Disability and Health Journal xxx (2017) 1–4

Contents lists available at ScienceDirect

Disability and Health Journal

journal homepage: www.disabilityandhealthjnl.com

Association between dietary behavior and mortality among American adults with mobility limitations

Paul D. Loprinzi [a, *], Ovuokerie Addoh [a], Joshua R. Mann [b]

[a] Physical Activity Epidemiology Laboratory, Exercise Psychology Laboratory, Department of Health, Exercise Science and Recreation Management, University of Mississippi, USA
[b] Department of Preventive Medicine, School of Medicine and John D. Bower School of Population Health, University of Mississippi Medical Center, USA

ARTICLE INFO

Article history:
Received 5 March 2017
Received in revised form
7 May 2017
Accepted 29 May 2017

Keywords:
Disability
Epidemiology
Mobility limitations
Survival

ABSTRACT

Background: Limited research has evaluated the relationship between dietary behavior and mortality among those with mobility limitations.
Objective: To examine the association between dietary behavior and mortality in a national sample of American adults with mobility limitations.
Methods: Data from the 2003–2006 National Health and Nutrition Examination Survey were utilized. Participants were followed through 2011. Based on self-report, analyzed participants included those with mobility limitations (N = 1369). Dietary behavior was assessed from the alternate healthy eating index (AHEI).
Results: For the sample, 108,010 person-months occurred with an all-cause mortality rate of 2.07 per 1000 person-months. Dietary behavior was associated with reduced all-cause mortality risk when expressed both as a continuous variable and binary variable (i.e., meeting dietary guidelines). With regard to the latter, and after adjustments, those meeting dietary guidelines (vs. not) had a 40% reduced hazard of all-cause death (HR = 0.60; 95% CI: 0.38–0.97; P = 0.03).
Conclusion: Among adults with mobility limitations, and thus, who unable to engage in sufficient physical activity, dietary behavior may have survival benefits.

Introduction

Healthy eating practices should be tailored to each individual's caloric needs, and emphasize appropriate amounts of fruits, vegetables, whole grains, lean meat and milk products, while limiting saturated fats, trans fats, cholesterol, sodium, added sugars and refined grains.[1] Healthy eating practices lower the risk for cardiovascular disease, diabetes, stroke, cancer, osteoporosis, and other chronic illnesses.[1,2] Hence, Dietary Guidelines for Americans stipulate that individuals aged 2 years and above inculcate the aforementioned healthy eating practices.[1,2] However, a sizeable proportion of the U.S. population does not meet these guidelines.[1,3]

Individuals with ambulatory difficulty, such as those unable to walk a quarter mile or who do so with extreme difficulty (reportedly 7.1% of the US adult population),[4] are at a relatively increased risk for cardiovascular disease and diabetes compared to the general population, as a result of increased sedentary time.[5] Therefore, healthy lifestyle behaviors such as healthy eating could be of critical importance in this population, in order to attenuate this potential (additive) chronic disease risk. Our previous work[6] demonstrates that meeting muscle strengthening activity guidelines is inversely associated with mortality among those with mobility limitations. We extend this work by evaluating the potential independent association of healthy eating on mortality risk among this vulnerable population. Although plausible, the association between healthy eating and death from all causes among adults with mobility limitations needs to be scientifically explored and characterized, in order to aid the objective prioritization of healthcare needs for adults with ambulatory limitations, which is an existing gap in the literature. Thus, the purpose of this *brief report* was to examine the association between dietary behavior and all-cause mortality among those with ambulatory limitations.

* Corresponding author. School of Applied Sciences, Department of Health, Exercise Science, and Recreation Management, 229 Turner Center University, MS 38677, USA.
E-mail address: pdloprin@olemiss.edu (P.D. Loprinzi).

http://dx.doi.org/10.1016/j.dhjo.2017.05.006
1936-6574/

Methods

Design and participants

The National Health and Nutrition Examination Survey (NHANES) is an ongoing survey conducted by the National Center for Health Statistics which evaluates a representative sample of non-institutionalized U.S. civilians. Participants are selected by a complex, multistage probability design. Participants are interviewed in their home and subsequently evaluated in a mobile examination center within 2 weeks after the household interview.

All procedures for data collection were approved by the National Center for Health Statistics ethics review board, and all participants provided written informed consent prior to data collection. The authors' institution provided institutional review board exemption for this study given that the NHANES data is de-identified.

Data from the 2003–2006 NHANES were used, as these are the only NHANES cycles with objectively-measured physical activity data (described below). Data from participants in these cycles were linked to death certificate data from the National Death Index via a probabilistic algorithm. Person-months of follow-up were calculated from the date of the interview until date of death or censoring on December 31, 2011, whichever came first.

Participants were excluded if they died within the first 12-months of the follow-up period or had any of the following conditions at baseline: coronary artery disease, congestive heart failure or stroke. The sample included 1369 participants with evidence of mobility limitations (described below) between 20 and 85 years of age.

Assessment of mobility limitations

Participants not dependent of wheelchair use were evaluated herein, as these individuals were not given an accelerometer to measure free-living physical activity (covariate; described below), and additionally, in the NHANES data set, there is no variable specifically indicating if participants used a wheelchair for ambulation. Consistent with previous work,[7–9] participants were considered to have a mobility limitation if they self-reported difficulty (some, much, or unable to do the activity) in any of the following activities: walking without special equipment use; walking 0.25 miles; walking ten steps without stopping; stooping, crouching, or kneeling; walking from one room to another on the same level; standing up from an armless straight chair; or standing or being on their feet for 2 h.

Measurement of dietary behavior

Two 24-h recalls were collected during the visit to the mobile examination center (MEC). Dietary intake may differ by weekday, especially weekend days. To capture intake on all days of the week, the 24 h recalls were collected on every day of the week. The dietary interviewers used the Dietary Data Collection (DDC) system, which is an automated standardized interactive dietary interview and coding system. The Alternate Healthy Eating Index (AHEI) 2005 was developed by the USDA (United States Department of Agriculture) as an indicator of dietary quality.[10] The AHEI is comprised of 12 components (total fruit; whole fruit; total vegetable; dark green, orange vegetable and legumes; total grain; whole grain; milk; meat and beans; oil; saturated fats; sodium; and calories from solid fats, alcoholic beverages, and added sugars) with a maximum score of 100 and with a higher score reflecting more closely adhering to the dietary guidelines for Americans. The Healthy Eating Index was derived for each of the 24 h recall days using the MyPyramid Equivalents Database and following the methods and SAS code established by the USDA Center for Nutrition Policy and Promotion.[11–14]

Using the average of the two-day AHEI scores, participants at or above the 60th percentile (i.e. top 40%) of AHEI scores in the population were categorized as adhering to the dietary guidelines or consuming a healthy diet.[15,16]

Covariates

Covariates included meeting *muscle strengthening* guidelines (yes/no), accelerometer-assessed aerobic-based *physical activity* (min/day; continuous), *age* (yrs; continuous), *sex*, *race-ethnicity* (Mexican American, non-Hispanic white, non-Hispanic black, other), cotinine-assessed *smoking* exposure (ng/mL; continuous), *C-reactive protein* (mg/dL; continuous), *cholesterol* medication use (yes/no), physician-diagnosed *hypertension* (yes/no), physician-diagnosed *diabetes* and measured *body mass index* (kg/m^2; continuous).

With regard to *muscle strengthening* activities, participants were asked two questions related to engagement in muscle strengthening activities: 1) “Over the past 30 days, did you do any physical activities specifically designed to strengthen your muscles such as lifting weights, push-ups or sit-ups?” (response option: *yes* or *no*), and 2) among those answering *yes* to this first question, they were asked, “Over the past 30 days, how many times did you do these activities designed to strengthen your muscles such as lifting weights, push-ups, or sit-ups?” Consistent with the United States Department of Health and Human Services (USDHHS) physical activity guidelines,[17] those self-reporting 8 muscle strengthening activities sessions/month (2/week) were considered to meet muscle strengthening guidelines.[18]

With regard to total aerobic-based physical activity, participants who were not dependent of wheelchair use for ambulation were asked to wear an ActiGraph 7164 (Pensacola, FL) accelerometer on their right hip for 7 days. Accelerometers were affixed to an elastic belt that was worn around the participant's waist near the mid-axillary line at the level iliac crest. Participants were asked to wear the accelerometer during all activities, except water-based activities and while sleeping. Only those participants with at least 4 days of 10 or more hours/day of accelerometer wear time were included in the analyses in order to ensure that data adequately captured habitual physical activity patterns.[19] To monitor the amount of time the device was worn, nonwear was defined by a period of a minimum of 60 consecutive minutes of zero activity counts, with the allowance of 1–2 min of activity counts between 0 and 100.[19] Minutes with activity counts/min $\geq$100 counts/min were classified as total physical activity.[20]

Data analysis

All statistical analyses (Stata, version 12.0, College Station, TX) accounted for the complex survey design used in NHANES by using survey sample weights, clustering, and primary sampling units (data analyzed in 2016). Weighted multivariable Cox proportional hazard models were used to examine the association between dietary behavior and all-cause mortality. Schoenfeld's residuals were used to verify the proportional hazards assumption. Statistical significance was established as $P < 0.05$.

Results

Among the analyzed sample of 1369 adults, 224 died during the median follow-up period of 81 months (IQR = 66–94). For the sample, 108,010 person-months occurred with an all-cause mortality rate of 2.07 per 1000 person-months. Among the 224

Please cite this article in press as: Loprinzi PD, et al., Association between dietary behavior and mortality among American adults with mobility limitations, Disability and Health Journal (2017), http://dx.doi.org/10.1016/j.dhjo.2017.05.006