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Emotional eating mediates the relationship between food insecurity and obesity in Latina women in the northeast U.S.

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Abstract

Objective: To examine the mediating role of emotional eating (EE) in the association between food insecurity (FI) and obesity in Latina women.

Design: Cross-sectional study.

Participants: Women (n=297) were recruited from a community health center in Lawrence, Massachusetts.

Variables measured: The 6-item USDA Household Food Security Scale was used to measure FI. The Three Factor Eating Questionnaire R18-V2 was used to measure EE. Measured height and weight were used to calculate BMI. Covariates included: age, education, marital status, number of children in the house, physical activity and country of birth.

Analysis: Multivariable logistic and linear regressions. Mediation was tested using the Baron and Kenny method and the mediated proportion was calculated.

Results: Overall, 36.7% of women experienced FI. In adjusted regression models, FI was positively associated with obesity (OR: 1.79; 95%CI: 1.08–2.97; p=0.023) and with EE (β : 0.22; 95%CI: 0.001–0.44; p=0.049), and EE was positively associated with obesity (OR: 1.82; 95%CI: 1.37–2.42; p<0.01). When EE was included in the main effects model, FI was not significantly associated with obesity (OR: 1.64; 95%CI: 0.97–2.76; p=0.063) and EE explained 21% of the association.

Conclusions and Implications: Longitudinal studies are needed to confirm findings. If confirmed, future studies can explore interventions to ameliorate EE among FI Latina women, and providers can screen for EE in FI Latinas for referral to stress management resources.

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Keywords

Food insecurity; obesity; emotional eating; Latina women

INTRODUCTION

Food insecurity (FI), or the limited access to nutritionally adequate and safe foods,¹ disproportionately affects Latino households in the U.S. Approximately 19% of U.S. Latino households experience FI compared to 10% of non-Latino White households.² Furthermore, U.S. Latina women face even greater FI burden, with 23% of U.S. Latina women living alone experiencing FI, and 30% of U.S. Latina female-head of household experiencing FI.³

A large body of research has documented that FI is a risk factor for obesity mainly in women and not in men.⁴⁻⁷ This evidence is particularly relevant to U.S. Latina women given that 49% of this group experiences obesity.⁸ Similarly, understanding the mechanisms by which FI may influence obesity in Latina women is important in order to mitigate the negative obesity-related effects of FI in this group.

Research indicates that FI is a stressful life experience,^{9,10} that may potentially influence obesity through stress-related eating behaviors. In fact, 4 out of 10 U.S. adults report changing their eating behaviors due to stress.¹¹ Emotional eating (EE), or eating due to an inability to resist negative emotions,¹² is a stress-related eating behavior that has been associated with FI.¹³⁻¹⁵ It has been previously documented that FI is significantly associated with higher levels of EE in U.S. Latino men and women.¹⁶ In addition, EE has also been associated with obesity,^{17,18} including in U.S. Latinos.¹⁹ However, little is known about the potential mediating role of EE in the relationship between FI and obesity.

A qualitative study of women residing in FI environments identified themes of EE in women with overweight or obesity but not in women with normal weight.²⁰ However, the contribution of EE in the relationship between FI and obesity in women has not been quantified and thus remains unknown. Given the aforementioned research gaps, the objectives of this study are to: 1) confirm the association between FI and obesity in a sample of Latina women, and 2) evaluate the mediating role of EE in the relationship between FI and obesity.

METHODS

Data from the Latino Health and Well-Being study, a cohort study of Latino men and women (ages 21–85 years) residing in the largely Latino city of Lawrence, Massachusetts, were used.²¹ Between September 2011–May 2013, the study recruited a sample of Latinos (stratified by age and sex) who sought care at the Greater Lawrence Family Health Center, which serves 80–85% of the Latino population in Lawrence (a city where 80% of the population is of Latino ethnicity²²). Individuals were eligible for participation if they were of Latino ethnicity and Spanish or English speaking, and ineligible if they had cognitive or physical impairment that precluded participation, were unwilling to provide consent, or were planning to move out of the area within 12 months.

The Latino Health and Well-Being study first contacted individuals via a mailed letter signed by the health center's Chief Medical Officer describing the study. The letter provided a toll-free number for individuals to opt out if they were not interested in participating. Three trained bilingual study staff then contacted individuals by phone to assess study eligibility and interest in participating. Eligible and interested individuals were scheduled for an in-person study visit. Written informed consent was obtained prior to the administration of a standardized assessment that included face to face interviews in the participant's preferred language (English or Spanish). The Institutional Review Board of the University of Massachusetts Medical School approved this study.

A total of 602 individuals (n=308 women and n=294 men) were enrolled in the Latino Health and Well-Being study. Given the documented sex differences in the association between FI and obesity,⁴⁻⁷ this analysis focused on women. Women were excluded if they had missing data on variables of interest (n=2 for obesity and n=1 for place of birth), and were pregnant (n=8). In all a total of 297 women were included in the analytic sample.

Measures

Rigorously trained bilingual study staff conducted the study assessments. Assessments included questionnaires on socio-demographic characteristics, FI, EE and physical activity. The staff administered the study surveys verbally in the participant's preferred language (English or Spanish), documented participants responses on paper forms and measured participants' height and weight.

Food insecurity

The 6-item US Department of Agriculture Household Food Security Scale,²³ derived from the 18-item US Department of Agriculture Household Food Security questionnaire, was used to measure FI. Using the last 12 months as the reference period, this scale asked about financial ability to obtain food as well as food-conserving behaviors. This instrument has a sensitivity of 92% and a specificity of 99.4%.²³ The FI score was calculated by adding up the responses of all items (score range 0–6). Further, the total score was categorized as food secure (0–1) and food insecure (scores greater than 1).²³ This FI binary indicator was used in all models.

Emotional eating

The 18-item Three Factor Eating Questionnaire (R18-V2) was used to measure EE.²⁴ Specifically, the EE subscale consisted of 6 items that measured eating in response to negative emotions. Response options ranged from definitely false (1) to definitely true (4). The total EE score was calculated by adding up responses to all items and dividing it by 6, creating a mean score (ranging from 1–4), where higher scores indicate greater EE. The Chronbach's alpha coefficient of this subscale is adequate in this sample of Latina women: 0.88.²⁵

Weight Status—Height and weight were measured by trained research assistants using a standardized protocol.²⁶ Body mass index (BMI) was calculated by dividing weight (in kg) by height (in m²). Obesity was defined as BMI ≥ 30 kg/m².²⁷

Covariates

Several covariates were considered due to their association with FI and obesity, including age, education, physical activity, marital status, number of children living in the house and country of birth. Education was categorized as high school graduate or less and greater than high school. Physical activity was measured with the Women's Health Initiative Brief Physical Activity Questionnaire, which measures walking and recreational physical activity.²⁸ Total minutes of physical activity were calculated and categorized as meeting the U.S. Department of Health and Human Services physical activity recommendation (150minutes/week).²⁹ Marital status was used as a dichotomous variable: married or living with partner and not married (i.e., single, separated, divorced and widowed). Lastly, participants self-reported their country of birth and were grouped as born in the U.S. (in any state of the U.S. and PR) and born in another country (outside of the U.S.).

Statistical analysis

Descriptive characteristics include frequencies for categorical variables and mean and standard deviation (SD) for continuous variables. Sample characteristics were contrasted by FI status using Pearson chi-square test of independence (for categorical variables) and T-tests (for continuous variables). A multivariable logistic regression model (adjusted for age, education, employment, physical activity, marital status, number of children living in the house and country of birth) was used to confirm the association between FI and obesity. To test for mediation, the Baron and Kenny approach was used.³⁰ For this, a series of multivariable models were evaluated (adjusted for the aforementioned covariates). These models tested: Step 1) the association between FI (independent variable) and obesity (dependent variable) using a logistic regression model; Step 2) the association between FI (independent variable) and EE (dependent variable) using a linear regression model; Step 3) the association between EE (independent variable) and obesity (dependent variable) (taking FI into account) using a logistic regression model; and Step 4) the association between FI (independent variable) and obesity (dependent variable), taking into account EE, using a logistic regression model. In order for mediation to be present, the association between FI and obesity in Step 4 should not be statistically significant. The regression coefficients from steps 1–4, were then used to calculate the mediated proportion (Step 2 x Step 3/Step 1).^{31,32} A 95% confidence interval was calculated for the mediated proportion using:

$\hat{p} \pm 1.96\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$. Statistical significance was set at $p < 0.05$; STATA (STATA version 14, Stata Corp., College Station, TX, 2015) was used for all analyses.

RESULTS

Overall, the mean age of women was 46.5 years, 72.6% self-identified as Dominican, 78.1% were born outside of the mainland U.S., 69.7% had a high school education, 37.0% met the recommendations for physical activity and they had on average 1 children residing in the house (Table 1). More than a third of women (36.7%) experienced FI. Compared to food secure women, women experiencing FI were less likely to be married or living with their partner (41.5% vs. 29.4%; $p=0.037$), had higher EE scores (1.78 ± 0.93 vs. 2.02 ± 0.90 ; $p=0.030$), and were more likely to have obesity (41.5% vs. 57.8; $p=0.007$).

Adjusted logistic regression models showed that, FI women had a 79% increase in the odds of obesity compared to food secure women (Table 2; step 1; $p=0.023$). In adjusted linear regression models, FI was significantly positively associated with EE scores. Food insecure women, on average, had an EE score 0.23 points higher than food secure women (Table 2; step 2; $p=0.049$). In addition, after adjusting for covariates, for each unit increase in the EE score, the odds of obesity increased by 82% (Table 2; step 3; $p<0.01$). Lastly, after taking EE into account in the main effects model, FI was not significantly associated with obesity (Table 2; step 4; $p=0.063$), and FI women had a 64% increase (compared to a 79% increase in Step 1) in the odds of obesity as compared to food secure women. In all, EE explained 21.2% (95%CI=25.9, 16.6) of the association between FI and obesity in women.

DISCUSSION

The finding of FI being positively associated with obesity in this population of Latina women is in agreement with previous studies of this association in other female populations.^{6,33,34} For example, a study that used data from the National Health and Nutrition Examination Survey found that FI women were 40% more likely to have obesity than food secure women.³⁴ The consistent associations between FI and obesity across studies underscores the need to understand mechanisms by which FI has an impact on obesity. This study additionally documented a positive association between EE and obesity, where each unit increase in the EE was associated with a 82% increase in the odds of obesity. Other studies have shown positive associations between EE and markers of obesity (i.e., BMI).^{17,35,36} For example, a study evaluated EE dichotomized according to a median split and odds of obesity, and found that individuals with EE score above the median were 3 times more likely to be obese than individuals with scores below the median, providing further support to our findings.³⁶

In this sample of Latina women, the relationship between FI and obesity was partially mediated by EE. To the authors' knowledge, no other study has evaluated the mediating role of EE in this relationship. However, a few studies provide indirect support to these findings. A qualitative study of women living in FI environments documented themes of EE in women with overweight and obesity but not in women with normal weight.²⁰ One other study conducted with women participating in the Supplemental Nutrition Assistance Program evaluated the relationship between FI and BMI, and the potential mediating role of a combined group of behavioral and environmental characteristics as assessed by the Multi-dimensional Home Environment Scale (MHES).³⁷ The MHES scale includes behaviors like resistance to EE, mindless eating and healthy eating attitudes, as well as neighborhood characteristics (availability of foods and safety, among others). Although this study found that the relationship between FI and BMI was largely mediated by the total MHES scale (addition of the MHES scale reduced the association between FI and BMI by 48%), the study did not specifically evaluate EE or any of the behavioral subscales of the MHES (i.e., resistance to EE and mindless eating). Thus, the present study makes a significant contribution to the literature on FI and obesity.

As previously mentioned, U.S. studies have found that eating may be a coping mechanism to manage stress, with approximately 40% of U.S. adults changing their eating behaviors due

to stress.¹¹ The authors hypothesized that, because FI is a stressful life experience, FI may trigger EE. Moreover, the documented associations between EE and obesity may be due, in part, to EE altering food selection and increasing intake of sweets and high fat foods.³⁸ However, it is important to note that EE partially mediated the association between FI and obesity in the present study, accounting for approximately 20%. The modest estimate of the association between FI and EE may explain this partial mediation. Nonetheless, the present study sheds light into one potential mechanism of action with potential to be an intervention target.

Findings of this study need to be interpreted with several limitations in mind. These results are based on cross-sectional data and thus causality cannot be determined. In addition, the study data precludes the examination of a possible bidirectional relationship between FI and EE. Approximately 35% of the sample had missing data on annual household income, thus the analysis was not able to take this socio-economic factor into account. Lastly, this sample includes Latina women primarily of Caribbean heritage residing in the Northeast U.S. thus findings may only be generalizable to this population.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Future research needs to evaluate longitudinal relationships between FI, EE and obesity to confirm the hypothesis and findings presented in the current study. In addition, future studies need to examine these findings in other Latino groups (i.e., Mexican, Central Americans and South Americans) and in other regions of the U.S. as they may have different stressors contributing to EE and different rates of FI. If these findings and hypotheses are proven in future studies, then culturally tailored interventions to ameliorate EE among Latina women experiencing FI may be warranted.

Given that EE has been associated with intake of high fat foods and sweets (foods that are often of low cost) which have high caloric density, studies that examine the potential interplay between EE and FI on intake of such foods are needed. Thus, future interventions may also need to take into account the challenges that FI women face in acquiring nutritious foods and the desire to consume affordable high fat foods and sweets at times of distress.

The results presented in this study also have clinical implications for healthcare providers. Providers can screen for EE in FI Latina patients and refer those in need to stress management, food banks, food pantries and other resources for access to healthy foods (e.g., Supplemental Nutrition Assistance Program) in order to address FI and related stressors, EE and reduce obesity.

In conclusion, this present study took the first step to evaluate the relationship between FI, EE and obesity in Latina women. It showed that FI was associated with obesity and that EE partially mediated this relationship. This dysfunctional eating behavior has potential as an intervention target for FI Latina women to reduce the obesity disparities observed in this group, but longitudinal studies are needed to confirm these findings.

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Table 1.

Sample characteristics of female participants of the Latino Health and Well-being Study by food security status (N=297).

	Total Sample n=297		Food insecure n= 109 (36.7%)		Food secure n=188 (63.3%)		P value
	Mean or n	SD or %	Mean or n	SD or %	Mean or n	SD or %	
Age (in years)	46.4	15.4	47.2	15.1	46.1	15.6	0.560
Latino group *							0.542
Puerto Rican	61	20.6	23	21.3	38	20.2	
Dominican	215	72.6	80	74.1	135	71.8	
Other	20	6.8	5	4.6	15	8.0	
Country of birth							0.134
U.S.	65	21.9	29	26.6	36	19.1	
Other country	232	78.1	80	73.4	152	80.9	
Education Level							0.114
High school	207	69.7	82	75.2	125	66.5	
>High school	90	30.3	27	24.8	63	33.5	
Married/living with partner	110	37.0	32	29.4	78	41.5	0.037
Number of children in the house	1.3	1.2	1.1	1.1	1.4	1.2	0.109
Meets recommendation for physical activity (150min/week)	110	37.0	36	33.0	74	39.4	0.276
EE	1.87	0.92	2.02	0.90	1.78	0.93	0.030
Obesity	141	47.5	63	57.8	78	41.5	0.007

SD=standard deviation. U.S.=United States. EE=emotional eating. EE means score obtained from adding up responses of the 6 EE items in the Three Factor Eating Questionnaire (R18-V2) and dividing it by the total number of EE items; score range=1–4.²⁴ Obesity was defined as body mass index $\geq 30\text{kg/m}^2$. Physical activity recommendations are based on the Department of Health and Human Services recommendations (150minutes/week).²⁸

* Data missing for one participant. P values are from Pearson chi-square test of independence for categorical variables, and T-tests for continuous variables.

Table 2.

Adjusted associations from mediation analysis for food insecurity, emotional eating and obesity in Latina women.

Modeled association	OR or β	95% CI	p value
Step 1: Food insecurity and obesity	1.79	1.08–2.97	0.023
Step 2: Food insecurity and EE	0.22	0.001–0.44	0.049
Step 3: EE and obesity	1.82	1.37–2.42	<0.001
Step 4: Food insecurity and obesity adjusting for EE	1.64	0.97–2.76	0.063

OR=odds ratio. CI=confidence interval. EE=emotional eating. Obesity was defined as body mass index $\geq 30\text{kg/m}^2$. All models are adjusted for age, education, physical activity, marital status, number of children living in the house and country of birth. OR presented for all models except for food insecurity and EE, in which case the β coefficient from linear regression is presented.