association between acculturation and BMI in men and physical activity in women. Cantero et al.⁴² found that acculturation was a very strong negative factor for health practices among middle-aged Hispanic women. In a study assessing the correlation of acculturation and dietary practices and health perceptions among Hispanic mothers and their adult daughters, it was found that daughters had a higher fat intake and were more acculturated than their mothers. Also, dietary fat intake was negatively related to their perception of health status.⁴³ Further research will be needed to explore whether mothers' perceptions of adiposity vary with ethnicity at similar levels of socioeconomic status, and whether mothers equally perceive overweight in daughters and sons.

Methodological Limitations

The survey included a relatively small sample size. This limited the statistical power of the analyses of possible risk factors, particularly those involving maternal weight. A type 2 error may thus obscure other relevant factors. To determine this, replication of the study in a larger and more diverse sample is needed. A future, larger study can focus on television viewing, ad libitum access to food, maternal perception of body image and obesity, and acculturation; it should obtain more detailed information on diet and exercise patterns and on family attitudes toward these items.

Because both the schools and the children were unfamiliar with triceps skinfold measurements, to avoid upsetting children, we decided to obtain these measurements only when the mother was present for the interview. However, because the skinfold measurements were limited to only the 80 subjects with interview data, we did not use the triceps skinfold measurements to describe the distribution of overweight in the study sample.

Children whose mothers were not interviewed were much like those whose mothers were interviewed; this is reassuring regarding the generalizability of the interview data to the full study sample. Still, there could be response biases that are not associated with the demographic variables on which the two groups are comparable, and this must be kept in mind when interpreting the data.

We sought to establish test-retest reliability for the survey tool, but a low rate of response to second interviews made this impossible. This evaluation should be undertaken before the tool is used again.

CONCLUSIONS

Approximately one quarter of this group of predominantly Mexican American preschool-aged children were overweight. Our hypothesis that their obesity was linked to acculturation was not confirmed. Longer hours of child television viewing on weekends and higher levels of sweetened beverage consumption were important behaviors associated with the occurrence of overweight. These may be alterable contributors to the development of overweight in Hispanic children. Many mothers did not accurately perceive when their children were overweight. Because the factors that differed substantially between the overweight and nonoverweight children in the study explained only a very small proportion of the variation in children's weight, the search must continue for multiple weaker—and perhaps previously unrecognized strong—explanatory factors.

ACKNOWLEDGEMENT

We thank Linda Somers, Sue Cowen, and Sergio Grajeda for their help in the development of this study. We also thank Nancy Irizari, Betty Sheldrick, Peter Hosfald, and Consuelo Hosfald, who provided their volunteer help.

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