Neurobiology of Aging 35 (2014) S74–S78

Contents lists available at ScienceDirect

Neurobiology of Aging

journal homepage: www.elsevier.com/locate/neuaging

Review

Dietary and lifestyle guidelines for the prevention of Alzheimer's disease

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ARTICLE INFO

Article history:
Received 25 October 2013
Received in revised form 4 March 2014
Accepted 14 March 2014
Available online 14 May 2014

Keywords:
Dementia
Alzheimer's disease
Prevention
Nutrition
Saturated fat
Trans fatty acids
Vitamin E
Iron
Copper
Exercise

ABSTRACT

Risk of developing Alzheimer's disease is increased by older age, genetic factors, and several medical risk factors. Studies have also suggested that dietary and lifestyle factors may influence risk, raising the possibility that preventive strategies may be effective. This body of research is incomplete. However, because the most scientifically supported lifestyle factors for Alzheimer's disease are known factors for cardiovascular diseases and diabetes, it is reasonable to provide preliminary guidance to help individuals who wish to reduce their risk. At the International Conference on Nutrition and the Brain, Washington, DC, July 19–20, 2013, speakers were asked to comment on possible guidelines for Alzheimer's disease prevention, with an aim of developing a set of practical, albeit preliminary, steps to be recommended to members of the public. From this discussion, 7 guidelines emerged related to healthful diet and exercise habits.

1. Introduction

Alzheimer's disease affected an estimated 4.7 million Americans in 2010, and its prevalence is expected to nearly triple in coming decades (Hebert et al., 2013). Several factors contribute to the risk of developing late-onset Alzheimer's disease, including older age, genetic factors (especially the presence of the APOEε4 allele), family history, a history of head trauma, midlife hypertension, obesity, diabetes, and hypercholesterolemia (Bendlin et al., 2010).

In addition, recent prospective studies have shown that certain dietary and lifestyle factors, including saturated fat intake, vitamin E intake, and physical exercise, among others, are associated with Alzheimer's risk, suggesting that prevention strategies may be applicable for these factors. In each of these areas, scientific evidence is less than complete. Nonetheless, individuals at risk for

Sources of funding: None.
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0197-4580/$ – see front matter © 2014 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.neurobiolaging.2014.03.033

Alzheimer's disease make decisions about dietary and lifestyle on a daily basis and need to act on the best evidence available to them, even when scientific consensus may not have been achieved.

In toxicology, the "precautionary principle" is invoked in situations in which there is a substantial basis for concern regarding the health consequences of an exposure and for which available data preclude a comprehensive evaluation of risk (European Commission, 2000). A similar approach can be applied to nutritional and other lifestyle-related exposures, particularly for conditions, such as cancer or Alzheimer's disease, for which there may be a long latency period between exposure and disease manifestation and for which randomized controlled trials are impractical or are, for whatever reason, not rapidly forthcoming. Some have argued that the level of evidence required for making dietary recommendations for disease prevention may be different from that required for establishing the efficacy of medical treatments, such as pharmaceuticals (Blumberg et al., 2010).

At the International Conference on Nutrition and the Brain, Washington, DC, July 19–20, 2013, evidence regarding the influence of dietary factors, physical and mental exercise, and sleep on aspects of cognition was reviewed, and conference speakers were asked to comment on possible dietary and lifestyle guidelines for Alzheimer's disease prevention, with an aim of developing a set of practical steps to be recommended to members of the public.

2. Methods

The following principles were applied to the development of guidelines:

1. Guidelines were to be based on substantial, although not necessarily conclusive, evidence of benefit.
2. Implementation of guidelines should present no reasonable risk of harm.
3. The guidelines were to be considered to be subject to modification as scientific evidence evolves.

3. Results

Seven guidelines emerged and are as follows:

1. Minimize your intake of saturated fats and trans fats. Saturated fat is found primarily in dairy products, meats, and certain oils (coconut and palm oils). Trans fats are found in many snack pastries and fried foods and are listed on labels as "partially hydrogenated oils."
2. Vegetables, legumes (beans, peas, and lentils), fruits, and whole grains should replace meats and dairy products as primary staples of the diet.
3. Vitamin E should come from foods, rather than supplements. Healthful food sources of vitamin E include seeds, nuts, green leafy vegetables, and whole grains. The recommended dietary allowance (RDA) for vitamin E is 15 mg per day.
4. A reliable source of vitamin B12, such as fortified foods or a supplement providing at least the recommended daily allowance (2.4 μg per day for adults), should be part of your daily diet. Have your blood levels of vitamin B12 checked regularly as many factors, including age, may impair absorption.
5. If using multiple vitamins, choose those without iron and copper and consume iron supplements only when directed by your physician.
6. Although aluminum's role in Alzheimer's disease remains a matter of investigation, those who desire to minimize their exposure can avoid the use of cookware, antacids, baking powder, or other products that contain aluminum.
7. Include aerobic exercise in your routine, equivalent to 40 minutes of brisk walking 3 times per week.

4. Discussion

The rationale for each of these guidelines is briefly discussed as follows.

1. Minimize your intake of saturated fats and trans fats.

As reviewed elsewhere in this supplement, several (although not all) prospective studies have indicated an association between intake of saturated or trans fats and incident Alzheimer's disease (Barnard et al., 2014; Morris, 2014). Saturated fat is found especially in dairy products and meats; trans fats are found in many snack foods.

In the Chicago Health and Aging Project, individuals in the upper quintile of saturated fat intake had twice the risk of developing Alzheimer's disease during a 4-year study period, compared with participants in the lowest quintile (Morris et al., 2003). In the Washington Heights-Inwood Columbia Aging Project in New York and the Cardiovascular Risk Factors, Aging, and Dementia study in Finland, Alzheimer's disease risk was positively, but nonsignificantly, associated with saturated fat intake (Laitinen et al., 2006; Luchsinger et al., 2002). A number of well-controlled studies of cognitive decline have found that high saturated fat intake increases the rate of decline in cognitive abilities with age (Beydoun et al., 2007; Devore et al., 2009; Eskelinen et al., 2008; Heude et al., 2003; Morris et al., 2006b; Okereke et al., 2012).

Increased saturated fat intake is associated with risk of cardiovascular disease and type 2 diabetes (Mahendran et al., 2013; Mann, 2002), which, in turn, are associated with increased risk of Alzheimer's disease (Ohara et al., 2011; Puglielli et al., 2003). A large study of Kaiser Permanente patients showed that participants with total plasma cholesterol levels $\geq$240 mg/dL in midlife had a 57% higher risk of Alzheimer's disease 3 decades later, compared with participants with cholesterol levels $<$200 mg/dL (Solomon et al., 2009).

Additional evidence of mechanistic associations between saturated or trans fat intake and Alzheimer's risk comes from the fact that the APOEε4 allele, which is strongly linked to Alzheimer's risk, produces a protein that plays a key role in cholesterol transport (Puglielli et al., 2003) and from the observation that high-fat foods and/or the increases in blood cholesterol concentrations they may cause may contribute to beta-amyloid production or aggregation in brain tissues (Puglielli et al., 2001).

2. Vegetables, legumes (beans, peas, and lentils), fruits, and whole grains should replace meats and dairy products as primary staples of the diet.

Vegetables, berries, and whole grains provide healthful micronutrients important to the brain and have little or no saturated fat or trans fats. In both the Chicago Health and Aging Project and the Nurses' Health Study cohorts, high vegetable intakes were associated with reduced cognitive decline (Kang et al., 2005; Morris et al., 2006a). Legumes and fruits merit emphasis, not because of an association with reduced Alzheimer's disease risk, but because, like grains and vegetables, they provide macronutrient nutrition that is essentially free of saturated and trans fats