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Featured Article

Prudent diet may attenuate the adverse effects of Western diet on cognitive decline

Behnaz Shakersain[a,*], Giola Santoni[a], Susanna C. Larsson[b], Gerd Faxén-Irving[c], Johan Fastbom[a], Laura Fratiglioni[a,d], Weili Xu[a,e,**]

[a]Aging Research Center, Center for Alzheimer Research, Department of Neurobiology, Care Sciences and Society, Karolinska Institutet and Stockholm University, Stockholm, Sweden
[b]Unit of Nutritional Epidemiology, Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden
[c]Division of Clinical Geriatrics, Department of Neurobiology, Care Sciences and Society, Karolinska Institutet, Huddinge, Sweden
[d]Stockholm Gerontology Research Center, Stockholm, Sweden
[e]Department of Epidemiology and Biostatistics, School of Public Health, Tianjin Medical University, Tianjin, China

Abstract

Introduction: The influence of mixed dietary patterns on cognitive changes is unknown.

Methods: A total of 2223 dementia-free participants aged ≥ 60 were followed up for 6 years to examine the impact of dietary patterns on cognitive decline. Mini-mental state examination (MMSE) was administered. Diet was assessed by a food frequency questionnaire. By factor analysis, Western and prudent dietary patterns emerged. Mixed-effect models for longitudinal data with repeated measurements were used.

Results: Compared with the lowest adherence to each pattern, the highest adherence to prudent pattern was related to less MMSE decline ($\beta = 0.106$, $P = .011$), whereas the highest adherence to Western pattern was associated with more MMSE decline ($\beta = -0.156$, $P < .001$). The decline associated with Western diet was attenuated when accompanied by high adherence to prudent pattern.

Discussion: High adherence to prudent diet may diminish the adverse effects of high adherence to Western diet on cognitive decline.

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Keywords: Dietary patterns; Cognitive decline; Population-based; Longitudinal study

1. Introduction

Cognitive decline is defined as an age-related deterioration in cognitive functioning characterized by increasing difficulties with memory, language, and other cognitive functions [1]. Cognitive decline may eventually lead to mild cognitive impairment (MCI) and dementia [2]. Because of the limited efficacy of pharmacologic therapies for MCI or dementia, a growing body of research focuses on modifiable risk factors (including diet) for progressive cognitive decline [3].

A number of studies have investigated the association between individual food items or nutrients and cognitive function and dementia [4]. Research suggests that the cumulative effect of various nutrients in a whole diet on cognitive function might differ from the effect of a single nutrient or food item [5,6]. As humans eat meals with complex combinations of nutrients that are likely to be correlated and interact with each other, the cumulative effects of different diet components have received special attention and different dietary patterns have been examined in relation to various chronic disorders [5,7]. In recent years, different dietary patterns (such as diets rich in saturated fat, sugar, red/processed meat and refined grains, and diets rich in vegetables, fruit, whole grains, and fish) have

been empirically derived and studied in relation to cardiovascular disease, cancer, and mortality [8].

Currently, few population-based prospective studies have examined the association between overall food patterns and cognition or dementia [4]. Most of these studies have shown the protective effect of "Mediterranean-like diets" on dementia or cognitive decline [9,10], although findings are inconsistent [11]. In contrast, a dietary pattern low in vegetables and high in saturated/trans-fat and sugar has been associated with cognitive deficits and Alzheimer's disease (AD) [12,13]. The "Western-type" dietary pattern, which includes red meat, refined grains, high-fat dairy products, and sugar [14], has been found to play a role in the development of AD in animal models [15,16], but the influence of major dietary patterns on cognitive decline remains unclear. Most people eat a combination of healthy and less healthy foods; but the impact of mixed dietary patterns on the risk of chronic conditions remains unknown.

This study aimed to (1) identify dietary patterns in a 60+ year old population; (2) investigate the individual impact of different dietary patterns on changes in cognitive functioning; and (3) explore the combined effect of mixed dietary pattern on changes in cognitive functioning using 6-year follow-up data from a population-based cohort study of the Swedish older adults.

2. Methods

2.1. Study population

Study participants were derived from the Swedish National study on Aging and Care-Kungsholmen (SNAC-K), an ongoing longitudinal project focusing on the aging process and the Swedish care system [17]. SNAC-K participants are a random sample of individuals aged 60+ years who live either at home or in institutions in the Kungsholmen district, a central area in Stockholm, Sweden. Because of more rapid changes in health and a higher attrition rate among older age groups, the sampling is stratified by age cohort. Assessments take place at 6-year intervals for younger cohorts (60, 66, 72, and 78 years) and at 3-year intervals for older cohorts (81, 84, 87, 90, 93, 96, and 99+ years). Among the 5111 persons initially invited to participate, 4590 were alive and eligible at baseline. Of them, 3363 participated in the baseline survey and 1227 were refusers. Of the participants, 2223 persons were left for the present study after exclusion of demented people (n = 321), those with more than 20% missing values on the semi-quantitative food frequency questionnaire (SFFQ; n = 508), mini-mental state examination (MMSE) score <27 (n = 306, nondemented) [18], and missing MMSE score (n = 5) at baseline.

The first follow-up of the older cohorts was conducted from 2004 through 2007. The second follow-up of the older cohorts and the first follow-up of the younger cohorts were carried out from 2007 through 2010 (Supplementary Fig. 1).

SNAC-K was approved by the Regional Ethical Review Board in Stockholm, Sweden. Written informed consent was obtained from each participant, or if the participant had cognitive impairment, from a proxy (e.g., a close family member).

2.2. Data collection

Data on demographics, lifestyle factors, anthropometrics, medical history, and current use of medications were collected through face-to-face interviews by nurses and physicians. These interviews followed a structured protocol (http://www.snac.org). Educational level was assessed as the maximum years of formal schooling and divided into elementary school, high school, and university. Smoking status was dichotomized as never-smokers and ever-smokers. Physical activity was categorized as (1) inadequate: never, ≤2–3 times/month; (2) health-enhancing: light exercise several times/week or every day; and (3) fitness-enhancing: moderate-to-intense exercise several times/week or every day [19]. Social network was defined based on information about civil status, living arrangement, and having contact with children or friends and categorized as rich, moderate, and poor (See details in the Supplementary Material) [20]. Weights and heights were measured by nurses with a standard scale when participants were in light clothing with no shoes. Body mass index (BMI) was calculated as weight (kg) divided by height (m) squared. Arterial blood pressure was measured twice at a 5-min interval in a sitting position on the right arm with a sphygmomanometer, and the mean of the two readings was used in the analyses.

Data on chronic diseases, including vascular disorders (hypertension, stroke, heart diseases including coronary heart disease, arrhythmia, and heart failure), diabetes, and cancer, were ascertained on the basis of clinical examinations by physicians, self-reported medical histories, medication use, and the inpatient registry that cover hospitalizations in Sweden since 1969. The ninth and tenth revisions of the International Classification of Diseases (ICD-9 and ICD-10) were used in the registry. Medicinal drugs were classified in accordance with the Anatomical Therapeutic Chemical (ATC) classification system. Blood samples were taken, and genotyping was performed for apolipoprotein E (*APOE*) (rs429358) [21]. The Swedish Cause of Death Register at the National Board of Health and Welfare was used to assess death dates.

2.3. Dietary assessment

Data on dietary intake at baseline were collected using a validated SFFQ with 98 food and beverage items [22]. Participants were asked about how often on average over the past 12 months they consumed each food item on a 9-level scale ranging from never to ≥4 times per day. Portion sizes were estimated using color photos showing four plates with different portions of staple foods (potatoes, rice, and pasta), meat, and vegetables in the SFFQ. For the other food items, a standard portion size was used. For example, the size of an