Research Brief

Adherence to the 2010 Dietary Guidelines for Americans and the Relationship to Adiposity in Young Women

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ABSTRACT

Objective: To determine the relationship between adherence to the 2010 Dietary Guidelines for Americans and adiposity in young women with and without statistical adjustment for physical activity (PA).

Methods: Participants included 324 young women (aged 17–25 years). The researchers measured dietary intake using the Dietary History Questionnaire and determined diet quality using the 2010 Healthy Eating Index (HEI-2010). BOD POD (Cosmed, Rome, Italy, 2006) and accelerometry were used to assess body fat and PA, respectively.

Results: Women in the top quartile of HEI-2010 had significantly lower percent body fat than women in the lowest 3 quartiles ($F = 3.36$; $P = .03$). Controlling for objectively measured PA weakened this relationship by 20%. These young women (top quartile of HEI-2010) also had 0.37 odds (95% confidence interval, 0.16–0.85) of having body fat > 32%.

Conclusions and Implications: Young women whose diets most closely meet the 2010 Dietary Guidelines for Americans have lower adiposity.

Key Words: body compositions, less nutrient-dense food, dairy, college, dietary quality (*J Nutr Educ Behav*. 2014;■:1-8.)

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INTRODUCTION

Dietary choice and quality of the foods habitually consumed have been shown to influence health and the development of chronic disease.[1-8] One aspect of health linked to dietary choice is excess body fat. Because of this, the current health goals for Americans (Healthy People 2020) focus on improving both diet quality and weight management.[9]

The majority of studies that have evaluated diet and weight management focus on a single aspect of the diet (ie, dietary fat, calcium, calories) rather than examining dietary patterns. A few studies have evaluated overall diet quality as it relates to body mass index (BMI). These studies use indexes, factor analysis, or cluster analysis to evaluate diet quality but they are inconsistently associated with BMI.[10,11] The inconsistency in these article could be the result of a number of factors, including variation in the age of the studied population, different methods of classifying diet quality, and lack of control over physical activity, which has an important role in energy balance.

To date, studies examining the relationship between adiposity and dietary quality in young women are lacking. This is specifically true when evaluating how better adherence to current dietary guidelines relates to adiposity. The relationship between adherence to the 2010 Dietary Guidelines for Americans (DGA) as a total dietary approach and adiposity in children and adults has recently been identified as a research gap.[12] In addition, studies evaluating dietary quality have used BMI to classify excess body weight, but rarely use measured body fat. Body mass index is only a crude estimate of adiposity and its ability to diagnose obesity accurately is limited, especially in the intermediate BMI ranges.[13,14] This is especially important for young women who have a lower prevalence of overweight and obesity as measured by BMI. In addition, most studies have not attempted to evaluate overall diet quality or control for objectively measured physical activity.[15] The primary purpose of this study was to examine the relationship between adherence to the 2010 DGA and adiposity in young women, with and without statistical adjustment for differences in objectively measured physical activity.

METHODS

Participants

This study was cross-sectional; data were collected between fall, 2009 and spring, 2012. A total of 340 women from 2 universities in the Mountain West Conference and surrounding areas were recruited to participate in the study. To be part of the study, participants had to be aged 17–25 years, nonsmokers, not be pregnant, be able to participate in physical activity

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without restriction, and not be taking metabolism-altering medication. Recruitment for the study was done using posters, flyers, a Facebook group, and word of mouth. Those interested in participating filled out a screening form to ensure the inclusion criteria were met. The study was approved by the university's institutional review board and participants' consent was obtained before their involvement in the study.

Instrumentation and Measurement Methods

Participation in the study involved completing the Dietary History Questionnaire (DHQ), wearing an accelerometer for 7 days, and undergoing body composition testing. During the initial appointment trained research assistants assessed height, weight, and body composition. In addition, research assistants instructed participants how to wear the accelerometer properly to assess physical activity over 7 days and how to complete the DHQ. To ensure compliance, each participant was contacted during the week via e-mail and/or by phone. Upon completion of the 7-day assessment of physical activity, participants returned the accelerometer and the accelerometer data were downloaded and examined for completeness. The following sections describe specific procedures for each measurement.

Body composition. Participants were asked to refrain from eating or exercising 3 hours before assessing body composition. Body composition was measured in a standardized 1-piece swimsuit. Height, weight, and percent body fat were each measured once for each participant.

Height. Participants' heights were measured barefoot to the nearest 0.1 cm using a digital wall-mounted stadiometer (Seca, Chino, CA).

Weight. Body mass was measured using a digital scale accurate to the nearest 0.05 kg (Tanita Corporation, Japan; modified by Cosmed, Rome, Italy).

Percent body fat. The researchers used the BOD POD to assess adiposity. The BOD POD has been compared to dual-energy x-ray absorptiometry and has been shown to be both valid (24.3%, SE 1.1%; and 23.8%, SE 0.8% for BOD POD and dual-energy x-ray absorptiometry, respectively) and reliable (intra-class correlation coefficient, 0.98).[16,17] Thoracic lung volume (average lung volume during normal tidal breathing) was measured using the BOD POD.

Dietary Intake

Dietary History Questionnaire. The researchers assessed dietary intake using the DHQ.[18] The DHQ is a self-administered, 144-question food frequency questionnaire (FFQ).[19] For this study the Web-based version was used. The DHQ was developed by the National Cancer Institute and was adapted from both the Block and the Willett FFQs. The DHQ takes about an hour to complete.[20] Compared with the Block and Willet FFQs, the DHQ had the strongest correlation to actual dietary consumption and energy intake.[21] The DHQ has been validated to assess pyramid food servings.[22]

The DHQ includes pictures of serving sizes and foods to help participants record diet information properly. The DHQ also includes questions on fruit and vegetable intake, snacks and less healthful food, and the frequency of those foods eaten in the past year. The questionnaires were analyzed using the Diet*Calc analysis program (version 1.5.0. National Cancer Institute, Applied Research Program, Bethesda, MD, April, 2010), which classifies dietary intake based on the food pyramid equivalents database, 2.0.[23]

Dietary quality. The authors used the 2010 Healthy Eating Index (HEI-2010) to score participants' dietary quality. The HEI-2010 was computed from the DHQ results.[24] It was developed by the US Department of Agriculture to score diets based on suggested consumption amounts.[25] The HEI components were updated to match the MyPlate equivalents in 2010; there are 12 HEI components to the HEI-2010 (Table 1). This index has been used in other studies to evaluate adherence to dietary recommendations and has been shown to be valid and reliable.[26-30] An HEI score of 100 signifies perfect adherence to the DGA. The current HEI based on National Health and Nutrition Examination Survey (NHANES) 2007–2008 data is 53.5.[31] This means that roughly half of the DGA is being met. In addition, the HEI has been used to classify diet quality using the following criteria: *good* ($\geq$ 80), *needs improvement* (51–80), and *poor* ($<$ 51).[25,32]

Physical activity. Physical activity was assessed using accelerometry to control for its potential influence on dietary choice and body composition. The Actigraph (Actigraph LLC, Model GT3X, Walton Beach, FL) accelerometer was worn to objectively measure the intensity of activities performed per day. The accelerometers were worn laterally on the right hip. The Actigraph is a valid measure of physical activity[33,34] and has shown excellent reliability (intra-class correlation coefficient, 0.80).[33]

Participants were asked to wear the accelerometer at all times for 7 consecutive days (excluding only swimming and bathing activities). Participants were considered to be in compliance for the day if they wore the monitor 80% of the time between 7:00 AM and 11:00 PM. Non-wear time was conservatively calculated as a string of 20 minutes of consecutive zeros. If the monitor malfunctioned, or if a day's data were incomplete, the participant was asked to wear the monitor for an additional day comparable to the day that was missed. Data were collected in 60-second epochs. Epochs were summed for the day and total daily counts were used for data analysis.

Statistical Analysis

Densities for MyPlate equivalents were calculated by dividing the number of equivalents by the number of calories and multiplying by 1,000 to get equivalents per 1,000 kcal. This calculation was required to calculate HEI-2010 and the authors used it because it standardizes the number of equivalents to the individual's energy needs. Table 1 presents specifics on calculating the HEI-2010.[24] The total HEI-2010 score was used to rank individuals by overall dietary quality and individual component scores of HEI-2010 were used to determine adequacy or inadequacy of dietary intake of specific food groups and nutrients, such as saturated

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