Original article

Psychosocial stress is associated with obesity and diet quality in Hispanic/Latino adults

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ABSTRACT

Purpose: To examine the association of psychosocial stress with obesity, adiposity, and dietary intake in a diverse sample of Hispanic/Latino adults.
Methods: Participants were 5077 men and women, aged 18 to 74 years, from diverse Hispanic/Latino ethnic backgrounds. Linear regression models were used to assess the association of ongoing chronic stressors and recent perceived stress with measures of adiposity (waist circumference and percentage body fat) and dietary intake (total energy, saturated fat, alternative healthy eating index-2010). Multinomial logistic models were used to describe the odds of obesity or overweight relative to normal weight.
Results: Greater number of chronic stressors and greater perceived stress were associated with higher total energy intake. Greater recent perceived stress was associated with lower diet quality as indicated by alternative healthy eating index-2010 scores. Compared with no stressors, reporting three or more chronic stressors was associated with higher odds of being obese (odds ratio = 1.5, 95% confidence interval [CI] 1.01–2.1), greater waist circumference (β = 3.3, 95% CI 1.0–5.5), and percentage body fat (β = 1.5, 95% CI 0.4–2.6).
Conclusions: The study found an association between stress and obesity and adiposity measures, suggesting that stress management techniques may be useful in obesity prevention and treatment programs that target Hispanic/Latino populations.

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Introduction

Obesity is currently a public health problem in the United States and disproportionately affects minority and low-income populations. Among Hispanic/Latino adults, 40% of men and 44% of women are obese [1]. Psychosocial stress is emerging as a potential risk factor for excess weight, and it may contribute to the race/ethnic disparities observed in prior research. Cross-sectional and prospective studies indicate that individuals with higher stress levels are more likely to be obese and experience greater weight gain over time [2–6]. Psychosocial stress may be related to the development of obesity through biological and behavioral pathways. Biological responses to stress include the activation of neuroendocrine and inflammatory pathways that directly increase fat accumulation, promoting visceral adiposity [7,8], and the release of appetite hormones that increase food consumption, leading to a positive energy balance [7]. Furthermore, when under stress, as the

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brain reward system becomes activated [9], individuals may show a preference for more palatable foods that are richer in sugars and fats, contributing to excess calories [2,10–13]. Other behavioral changes have also been proposed as possible explanations for the stress–obesity relationship, such as engaging in less physical activity [14] and consuming fast foods more frequently [15].

Few studies distinguish between chronic ongoing stress and recent exposure to stress, which may have different associations with obesity. Prolonged exposure to stress may be needed to activate and maintain the biological and behavioral pathways that lead to increased weight, whereas the effects of recent exposure may be observed in terms of changes in lifestyle behaviors that, if occurring for a limited amount of time, may not lead to excess weight. In this study, we examined ongoing chronic stress in important life domains and perceived stress during the past 30 days in relation to obesity and dietary intake in Hispanic/Latino adults who are participants in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL), a large multicenter cohort. This study includes a subset of HCHS/SOL participants who completed a separate assessment of sociocultural factors, including stress measures. We hypothesized that participants reporting more chronic stressors would be more likely to be obese and have higher adiposity (assessed by waist circumference and percentage body fat) than participants with lower stress levels. In addition, we hypothesized that participants reporting higher recent perceived stress (past 30 days) would have a higher intake of total calories and saturated fat. However, we would not expect that those participants with higher recent perceived stress would be more likely to be obese than participants experiencing lower recent stress because a longer period would be needed for the excess calories to manifest as obesity. Furthermore, because prior research has shown evidence for differences in the stress/obesity association by sex [5,6,8], we also examined whether the relationship between stress and obesity was modified by sex.

Methods

HCHS/SOL is a population-based cohort study of 16,415 Hispanic/Latino adults (aged 18–74 years) who were selected using two-stage probability sampling design from four US communities (Chicago, IL; Miami, FL; Bronx, NY; and San Diego, CA). The HCHS/SOL SocioCultural Ancillary Study (SCAS) enrolled 5313 participants from the HCHS/SOL between February 2010 and June 2011. Participants were asked to return to the HCHS/SOL clinic within 9 months of their baseline examination to complete a comprehensive set of psychosocial measures that included self-reported stress. However, the majority of participants (72%) completed the psychosocial assessment within 3 months. Details about the aims and methodology of HCHS/SOL and HCHS/SOL SCAS are published elsewhere [16–18]. Of the 5313 participants, 236 were excluded because they were missing body mass index (BMI) or stress measures, leaving a final analytic sample of $N = 5077$.

Measures

Overweight and obesity

Height and weight were obtained at each field center as part of the HCHS/SOL baseline examination. Height (centimeter) was measured with a wall stadiometer (SECA Corp., SECA 222; Germany) and weight (kilogram) was obtained with a digital scale (Tanita Body Composition Analyzer, TBF 300; Japan). BMI was calculated as weight in kilograms divided by height in meters squared. BMI values were used to define weight categories according to National Heart Lung and Blood Institute guidelines: underweight (<18.5 kg/m^2)/normal weight (BMI, 18.5–24.9 kg/m^2), overweight (BMI 25.0–29.9 kg/m^2), and obese (BMI $\geq$ 30.0 kg/m^2). Because the

number of underweight participants was very small ($n = 41$), we grouped underweight individuals with those of normal weight into a single category. Obesity was further classified into categories of severity: class I (BMI 30–34.9 kg/m^2), class II (BMI 35–39.9 kg/m^2), and class III (BMI $\geq$40 kg/m^2) [19].

Adiposity

Waist circumference was obtained using the lateral border of the ilium as the anatomical reference, according to a standardized protocol. Percentage body fat was obtained by bioelectrical impedance analysis using the Tanita Body Composition Analyzer (TBF 300, Japan).

Stress measures

Two measures of psychosocial stress were examined. Chronic stress burden (eight items) [20,21] asked participants about ongoing stressors in important life domains (health, work, and relationships) that have lasted for at least 6 months. A score was created by summing the number of ongoing stressors reported (range 0–8), which was later categorized into number of reported stressors (0, 1, 2, $\geq$3). Perceived stress scale [22] queried participants' perceptions of feeling stressed during the last month (10 items). Responses were on a five-point scale from "never" to "very often." Scores were summed to indicate current stress levels, with higher scores suggesting greater perceived stress (Cronbach's α for participants answering questionnaire in English = 0.86; Cronbach's α = 0.84 in Spanish). Before analysis, the sum score (range 0–40) was divided into quartiles (Q1: 0–9; Q2: 10–14; Q3: 15–18; and Q4: $\geq$19), with the top quartile indicating the highest perceived stress.

Dietary intake

Dietary intake was obtained with two interviewer-administered 24-hour recalls using the Nutrition Data System for Research software developed by the University of Minnesota. The first recall was conducted in person during the HCHS/SOL examination, and the second recall was conducted by phone within 1 month of the initial assessment. Using the National Cancer Institute approach [23], we predicted usual energy intake and percent calories from saturated fat, adjusting for age, gender, Hispanic/Latino background, field center, weekend (including Friday), recall sequence, and self-report intake amount. In addition, to assess overall dietary quality, we used the alternative healthy eating index (AHEI-2010), which is based on 11 components (vegetable and fruit intake, whole grains, sugar-sweetened beverages and fruit juices, nuts and legumes, red/processed meat, trans fat, long-chain fats, polyunsaturated fats, sodium, and alcohol intake) that are known to be predictive of chronic disease [24,25]. AHEI-2010 scores were calculated based on National Cancer Institute predicted usual nutrient intake and gender-specific serving sizes for component items from 24-hour dietary recalls. AHEI-2010 scores range from 0 to 110 and higher scores indicate better diet quality. Eating meals prepared outside the home was assessed with a 10-item scale that asked participants to indicate how often they ate their meals outside the home at establishments such as fast food restaurants, or brought home ready-to-eat foods from grocery stores, on-street vendors or similar venues [26].

Physical activity

Self-reported physical activity was obtained using a modified version of the World Health Organization Global Physical Activity Questionnaire, which obtains information about participants' habitual activities in three domains: work, transportation, and leisure [27].

Depressive symptoms were assessed with the 10-item form of Center for Epidemiological Studies Depression Scale [28]. This scale includes a subset of items from the original 20-item Center for