Association between food insecurity and emotional eating in Latinos and the mediating role of perceived stress.

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Abstract

Objective: To examine the association between food insecurity and emotional eating (EE) in U.S. Latinxs and explore the mediating role of perceived stress.

Design: Cross-sectional analysis. Food insecurity was measured with the 6-item CiSDA Household Food Security Scale. EE was measured with the Three Factor Eating Questionnaire R18-V2. Perceived stress was measured with Cohen's Perceived Stress Scale-10. Covariates included: age, sex, education, marital status, household size and country of birth. Mediation was tested using the Baron and Kenny method and the mediated proportion was calculated. Analyses included multivariable linear regression and multinomial logistic regression.

Setting: The study was conducted in a largely Latinx city in Massachusetts. Participants were recruited from a community health center serving a large portion of this Latinx community.

Subjects: Latinx individuals (n=580), ages 21-84 years.

Results: Overall, 34.4% were food insecure and 33.8% experienced High EE. Food insecurity was associated with higher odds of High EE (aOR: 1.96; 95%CT 1.28-3.02) but not Low EE (aOR: 1.27; 95%CT 0.82-1.99). Food insecurity was associated with higher perceived stress (β: 5.69; 95%CT 4.20-7.19). Perceived stress was associated with High EE (aOR: 1.09; 95%CT 1.06-1.12) but not Low EE (aOR: 1.00; 95%CT 0.97-1.02). When perceived stress was added in the main effects model, food insecurity was no longer associated with High EE (OR: 1.31; 95%CI: 0.83-2.07) and explained 69.9% of the association between food insecurity and High EE.

Conclusion: The association between food insecurity and high EE among Latinxs may be largely mediated by perceived stress. Longitudinal studies are needed.

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Keywords

Food insecurity; emotional eating; perceived stress; Latinx

Introduction

Food insecurity, defined as limited availability of nutritionally adequate and safe foods or an uncertain ability to acquire acceptable foods in socially acceptable ways[1], affects 12% of U.S. households[2]. Additionally, there are racial/ethnic disparities in food insecurity, with U.S. Latinx households experiencing a higher prevalence of food insecurity (19%) than non-Latinx White households (10%)[2]. Unless new and efficient policies are adopted, food insecurity is likely going to be magnified over time due to continued demographic shifts where Latinxs are expected to constitute one third of the U.S. population by 2065[3].

Food insecurity has been consistently associated with nutrition-related health conditions (i.e., obesity, pre-diabetes and type 2 diabetes)[4–6]. Emotional eating (EE), which is a dysfunctional eating behavior characterized by eating due to an inability to resist negative emotions[7], also has been linked to nutrition-related chronic conditions (i.e., obesity, type 2 diabetes and hypertension)[8]. Few studies have explored mechanisms by which food insecurity may influence behavioral factors, such as EE, particularly among ethnic minority populations disproportionately affected by food insecurity.

Food insecurity is a stressful life experience and studies have documented positive associations between food insecurity and stress[9,10]. Further, there is evidence that eating behaviors such as EE are triggered during stressful circumstances. In fact, 40% of U.S. adults report that they change their eating behaviors during times of stress[11]. Several studies have shown positive associations between stress and EE[12–14]. However, only three studies have examined the relationship between food insecurity and EE[15–17]. These studies mainly focused on women and were not specific to Latinx populations. Because EE and food insecurity affect dietary intake[18], and both are associated with nutrition-related chronic conditions[4–6,8], it is important to understand the relationship between food insecurity and EE, and to uncover potential mediators of this relationship (i.e., perceived stress). Such knowledge would help identify novel intervention targets to alleviate EE and decrease nutrition-related health disparities in Latinxs.

Thus, the objective of this study was to examine the association between food insecurity and EE and evaluate the mediating role of stress in a sample of U.S. Latinxs. We hypothesized that food insecurity would be positively associated with EE and that this relationship would be mediated, in part, by perceived stress.

Methods

Study design and participants

This cross-sectional study used data from the Latino Health and Well-being Study[19]. Participants were recruited from the Greater Lawrence Family Health Center, a federally qualified community health center providing health care services to 80-85% of the Latinx

population in the city of Lawrence, Massachusetts, between September 2011-May 2013. The sample was stratified by age (21-34, 35-54, 55-85 years) and sex. To be eligible, individuals had to be of Latinx or Hispanic ethnicity, Spanish or English speaking, and between 21 and 85 years of age. Individuals with plans to move out of the area within the study period (12 months), experiencing cognitive or physical impairments for participation, or unwilling to provide informed consent were excluded.

Individuals were contacted via mail with a letter signed by the health center Chief Medical Officer describing the purpose of the study and stating that a study coordinator would call to provide additional information about the study, assess eligibility, and ask about interest in participating. Individuals were provided with a toll-free number to opt out of the study and those that did not opt out were contacted by bilingual trained study personnel. Eligible patients interested in participating were scheduled for a baseline visit. At the baseline visit, study staff obtained written informed consent and conducted face to face interviews that included a verbally administered survey assessment and anthropometric measurements. The visits were conducted in the participant's preferred language (English or Spanish) and lasted approximately 2.5 – 3 hours. This study was approved by the Institutional Review Board of the University of Massachusetts Medical School.

A total of 3,067 individuals were screened for eligibility; 284 individuals were ineligible (i.e., age, cognitively impaired, moving, residing outside of the study area and deceased) and 1,547 were unreachable (i.e., wrong number, number disconnected and invitation letter returned). Of the remaining potential participants, 484 refused to participate and 150 were scheduled for a study visit but did not attend. In all, 602 individuals enrolled in the study. The current analysis excluded 13 participants that had incomplete data on covariates (perceived income: n=4; household size: n=9; country of birth= 1). Because emotional eating may be higher during pregnancy[20], we excluded 8 pregnant women. The final sample size was 580.

Measures

Trained bilingual study personnel conducted standardized interviews that included food insecurity, psychosocial factors, eating behaviors, socio-demographics and anthropometric measures.

Food insecurity—Food insecurity was measured with the 6-item US Department of Agriculture Household Food Security Scale[21]. This instrument was derived from the 18-item US Department of Agriculture Household Food Security questionnaire[22]. The scale measures household food insecurity using the previous 12 months as the reference period and asks about financial means to obtain food and food-conserving behaviors. The food insecurity score was calculated by adding the responses of all 6 items. The total score ranged from 0-6, with higher scores indicating greater food insecurity. As per guidelines, scores were categorized as food secure (scores between 0-1; referent group) and food insecure (scores ≥ 2)[21]. This scale has been shown to have good sensitivity and specificity relative to the 18-item US Department of Agriculture Household Food Security questionnaire and has been validated in Spanish[23].

Perceived Stress—Perceived stress was measured with the 10-item Perceived Stress Scale[24]. This scale has been widely used and has shown to have good reliability with Chronbach's alpha ranging between 0.7-0.9[24]. The original version of this scale, which consists of 14 items, has also been validated in Spanish[25]. For the present study, we used the translated Spanish items of the original scale, and we cognitive tested the items with community staff to ensure clarity and language adequacy for our target population. The perceived stress scale measures general stress perceptions without reference to the source and asks about uncontrollability and inability to cope. For example, using the previous month as the reference period, participants were asked: "how often have you been upset because of something that happened unexpectedly?", "how often have you felt that you were unable to control the important things in life?", and "how often have you felt nervous and stressed?". Response options were: never, almost never, sometimes, fairly often and very often. To calculate the score, responses to all items were summed. The final score ranged from 0-40, with higher scores suggesting greater perceived stress.

Emotional Eating—EE was measured with the Three Factor Eating Questionnaire (TFEQ)-R18 V2[26]. This scale was translated to Spanish by a professional translator and was pre-tested for fidelity and clarity using cognitive interviews with community staff from various Latino heritages representing the study target population. The EE subscale consists of 6 items that evaluate eating in response to negative emotions (e.g., anxious, wound up, depressed, lonely, sad and nervous). Response options for all items were: definitely false (1), mostly false (2), mostly true (3) and definitely true (4). To calculate the EE score, responses of all items were summed and divided by 6 to generate a mean score (ranging from 1-4, with higher scores indicating greater EE). We created three categories for the total EE score because the score was not normally distributed and no transformation improved the distribution (residuals from regression models with the transformed scores were still not normally distributed). Consistent with previous research[27], the following three categories were created: No EE, Low EE and High EE. The No EE category was comprised of individuals with a score of 1, thus answering "mostly false" to all items. The Low and High EE groups were created using a median split, with a median that exclude scores of 1.0 (median=1.83). Thus, a score at or below the median was categorized as "Low EE" and a score above as "High EE". Overall, this scale has shown good reliability and factor structure[26] and its Chronbach's alpha coefficient is adequate in this sample of Latinx adults (alpha=0.86).

Demographics and covariates—Confounders were selected a priori because of their known association with food insecurity and dysfunctional eating behaviors and included: sex, age, education, marital status, household size and country of birth[2,28–31]. Age was used as a continuous variable. Education was defined as the highest level of education attained and was categorized as: less than high school, high school graduate, and some college/college graduate. Marital status was a dichotomous variable categorized as currently married or living with partner as married and not married (i.e., single, separated, divorced and widowed). Household size was assessed for the total household, including children and other family members. Lastly, country of birth was self-reported by participants and was

categorized as: born in Puerto Rico, born in the mainland U.S. (in any state of the U.S.), and born in other country (outside of the U.S.).

Statistical analysis

Descriptive statistics include mean and standard deviations for continuous variables and frequencies for categorical variables. EE and covariates were contrasted by food security status using Chi-square test (for categorical variables) or t-tests (for continuous variables). Due to violation of the proportional odds assumption, multinomial logistic regression models were performed to evaluate the association between food insecurity and EE, and the association between perceived stress and EE. We performed mediation analyses using the Baron and Kenny method[32], which consists of 4 steps. For the first step, we evaluated the association between food insecurity and emotional eating using multinomial regression models (adjusting for covariates; path c). The second step examined the association between food insecurity and perceived stress using a linear regression model (because perceived stress was used as a continuous measure) adjusting for covariates (path a). For the third step, we evaluated the association between perceived stress and emotional eating (taking food insecurity into account) using multinomial regression and adjusting for covariates (path b). In the fourth and final step, we examined the association between food insecurity and emotional eating adjusting for perceived stress and all covariates using a multinomial regression model (path c'). The mediated effect (a × b) and the mediated proportion were calculated (a × b/c)[33,34]. A 95% confidence interval was also calculated for the mediatied proportion using the formula for a confidence interval around a proportion: $\hat{p} \pm 1.96\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$. Statistical significance was set at $p<0.05$. STATA version 14 was used for all analyses.

Results

Sample characteristics are presented by food security status in Table 1. Overall, mean age was 47 and about half of the sample were women. Approximately 75% self-identified as Dominicans and the majority were born outside of the mainland US. Mean household size was 3 and 43% were married or living with a partner. Over a third of the sample experienced food insecurity. A larger proportion of food insecure individuals had a lower education level than food secure individuals. In addition, a larger proportion of food insecure individuals reported High EE than food secure individuals.

Multivariable multinomial models adjusted for age, sex, education, marital status, household size and country of birth showed that food insecurity was associated with almost twice the odds of High EE (Table 2). Food insecurity was also associated with higher perceived stress scores in a multivariable linear regression model adjusted for covariates (Table 2). In turn, perceived stress was associated with almost 10% higher odds of High EE but not Low EE (Table 2). When perceived stress was added in the main effects model, food insecurity was no longer associated with High EE (Table 2). Estimates from Table 2 were used to calculate the mediated proportion. Perceived stress explained 69.9% (95% CI: 66.2-73.6) of the association between food insecurity and High EE.

Discussion

To our knowledge, this is the first study to examine the association between food insecurity and EE and the mediating role of perceived stress in a sample of U.S. Latinxs. Overall, our results show that food insecurity was associated with EE and that perceived stress mediated a large proportion of this association.

Only three previous studies have examined the association between food insecurity and EE. Our finding of food insecurity being associated with high levels of EE is in line with two of the previous studies conducted with samples of predominantly African American women[15, 17]; and found that food insecure individuals had higher EE scores than food secure individuals. The third study, conducted with a diverse sample of U.S. men and women, failed to find an association between food insecurity and EE[16]. This discrepancy may be due to differences in sample size and race/ethnicity of study participants as the third study was considerably smaller (n=118[16], vs. 202 and 632 in the previous two studies, respectively [15, 17]) and had a larger proportion of white participants (57% African Americans[16] vs. 84% and 87% African Americans, respectively[15, 17]). Methodological differences could also account for the difference in findings. Specifically, the approach taken to categorize EE dichotomously may have hindered the ability to detect a difference.

The high prevalence of food insecurity in this sample reflects insufficient income and insufficient benefits among Latino residents in Lawrence. Compared to the overall national estimate [2], the prevalence of food insecurity was approximately three times higher; which shows that food insecurity is a major public health issue in this population. The population in Lawrence, which is comprised largely of Latinos (74%) [35], experiences socio-economic disadvantage compared to the rest of the state of MA, where median household income is low and poverty is high [35]. Thus, all of these factors may increase the risk of food insecurity in the Lawrence population and highlight the need to address this public health issue in this vulnerable group.

Although the mechanisms by which food insecurity may be associated with EE are likely complex, our results suggest that perceived stress mediates a large proportion of this relationship. It is possible that food insecurity is associated with EE due to the emotional distress caused by lack of access to adequate and nutritious meals, or due to the correlation between food insecurity and numerous other stressors associated with low socio-economic status. Food insecurity has been linked to stress[9,10], which is a known predictor of EE [27,36–38]. Thus, EE may serve as a coping mechanism to relieve the emotional distress caused by food insecurity and other stressors related to low-socioeconomic status.

The fact that food insecurity and EE have both been linked with nutrition-related health conditions such as obesity, pre-diabetes and type 2 diabetes, which are highly prevalent among U.S. Latinx populations [4,5,39–42], points to a need to ameliorate food insecurity in this population. Reducing and eliminating the problem of food insecurity is a national priority [43]. At the policy level, there is room for improvement of benefits and eligibility of such benefits, as well as a need for efforts to reduce the racial/ethnic wage gap. In addition, at the community level, improving access to healthy foods may decrease stress and EE by

overall alleviating food insecurity. For example, community level Interventions should incorporate efforts to improve access to healthy foods such as through mobile markets (to decrease transportation barriers) and community gardens, and chain supermarkets (to eliminate food deserts) [44,45]. Lastly, at the individual level, there is a need for tailored interventions targeting stress and EE in food insecure Latinxs. Although the aforementioned suggestions are sensible, they may not be sufficient to alleviate food insecurity and their efficiency has not been vigorously tested.

The study results should be considered with limitations and strengths in mind. One limitation is the cross-sectional nature of the study, thus causality cannot be determined. Another limitation of our study is the potential existence of selection bias in our cohort. Out of 2,783 potentially eligible participants, only 602 were enrolled. Comparisons between participants vs non-participants on key demographic characteristics was not feasible as the study was not able to collect data on non-participants. In addition, the generalizability of our findings may be limited to Latinxs of Caribbean decent residing in the northeast of the U.S. However, this is also a study strength as Caribbean Latinxs, the largest Latinx group in the northeast U.S., experience disparities in both food insecurity[2] and nutrition-related health conditions[46] but have been underrepresented in research. To our knowledge, this is the first study of its kind to evaluate the relationship between food insecurity, perceived stress and EE in Latinxs.

Conclusion

In conclusion, this study found that food insecurity was associated with high levels of EE and this association was largely mediated by perceived stress. Identifying modifiable factors associated with nutrition-related health conditions will help to design interventions to reduce health disparities in this vulnerable population. Longitudinal studies are needed to examine the association between food insecurity, perceived stress and EE, and to test interventions that improve access to healthy foods and include stress reduction strategies for food insecure Latinxs.

Acknowledgements

List of Abbreviations

aOR   adjusted odds ratio

CI	confidence interval
EE	emotional eating
OR	odds ratio
SD	standard deviation
TFEQ	Three Factor Eating Questionnaire
US	United States

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Table 1.

Sample characteristics of the Latino Health and Well-being Study by food security status (N=580).

	Food insecure N= 200 (34.4%)		Food secure N=380 (65.6%)		P value
	Mean or n/N	SD or %	Mean or n/N	SD or %	
Age	48.8	14.8	46.1	15.7	0.044
Female	110/200	55.0	183/380	48.3	0.117
Latinx group *					
Puerto Rican	38/199	19.1	71/380	18.7	0.296
Dominican	150/199	75.4	274/380	72.1	
Other	11/199	5.5	35/380	9.2	
Country of birth					
Puerto Rico	33/200	16.5	49/380	12.9	0.363
Mainland U.S.	13/200	6.5	33/380	8.7	
Other country	154/200	77.0	298/380	78.4	
Education Level					
<High school	121/200	60.5	178/380	46.8	0.007
High school	32/200	16.0	82/380	21.6	
>High school	47/200	23.5	120/380	31.6	
Household size	3.4	1.8	3.6	1.9	0.318
Married/living with partner	86/200	43.0	166/380	43.7	0.874
EE					
No EE	61/200	30.5	160/380	42.1	0.003
Low EE	54/200	27.0	109/380	28.7	
High EE	85/200	42.5	111/380	29.2	

SD=standard deviation. EE=emotional eating.

*
Data missing for one participant.

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Table 2.

Adjusted associations from meditation analysis for food insecurity, perceived stress and emotional eating.

Modeled association	OR or β	95% CI	P value
Step 1:			
Adjusted food insecurity – EE			
No EE		Reference	
Low EE	1.27	0.82-1.99	0.286
High EE	1.96	1.28-3.02	0.002
Step 2:			
Adjusted food insecurity perceived stress	5.69	4.20-7.19	<0.001
Step 3:			
Adjusted perceived stress – EE			
No EE		Reference	
Low EE	1.00	0.97-1.02	0.822
High EE	1.09	1.06-1.12	<0.001
Step 4:			
Adjusted food insecurity – EE adjusting for perceived stress			
No EE		Reference	
Low EE	1.29	0.81-2.06	0.286
High EE	1.31	0.83-7.07	0.251

OR=odds ratio. EE=emotional eating. All models are adjusted for age, education, sex, household size, marital status and country of birth.

OR presented for all models except for food insecurity and perceived stress in which case the β coefficient is presented.