The Association between Early Childhood Overweight and Maternal Factors

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Abstract

Background: Early childhood obesity, like other health disparities, disproportionately affects low-income populations. The purpose of this study is to determine the association between maternal sociodemographic factors and child overweight and obesity in a sample of low-income Mexican Americans.

Methods: The current study is a secondary analysis of baseline data that were collected as part of a longitudinal study of 374 children aged 12–24 months receiving Women, Infants, and Children (WIC) services in a large metropolitan area in central/south Texas. Measures used in this secondary analysis were: Measured weight and height of the child and mother to calculate weight-for-stature and BMI, respectively; maternal sociodemographic variables (age, education, marital status, employment status, and nativity); maternal acculturation level; and child breastfed status. Descriptive statistics are reported as frequencies, percentages, means, and standard deviations (SD). Chi-squared Fisher exact tests assessed differences in maternal factors by child weight (healthy weight and overweight). Odds ratios (OR), 95% confidence intervals (CI), and levels of significance are reported.

Results: Of the 372 mothers, most were young (mean age 26.1 years, SD = 6.1), 47.3% had graduated high school, 33.6% were employed at the time of the study, and 72.1% were U.S. born. No significant differences were observed for the maternal factors by child weight-for-stature *z*-score. However, maternal BMI statistically differed by child weight. Healthy weight mothers were more likely to have healthy weight children than overweight mothers. Maternal nativity and maternal acculturation were not statistically associated with child weight in this sample of low-income Mexican Americans.

Conclusions: The findings of the current study reinforce the importance of addressing the influence of maternal sociodemographic factors on child weight, in particular, maternal weight. A more comprehensive investigation of ecological factors' influence on obesity onset and control in young Mexican-American children is needed.

Introduction

Early childhood obesity, like other health disparities, disproportionately affects low-income populations.¹ According to the 2007–2008 National Health and Nutrition Examination Survey (NHANES), the prevalence of overweight and obesity ($\geq 85^{\text{th}}$ percentile using CDC standards for BMI) among non-Hispanic white children aged 2–5 years was 17.4% and was 27.7% for Hispanic preschool children.² Childhood experiences set an important life trajectory with regard to food choice and physical activity behaviors.³ In particular, early childhood is a time of transition from dependent feeding to independent feeding, and practices established during this

time period may profoundly influence food preferences and weight status throughout life.⁴

Ecological models have been used to understand and intervene on the intrapersonal, interpersonal, socio-cultural, built, and policy environments that interact synergistically to influence a person's health decisions, behaviors, and, ultimately, outcomes.^{5,6} In short, these multifactor environments interact to foster or abate a health behavior.^{5,6} The relationship between acculturation, a sociocultural environment component, and obesity is poorly understood. Acculturation, adaptation of culture and values of a host country by an immigrant group, is believed to influence health outcomes.^{7–9} Several studies have examined acculturation in adult Hispanics and obe-

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sity with mixed findings.^{7,8,10} Data from the 1988–1994 NHANES revealed that among 2791 Mexican-American men and women, waist circumference varied by country of birth and level of acculturation. Mean values for waist circumference were smallest in Mexican-born adults, followed by U.S.-born English-speaking adults, and largest in U.S.-born Spanish-speaking adults.⁷ Results from the Massachusetts Hispanic Elderly Study showed that Puerto Rican and Dominican elders who consumed traditional Caribbean Hispanic foods (rice, beans, and starchy roots) were less acculturated and had higher mean values for waist circumference than individuals who consumed nontraditional Caribbean Hispanic foods.⁸ A systematic review on acculturation and diet in Hispanics reported that acculturation is not associated with dietary fat intake, yet less acculturated Hispanics consumed more high-fiber foods (fruit, rice, and beans) and less sugar-sweetened beverages than more acculturated Hispanics.¹¹ A body of research has shown that acculturation is positively associated with obesity among Hispanic adults,^{7,11} but the results for children remain mixed.¹²

Data from the Early Childhood Longitudinal Study Kindergarten Class of 1998–1999, a nationally representative longitudinal study with diverse ethnic groups including Hispanic and Asian immigrants, suggest that economic development of the country of origin, socioeconomic status in the United States, and the assimilation process/U.S. generation all play a role in child weight.¹² This finding may help explain the mixed results on acculturation and weight status or weight-related outcomes in children. How these ecological factors act synergistically to catalyze the onset of unhealthy behaviors in children of immigrants continues to be poorly understood. Acculturation (as measured by length of time in the United States) in Hispanic adults is positively associated with obesity. The authors speculate that maternal acculturation may have a similar effect on her child's weight. Because young children are dependent on their parents or caretakers for their basic life needs, understanding the interpersonal and sociocultural factors of the parents (*i.e.*, mothers because they tend to be the primary caretakers of children), and its relationship with childhood overweight and obesity warrants further investigation.¹²

Given that Mexican-American preschool children have an alarming prevalence of obesity,² there is an unambiguous need to examine the association between maternal sociodemographic factors that may influence the risk of overweight and obesity in this group. The purpose of this study is to determine the association between maternal sociodemographic factors and child overweight and obesity in a sample of low-income Mexican Americans. The authors hypothesize that interpersonal and sociocultural factors, in particular, maternal acculturation to the U.S. mainstream culture, maternal U.S. nativity, and a high maternal BMI, are positively associated with the prevalence of child overweight and obesity (weight-for-stature values $\geq 85^{\text{th}}$ percentile using CDC standards for BMI).

Methods

Study Design and Participants

The current study is a secondary analysis of baseline data that were collected as part of a longitudinal study of 374 children aged 12–24 months receiving Women, Infants, and Children (WIC) services in a large metropolitan area in central/south Texas. Study measures for the longitudinal study were obtained at three time points: Baseline, 6 months, and 12 months. Data used for this cross-sectional study were baseline measures. Trained bilingual (English/Spanish) research personnel enrolled mothers of eligible toddlers during biannual WIC certification clinic visits. Children were eligible to participate in the parent study if: (1) Their mothers identified as Hispanic (mothers were asked to self-identify their Hispanic subgroup); (2) they were 12–24 months old at enrollment; and (3) they did not have any metabolic illness, major disease, or neurological or developmental delays. Because all study participants were WIC families, all mothers had incomes at or below 185% of the federal poverty line. Detailed descriptions of the study, procedures, and measures are reported elsewhere.^{13–15} Informed consent was obtained for all mother–child dyads. All study materials and protocols were approved by the internal review boards of the University of Texas Health Science Center at San Antonio, San Antonio Metropolitan Health District, and the Texas Department of State Health Services.

Measures

Study questionnaires were interviewer- and self-administered, dependent on the preference of the participant. All study materials, *i.e.*, questionnaires, were available in both English and Spanish, and participants completed questionnaires and interviews based on their preference. Measures used in this secondary analysis were: Measured weight and height of the child and mother to calculate weight-for-stature and BMI, respectively; maternal sociodemographic variables (age, education, marital status, employment status, and nativity); maternal acculturation level; and current breastfeeding status. In the current study only children younger than 24 months were included. For children, healthy weight was considered as $< 85^{\text{th}}$ percentile weight-for-stature, whereas the prevalence of overweight and obesity was defined as $\geq 85^{\text{th}}$ percentile weight-for-stature based on the 2000 CDC growth charts.¹⁶ Sociodemographic variables and other maternal factors were obtained from mothers and WIC records. The Acculturation Rating Scale for Mexican Americans (ARSMA), a 20-item Likert scale assessed acculturation level by primary language use, ethnic identity, ethnic interaction, and generation in the United States.¹⁷ The internal reliability of the ARSMA as reported by Cuellar et al., is 0.88 (Cronbach alpha)¹⁷ calculated by the sum of the numerical responses divided by 20. Higher scores on the ARSMA suggest a conventional American orientation, whereas a lower score indicates a Mexican orientation.

Analysis

Statistical analyses were performed using the statistical software package SPSS (version 17.0, Chicago, IL). Child weight-for-stature values were converted into weight-for-stature *z*-scores.¹⁶ Two children who were underweight based on the CDC age and sex growth charts were dropped from all analyses (*n* = 372). Descriptive statistics are reported as frequencies, percentages, means, and standard deviations (SD). In the current study, overweight refers to both overweight and obese. Chi-squared Fisher exact tests were performed to select the maternal factors that should be included as covariates in the multivariate model.¹⁸ Maternal factors with a *p* value ≤ 0.25 were retained for further analysis. A multivariate logistic regression analysis was then performed in which child weight (healthy weight, the referent, vs. overweight) was regressed onto maternal acculturation level, maternal nativity, and maternal BMI. Odds ratios (OR), 95% confidence intervals (CI), and levels of significance are reported. A two-sided significance level of 0.05 indicated statistical significance. Acculturation level was evaluated as a continuous variable whereas maternal nativity and maternal BMI were dichotomous (U.S. born and overweight, the most frequent categories, were the referent groups). The mean ARSMA score was 2.96 (SD = 0.88; range = 0.95–4.70). Values for skewness (−0.664) and kurtosis (−0.606) indicated sufficient variability within this sample for this measure. *Post hoc* analyses were performed to delineate the association between maternal BMI and child overweight, where maternal BMI was categorized into normal weight (BMI <25 kg/m²), overweight (BMI = 25–29.9), and obese (BMI ≥30 kg/m²).

Results

Characteristics of the participants are displayed in Table 1. Of the 372 mothers included in the present study, most were young (mean age 26.1 years, SD = 6.1), 47.3%

Table 1. Demographic Characteristics of the Participants (N = 372)

	Mothers	Children
Age, mean (SD)	26.1 y (6.1)	17.5 months (4.1)
High school graduate	168 (47.3%)	—
Married	155 (44.0%)	—
Employed	117 (33.6%)	—
U.S. born	248 (72.1%)	—
English questionnaire completed	297 (80.1%)	—
ARSMA score, mean (SD)	2.96 (0.88)	—
BMI, mean (SD)	30.1 (7.3)	18.1 (1.7)
Breastfed child	21 (6.0%)	—

SD, Standard deviation; ARSMA, Acculturation Rating Scale for Mexican Americans.

had graduated high school, and 33.6% were employed at the time of the study. Most of the mothers were U.S. born (72.1%), 26.4% (*n* = 91) of the mothers were born in Mexico, and 1.5% (*n* = 5) of the mothers were born in Central America. Most of the mothers were not currently breastfeeding their child (94%). The majority of the infants and toddlers had a healthy weight (57.8%); however, 74.5% of the mothers were overweight.

Chi-squared Fisher exact tests compared maternal factors by child weight-for-stature *z*-score (results shown in Table 2). No statistically significant differences were observed for the maternal sociodemographic factors by child weight-for-stature *z*-score. Even though foreign-born mothers had a lower mean BMI (29.0, SD = 7.7) than U.S.-born mothers (mean BMI was 31.4, SD = 6.6), maternal nativity was not statistically different by child weight-for-stature *z*-score. However, maternal BMI statistically differed by child weight. Healthy weight children had mothers who were both healthy weight and overweight, but overweight children had mostly mothers who were overweight (*p* value = 0.003). Data available indicate that most of the children were not breastfed, and breastfed status did not differ by child weight-for-stature *z*-score (*p* value = 0.496).

Table 2. Comparison of Maternal Factors by Child Weight Status (N = 372)

Maternal characteristics	Child healthy weight <i>n</i> (%)	Child overweight ^a <i>n</i> (%)	<i>P</i> value
Age			
<25	95 (45.5)	70 (45.8)	0.520
≥25	114 (54.5)	83 (54.2)	
High school graduate			
No	110 (53.9)	77 (51.0)	0.593
Yes	94 (46.1)	74 (49.0)	
Marital status			
Unmarried	110 (54.7)	87 (57.6)	0.664
Married	91 (45.3)	64 (42.4)	
Employment status			
Not employed	131 (65.5)	100 (67.6)	0.731
Employed	69 (34.5)	48 (32.4)	
Nativity			
U.S. born	139 (69.5)	109 (75.7)	0.225
Foreign born	61 (30.5)	35 (24.3)	
BMI			
<25	63 (31.5)	25 (17.2)	0.003
≥25	137 (68.5)	120 (82.8)	
Breastfed child			
No	188 (93.1)	142 (95.3)	0.496
Yes	14 (6.9)	7 (4.7)	

Frequencies that do not sum to the total *N* represent missing data.

^aChild overweight includes both overweight and obese.

Multivariate logistic regression was used to examine the association between child weight and maternal factors (results shown in Table 3). Maternal acculturation, assessed by the ARSMA, and maternal nativity were not statistically associated with child weight. However, maternal BMI predicted child weight. Normal weight mothers had a significantly lower odds of having an overweight or obese child compared to overweight or obese mothers (OR = 0.46; 95% CI 0.27–0.78). This is because of the nonequivalence of risk and odds.

Post hoc analyses (data not shown) stratified by maternal weight status revealed that obese mothers were more likely to have overweight children compared to normal weight mothers (OR = 2.50; $p = 0.002$; 95% CI 1.41–4.43). However, overweight mothers were not more likely than normal weight mothers to have overweight children (OR = 1.80; $p = 0.065$; 95% CI 0.964–3.355).

Discussion

The purpose of this study was to enlarge the knowledge base regarding the association between maternal sociodemographic factors and child weight in a sample of low-income Mexican Americans. This study is unique in that it is one of very few studies that used data obtained from low-income Mexican Americans whose prevalence of overweight and obesity is significantly higher compared to the general population, focused on maternal sociodemographic factors, and provides further evidence of the association between maternal and child weight status, in particular, in early childhood. This study examined the relationship between maternal acculturation, maternal nativity, and maternal BMI on early childhood overweight and obesity.

Of the three maternal sociodemographic factors (maternal acculturation, maternal nativity, and maternal BMI) studied, only maternal BMI was positively associated with child weight status. In this sample of low-income Mexican Americans, a high maternal BMI was associ-

ated with child overweight. Contrary to a recent study conducted with mother–child pairs of primarily Central American, Puerto Rican, and Dominican Republic descent,¹⁹ a high acculturation level (native language use) was not predictive of child overweight. Sussner et al. reported that at age 24 months children of Spanish-speaking only mothers had higher BMI z -scores than children of bilingual or English-speaking only mothers.¹⁹ Other measures of acculturation in the Sussner et al. study were not associated with child BMI z -scores.¹⁹ However, our study findings were similar to a cross-sectional study with 250 low-income kindergarten children of Mexican descent in the Midwest.²⁰ Ariza et al. reported that maternal acculturation level (gauged by a 12-item scale) and maternal nativity were not associated with child overweight (defined as $\geq 95^{\text{th}}$ percentile for BMI based on sex and age).²⁰ They did, however, find that overweight children were more likely to watch television for more than 3 hours during the weekend and consume sugar-sweetened beverages daily as compared to children with $< 95^{\text{th}}$ percentile for BMI based on sex and age.²⁰

The current study found that maternal weight, in general, plays a role in child weight regardless of acculturation level. Even though Mexican Americans may have a genetic predisposition to obesity and other health outcomes, environmental influences play a larger role in the onset and outcome of childhood obesity²¹ because most populations worldwide are genetically stable.²² The study sample was fairly homogeneous in socioeconomic status and country of birth (most were U.S. born), but sufficient variability existed regarding acculturation level. The Center for Health Assessment of Mothers and Children of Salinas (CHAMACOS) study reported similar findings regarding a correlation between maternal weight and child weight as well as a lack of association between acculturation (*i.e.*, maternal length of residence in the United States) and child weight.^{23,24} The CHAMACOS investigators concluded that obesity, an adverse health outcome, may signify an increase in socioeconomic status among immigrants.²³ Immigrant families may more easily afford foods of poor nutritional quality (high-energy, low-nutrient foods) due to their higher earnings in the United States compared to their earnings in their country of origin.

Furthermore, this study provided further evidence for a lack of an association between acculturation and child weight status among young children of Mexican descent. Immigrants and their children may tolerate and/or accept adverse health decisions, health behaviors, and environments, which may result in adverse health outcomes because of their desire to attain or even emulate the attainment of the American Dream (economic prosperity or improvement compared to previous generations). The pursuit of the American Dream and the concurrent adoption of unhealthy lifestyle practices by immigrants and their families (“American Dream Paradox”) permit and facilitate the negative influence of poor nutritional habits, physical inactivity, and the lack of health policies that

Table 3. Relationship between Child Weight ($\geq 85^{\text{th}}$ Percentile Weight-for-Stature) and Maternal Sociodemographic Factors (N = 372)

	Odds ratio	95% CI	p value
Acculturation (ARSMA)	0.73	0.48–1.11	0.139
Maternal nativity			
U.S. born ^a	1.0	—	0.095
Foreign born	0.50	0.22–1.13	
Maternal BMI			
≥25 ^b	1.0	—	0.004
<25	0.46	0.27–0.78	

^aReferent was U.S. born.

^bReferent BMI was ≥ 25 .

ARSMA, Acculturation Rating Scale for Mexican Americans.

promote equitable healthcare access, health education and promotion, and health prevention strategies.

Additionally, it may be that immigrants are no longer arriving to the United States with traditional lifestyle behaviors, often presumed to be healthy, due to globalization and nutrition transition in developing countries. Hence, recent immigrants may be at risk for or are overweight or obese prior to their arrival to the United States rather than later. The loss of traditional lifestyle behaviors prior to U.S. immigration may contribute to the null association between acculturation and child weight status because children of these parents may have started the acculturation process earlier or may acculturate faster. Children may also be more susceptible to environmental factors than their parents because of their ability to learn and adopt new behaviors more readily than adults. More research is needed to delineate how and why interpersonal, sociocultural, built, and policy environments affect at-risk groups' health decisions, health behaviors, and, most importantly, health outcomes.^{5,6}

Another crucial area of investigation, but outside of the scope of the current study, is the impact of food and nutrition policies on child development, growth, and health behaviors. Food and nutrition policies reside at the macrosystem level. The WIC program is funded by the United States Department of Agriculture, and the appropriations provided by the federal government each year govern the priority and number of clients served yearly, as well as the eligibility guidelines. In October, 2009, a WIC policy change, the Interim Rule, implemented by the 90 WIC State Agencies, significantly altered the content of food packages made available to eligible women and children.²⁵ Food packages now offer an increased provision of fresh and frozen fruits, vegetables, and whole grains, reduced portions of foods high in saturated fat such as whole or 2% milk, cheese, eggs, the elimination of infant fruit juice, as well as the delayed introduction of infant cereal. Furthermore, one area of WIC policy that is debated among healthcare providers for low-income populations is the provision of infant formula to WIC infants. Some healthcare providers believe that breastfeeding rates in WIC clients would improve if infant formula was not provided to eligible infants.²⁶ These examples of food policies at the national level illustrate how important policy initiatives can impact preschool children's healthy eating and the childhood obesity epidemic.

The present study is limited in that it is a cross-sectional study based solely on data collected from 374 low-income Mexican American mother-child pairs receiving WIC services in a large metropolitan area in central/south Texas and may not be generalizable to other Hispanics or Mexican Americans in other geographic locations or with other socioeconomic factors. The study design precludes causal confirmation and may be viewed only as an exploratory analysis. Additionally, the self-report measures are subject to bias. Mothers may have altered their

responses based on recall bias, social desirability, or both. Moreover, research with other Hispanic subgroups as well as Mexican Americans in other locations, a larger sample size, with more robust measures of maternal sociodemographic factors should be conducted in various settings. At the time of data collection for the parent study, the ARSMA was the most feasible tool to administer; however, orthogonal conceptualizations of acculturation are now more commonly used.^{27,28} The narrow measurement of acculturation in the current study could have restricted the role of acculturation on child weight outcomes. Data on breastfeeding practices, an important factor in the onset of child overweight,^{26,29} in the current analysis were restricted; in particular, child breastfed status was determined by a yes/no item, and data on duration were not available. Hence, the limited available data on breastfeeding practices in this sample of Mexican Americans should be seen as a limitation. Finally, the maternal factors such as these examined are only a subset of a wide range of home environment factors that may influence child obesity.³⁰

Conclusion

In summary, healthy weight mothers were more likely to have healthy weight children than overweight mothers. Maternal nativity and maternal acculturation were not statistically associated with child weight in this sample of low-income Mexican Americans. The findings of the current study reinforce the importance of addressing the influence of maternal sociodemographic factors on child weight, in particular, maternal weight. For U.S. children of Mexican descent, early childhood is a crucial developmental stage for monitoring physical growth and weight-for-stature values, and the most opportune time to prevent obesity by promoting healthy eating and active living. In particular, a more comprehensive investigation of ecological factors' influence on obesity onset and control in young Mexican American children is needed. Future research should focus on differentiating the influence of these ecological factors on obesity onset and control.

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Author Disclosure Statement

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