DIETARY PATTERNS AND DIET QUALITY AMONG DIVERSE OLDER ADULTS: THE UNIVERSITY OF ALABAMA AT BIRMINGHAM STUDY OF AGING

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Abstract: Objectives: To characterize dietary patterns among a diverse sample of older adults (≥ 65 years). Design: Cross-sectional. Setting: Five counties in west central Alabama. Participants: Community-dwelling Medicare beneficiaries (N=416; 76.8 ± 5.2 years, 56% female, 39% African American) in the University of Alabama at Birmingham (UAB) Study of Aging. Measurements: Dietary data collected via three, unannounced 24-hour dietary recalls was used to identify dietary patterns. Foods were aggregated into 13 groups. Finite mixture modeling (FMM) was used to classify individuals into three dietary patterns. Differences across dietary patterns for nutrient intakes, sociodemographic, and anthropometric measurements were examined using chi-square and general linear models. Results: Three dietary patterns were derived. A “More healthful” dietary pattern, with relatively higher intakes of fruit, vegetables, whole grains, eggs, nuts, legumes and dairy, was associated with lower energy density, higher quality diets as determined by Healthy eating index (HEI)-2005 scores and higher intakes of fiber, folate, vitamins C and B6, calcium, iron, magnesium, and zinc. The “Western-like” pattern was defined by an intake of starchy vegetables, refined grains, meats, fried poultry and fish, oils and fats and was associated with lower HEI-2005 scores. The “Low produce, high sweets” pattern was characterized by high saturated fat, and low dietary fiber and vitamin C intakes. The strongest predictors of better diet quality were female gender and non-Hispanic white race. Conclusion: The dietary patterns identified may provide a useful basis on which to base dietary interventions targeted at older adults. Examination of nutrient intakes regardless of the dietary pattern suggests that older adults are not meeting nutrient recommendations and should continue to be encouraged to choose high quality diets.

Key words: Dietary pattern, finite mixture modeling, older adults.

Introduction

Although aging is associated with declines of physiological and cognitive functions that contribute to ill health, longitudinal studies suggest that nutrition may be an important determinant of successful aging (1). Historically, studies have examined nutrients in isolation. Because nutrients are consumed in combination and foods are consumed as a component of meals, there has been considerable interest in the investigation of total diet (versus single, isolated nutrients).

Little research has been done on dietary patterns of older adults, and even less that reflects the diversity of older adult populations in the US. Yet, it is well-established that obesity is a major public health concern among older adults, with close to 35% being obese. For older African Americans, the obesity rates are even more alarming and are particularly high for women (50%) (2). Understanding the dietary practices of older adults may help target interventions to improve diet and weight status. The primary aim of this study was to identify food patterns in a sample of community-dwelling older adults living in Alabama.

Previous evidence suggests that sociodemographic characteristics are associated with dietary quality (3). However, the complexity of these relationships has not been well studied in older Americans. Therefore, a secondary aim was to determine predictors of diet quality (defined by both dietary patterns and Healthy Eating Index-2005 (HEI-2005)), including an examination of the association between body mass index (BMI) and dietary patterns.

Methods

Subjects

The University of Alabama at Birmingham (UAB) Study of Aging is a longitudinal, observational study designed to investigate racial disparities in life-space mobility associated with aging (4). Participants from the UAB Study of Aging initially included 1000 community-dwelling older non-Hispanic whites and African-Americans (≥ 65 years old) recruited between late 1999 to February 2001 from a stratified random sample (stratified by county of residence, gender, race) of Medicare beneficiaries living in rural and urban areas in five counties of central Alabama (4). Study procedures were approved by the UAB Institutional Review Board.

In 2004 (year 4), 733 surviving participants who were not living in a nursing home were eligible to participate in a follow-
up in-home assessment. Of these, 622 (84.9%) agreed to participate in the home interview and provided complete dietary data. Nonparticipation did not differ from participants in terms of gender, urban/rural residence, or race (p >.05). However, nonparticipants were older, had lower levels of education and household incomes, lower life-space mobility, more chronic conditions and had lower scores on a cognitive screening test (p >.05) (5-7).

For the current analyses, we excluded those with symptoms suggestive of depression (Geriatric Depressive Score [GDS] ≥6; n=28) or cognitive assessment test score <24 (n=147) or both (n=27), and four participants who were missing height and/or weight measurements (5, 8). Analyses were performed with year 4 data from the remaining 416 individuals; 183 males and 233 females, respectively.

Data collection
In-home interviews were conducted at baseline to collect general health, anthropometric measures (height and weight), and sociodemographic information and to assess factors affecting life-space mobility. Counties classified as Metropolitan Statistical Areas at the time of data collection were considered urban as defined by the U.S. Office of Management and Budget (9). Diet was assessed during year 4 of the study using three unannounced 24-hour dietary recalls conducted by trained interviewers. Food intake data was entered into the Nutrition Data System for Research software (NDSR; Nutrition Coordinating Center, Minneapolis, MN), food database version 34 and 35, nutrient database version 4.06 and 5 and regenerated in NDSR 2008 for analysis. One of the features of NDSR is the ability to reanalyze data that is reflective of the marketplace at the time of data collection but with updated nutrient and other aspects of analysis, such as food group data, that was not available at the time of the original data collection. Data collected on vitamin and mineral supplement use was not included in analyses. Food and beverage codes were assigned to items in the individual food file dataset. Energy density was calculated as average energy (kcal) divided by average food weight (grams) (10). Overall HEI-2005 scores, which act as a summary measure of diet quality, were calculated for each individual using methods described by Miller et al. (11). Foods were aggregated into 13 groups on the basis of nutritional similarity and frequency of intake among the sample (Table 1). Food intake patterns were derived on the basis of average servings per 1000 kcal.

Servings were based on the Dietary Guidelines for Americans, 2005 for foods that have recommendations (12). Food and Drug Administration (FDA) serving sizes were used for those without current recommendations (e.g., cookies, fruit drinks).

Statistical analysis
Statistical analyses for identification of food intake patterns were conducted using latent class cluster analysis (more generally known as finite mixture modeling [FMM]) in Latent Gold (version 4.5, Statistical Innovations Inc., Belmont, MA). FMM was performed to examine the clustering of dietary intake based on frequency of intake (servings per 1000 kcal). FMM is a data-reduction technique that uses a K-class latent variable to explain associations among a group of observed variables. In this particular case, each latent class is assumed to represent a dietary pattern. Dietary pattern models were evaluated for solutions specifying K=2-10. Selection of the model was based on comparison of the Bayesian Information Criterion (BIC) and interpretability of dietary patterns (13). There has been evidence of high levels of low-energy reporting among older adults (14). Implausible energy reporters were identified in this sample using procedures described by McCrory et al. (15), which compares predicted energy expenditure with reported energy intake.

FMM, unlike cluster analysis, does not divide individuals into exclusive dietary patterns, such that each person only belongs to one and only one pattern, but rather, each individual has a probability of membership into each of the derived dietary patterns. Therefore, participants were assigned into patterns based on highest respective posterior class-membership probabilities. The average and median individual posterior class-membership probabilities ranged from 0.85 to 0.90 and 0.92 to 0.97, respectively. Model-predicted mean energy-adjusted servings and evaluation of nutrient intakes by food intake pattern were used to interpret and label the food patterns. Analysis of food patterns was also attempted by gender and race separately, but the sample sizes were insufficient to assure model stability.

Differences of nutrient intakes, sociodemographic and health characteristics across the food intake patterns were compared using chi-square and analysis of covariance for categorical and continuous variables, respectively using the Statistical Analysis System (SAS version 9.2, SAS Institute, Inc., Cary, NC). To examine the association between dietary pattern (dependent variable) and BMI, including the interaction between BMI and gender, we performed latent class multiple regression analysis using Latent Gold, adjusting for important covariates, including race, income, cognitive score, education and age. To investigate the probability of being classified into one dietary pattern versus another, the association between dietary pattern and BMI by gender was investigated using logistic regression and was plotted using estimated conditional probabilities (from Latent Gold output), based on model covariates mentioned above and odds ratios were calculated. An alpha-level of .05 was used as the threshold for statistical significance.

Results
Sample characteristics
Our sample was 39% African American and 56% female. A total of 69% completed high school or greater, 46% lived in rural areas and 53% were married. Mean age (± standard deviation) of the 416 participants was 76.8 ± 5.2 years and mean BMI (kg/m²) was 28.3 ± 5.4 and 28.3 ± 6.2 for men and women, respectively (p =.94). (Table 2) BMI did vary across race and gender, with African American women being the