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RESEARCH

Original Research

Alcoholic Beverage Consumption, Nutrient Intakes, and Diet Quality in the US Adult Population, 1999-2006

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ABSTRACT

Background Little is known about associations between alcoholic beverage consumption, nutrient intakes, and diet quality, although each has been independently associated with chronic disease outcomes.

Objective This study examines cross-sectional relationships between alcoholic beverage consumption, nutrient intakes, and diet quality (Healthy Eating Index-2005 [HEI-2005] scores) in the US adult population.

Methods Data were from four cycles of the National Health and Nutrition Examination Survey (1999-2006). Weighted multiple regression analyses, adjusted for age, race/ethnicity, education, smoking status, and body mass index included 8,155 men and 7,715 women aged ≥20 years who reported their past-year alcoholic beverage consumption and 24-hour dietary intake. Alcoholic beverage consumption was defined by drinking status (never, former, current drinker) and, among current drinkers, by drinking level (number of drinks per day, on average: men <1 to ≥5; women <1 to ≥3).

Results Among men, there was no association between drinking status and intakes of energy, most nutrients, or total HEI-2005 score. Among women, former and current (compared to never) drinkers had significantly higher intakes of energy and several nutrients, and current drinkers had significantly lower total HEI-2005 scores (current drinkers 58.9; never drinkers 63.2). Among current drinkers of both sexes, as drinking level increased, intakes of energy and several nutrients significantly increased, whereas total HEI-2005 scores significantly decreased (from 55.9 to 41.5 in men, and from 59.5 to 51.8 in women).

Conclusions Among men and women, increasing alcoholic beverage consumption was associated with a decline in total diet quality as measured by the HEI-2005, apparently due to higher energy intake from alcohol as well as other differences in food choices. Educational messages should focus on nutrition and chronic disease risk associated with high consumption of alcoholic beverages and poor food choices, including excessive energy intake.

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Heavier alcoholic beverage consumption and less healthful dietary intake have been associated with chronic diseases, including cardiovascular disease (1,2), cancers of the colorectum and upper aero-digestive tract (3), and alcohol-related liver disease (4). Both of these modifiable lifestyle behaviors are preventable causes of chronic disease morbidity and mortality (5,6). An understanding of their association in the US population could inform clinical practice, epidemiologic research, and public health education.

Observed associations between alcoholic beverage consumption and dietary intake may vary depending on the way each is assessed. Alcoholic beverage consumption may be measured by drinking status (never, former, current drinker) and drinking level (number of drinks per day, on average). Dietary intake may be assessed by examining intake of various nutrients and/or a more global measure of diet quality such as the Healthy Eating Index (HEI) (7). The HEI, which measures diet quality in terms of compliance with Federal dietary recommendations, was developed by the US Department of Agriculture to assess and monitor the dietary status of Americans (8). The original HEI was released in 1995, and it was recently revised to reflect the 2005 Dietary Guidelines for Americans (DGA) (HEI-2005) (9-11).

Several epidemiologic studies (12-22) have examined associations between drinking status and nutrient intakes; however, nondrinkers typically were not separated into former and never drinkers. Former drinkers who

quit drinking due to illness (23) could have different dietary intakes than lifetime abstainers.

Several epidemiologic studies (12-22,24,25) have examined associations between drinking levels and nutrient intakes. However, of the four studies conducted in the United States (12-14,24), only two used samples nationally representative of the US adult population, and both were performed more than 20 years ago (13,14). The other two studies were performed in a specialized cohort (12) and among elderly individuals (24).

The *Report of the 2005 Dietary Guidelines Advisory Committee* provided unadjusted estimates of nutrient intakes and original HEI total scores by current drinking level using data from the 1999-2000 National Health and Nutrition Examination Survey (NHANES) (2); nondrinkers were not considered. Breslow and colleagues (26), using the same data source, estimated associations between drinking levels and the original HEI, adjusted for demographic and lifestyle factors; however, nondrinkers were not considered in adjusted analyses, and nutrient intakes were not examined. Both studies (2,26) had a relatively small sample size, and neither evaluated associations with the HEI-2005. Therefore, the purpose of our study is to examine associations between alcoholic beverage consumption (drinking status and drinking level), nutrient intakes, and diet quality as evaluated by the HEI-2005, among US adults using data from NHANES 1999-2006.

METHODS

Data Source

Data for this study were provided by participants in four cycles of NHANES: 1999-2000, 2001-2002, 2003-2004, and 2005-2006 (NHANES 1999-2006). NHANES is a continuing, cross-sectional, nationally representative survey of the US noninstitutionalized civilian population, conducted by the National Center for Health Statistics. It employs a complex, stratified, multistage probability sample design. In NHANES 1999-2006, a total of 41,474 individuals completed an in-person home interview, and 39,352 subsequently completed an interview and examination conducted in a mobile examination center. Response rates for the unweighted examined sample in NHANES 1999-2000, 2001-2002, 2003-2004, and 2005-2006 were 76%, 80%, 76%, and 77%, respectively (27).

Measurements of Alcohol Consumption, Nutrient Intakes, and Diet Quality

The independent variables of interest were drinking status (never, former, current drinker) and drinking levels (number of drinks per day, on average) among current drinkers. An alcohol use questionnaire was administered in the mobile examination center interview. Participants who were aged 20 years and older were asked: "In any 1 year, have you had at least 12 drinks of any type of alcoholic beverage?" (yes/no); "In your entire life, have you had at least 12 drinks of any type of alcoholic beverage?" (yes/no); "In the past 12 months, how often did you drink any type of alcoholic beverage?" (frequency); and, "In the past 12 months, on those days that you drank alcoholic beverages, on the average how many drinks did you have?" (quantity).

Participants who, in their entire life, never had at least 12 drinks were defined as never drinkers. Participants who had at least 12 drinks in their entire life, but had not consumed alcohol in the past 12 months, were defined as former drinkers. Participants who consumed at least 12 drinks in their entire life and drank on at least 1 day in the past year were considered current drinkers. For current drinkers, number of drinks per day, on average, was calculated as ([quantity×frequency]/365.25); categorization of drinking level was sex-specific because men and women differ in amounts of alcoholic beverages consumed. For men, number of drinks per day, on average, was categorized as <1 (operationally, >0 to 0.49), 1 (0.5 to 1.49), 2 (1.5 to 2.49), 3 (2.5 to 3.49), 4 (3.5 to 4.49), and ≥ 5 (≥ 4.5) drinks/day. For women, categories were <1, 1, 2, and ≥ 3 drinks/day because of the small number who consumed ≥ 4 drinks per day.

The dependent variables of interest were energy and nutrient intakes and HEI-2005 total and component scores. Participants' dietary intakes were collected in the mobile examination center via an interviewer-administered recall of foods and beverages consumed during the previous day (midnight to midnight). Nutrient intakes used in this study include those obtained from all foods and beverages consumed, including alcoholic beverages, but not dietary supplements. They were calculated by the US Department of Agriculture's (USDA) Agricultural Research Service using the Food and Nutrient Database for Dietary Studies (28). This study did not estimate intakes of linoleic acid or linolenic acid; however, such estimates have been published elsewhere (29).

The HEI-2005 scores were calculated using the MyPyramid Equivalents Database according to the methodology established by the USDA Center for Nutrition Policy and Promotion (30). Individuals' dietary intakes vary from day to day, so a 24-hour dietary recall does not provide a reliable estimate of an individual's long-term average or usual daily intake. However, the mean of a group's usual intake can yield a reasonable estimate of the group's mean usual nutrient or food group intake if the recalls are collected on all days of the week and seasons of the year, as is the case with NHANES 1999-2006. Thus, the mean nutrient intakes reported here for groups approximate their mean usual nutrient intakes, and the HEI-2005 scores are based on mean usual intakes of the relevant food groups, nutrients, and energy. At the time of this study the MyPyramid Equivalents for food groups needed to calculate the HEI-2005 were not available from the USDA Agricultural Research Service for 2005-2006. For those years we used the 2003-2004 values for 4,368 of the food codes (28). For the 210 codes that were new in 2005-2006, values were imputed by a registered dietitian by matching to the most similar food code used in 2003-2004.

Like the DGA, the HEI-2005 is primarily food-based. The total score is the sum of 12 component scores. Nine components measure intake of food groups: total fruit; whole fruit (ie, forms other than juice); total vegetables; dark-green and orange vegetables and legumes; total grains; whole grains; milk, which includes soy beverages; meat and beans, which includes meat, poultry, fish, eggs, soybean products other than beverages, nuts, seeds, and legumes; and oils (nonhydrogenated vegetable oils, and