Chapter

Dementia and Nutrition

Krishna Prasad Pathak and Emanuela Mattos

Abstract

Global aging population worldwide increasing. As growing age, the aging related issues like dementia came to be seen not as an inevitable condition at the old age phase, but as a condition that results from the competition between multiple risk factors and protective factors acquired throughout life. There is currently no cure for dementia. Thus, strategies to prevent or delay onset of dementia by changes in lifestyle factors, such as diet, are important as non-pharmacological therapy. A healthy nutrition contributes in delaying the cognitive decline for the elderly people and dementia patients. Cognitive decline is a normal part of the aging process and it is a main clinical identification in between elderly and dementia. The group of B Vitamins (B1, B2, B6, B12) are significantly associated with healthy neuropsychological function. The lack of B12 can show impairment of cognition and neurologic deficit and impacts on educational achievement. The cognitive impairment is a main clinical symptom of dementia which can raise the prevalence rates of cognitive impairment that can be dementia accordingly at the end of life.

Keywords: dementia, cognitive impairment, diet

1. Introduction

The aging of the population worldwide has accentuated the emergence of chronic degenerative diseases, including dementia. This is already recognized as a public health priority, given the social and economic impacts at local and regional levels. The absence of effective pharmacological treatments for the reversal of the conditions, caused many researches to be developed in search of preventive strategies. In the past few decades, researchers have focused on identifying potentially modifiable risk factors. This led to a paradigm shift. Dementia came to be seen not as an inevitable condition at the old age phase, but as a condition that results from the competition between multiple risk factors and protective factors acquired throughout life. Scholars have already pointed out evidence linking dementia to vascular risk factors (e.g., hypertension, diabetes, obesity), psychosocial factors (e.g., depression), lifestyle behaviors (e.g., low intellectual level and physical activity, smoking). Meanwhile, high level of education and work complexity, social networks, involvement in mental stimulating activities and regular physical exercise have shown protective properties against dementia [1–3]. Based on this, interventions focused on lifestyle modification have been conducted to assess the impact and association of eating habits and cognitive performance/dementia [1].

Data from the Alzheimer's International Disease (ADI) points out that the number of elderly citizens in the world comprises almost 900 million people. Most live in low-income countries. Longer life expectancy is one of the main risk factors for the development of chronic diseases, with dementia being the most prevalent in

this population [4]. The figure bellow shows the high difference between the number of people with dementia in low and middle income compared to high income countries (**Figure 1**).

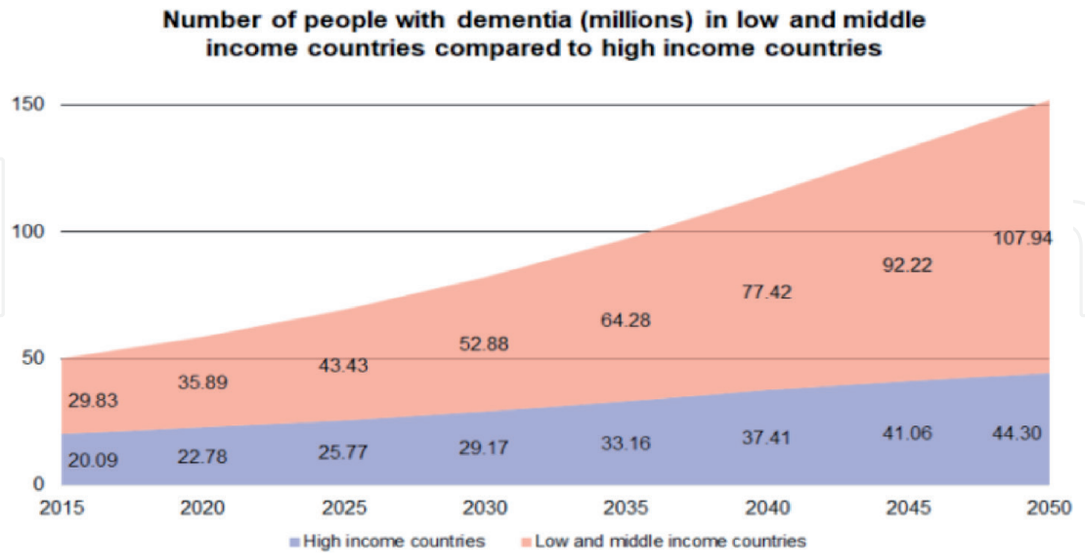

Figure 1.
Alzheimer's Disease International (2015) [5].

Aspects related to industrial and economic development and urbanization make traditional societies adapt to rapid changes. These 'social' aspects have been little discussed but their impacts as well as those caused by the demographic and epidemiological transition will make a profound difference in the great number of cases of dementia largely concentrated in middle and low-income countries. In 2015, the country with the highest percentage of elderly citizens was Japan (33.2%), and the lowest was Uganda (3.7%). Analysing the table below, it is possible to predict the distribution of the world's elderly population according to the country's income range in the coming years [4] (**Figure 2**).

The world's population of older people (age 60 and over, millions), and their distribution according to country income level (World Bank Classification 2009 and 2015)

	Current and projected numbers of older people (% of total population)					% increase over time	
Year	2010	2015		2030	2050	2015-2030	2015-2050
World Bank income classification	2009	2009	2015	2015	2015	2015	2015
HIC	232.3 (30.4%)	258.7 (28.9%)	309.4 (34.6%)	403.9 (29.4%)	482.5 (23.9%)	31%	56%
UMIC	116.4 (15.2%)	135.3 (15.1%)	319.8 (35.7%)	531.5 (38.7%)	760.8 (37.7%)	66%	138%
L-MIC	356.2 (46.6%)	431.7 (48.2%)	233.1 (26.0%)	386.0 (28.1%)	665.3 (32.9%)	66%	185%
LIC	59.8 (7.8%)	69.5 (7.8%)	32.9 (3.7%)	53.5 (3.9%)	111.4 (5.5%)	63%	239%
World	764.7 (100%)	895.2 (100%)		1347.8 (100%)	2020.0 (100%)	51%	126%

Figure 2.
Alzheimer's Disease International (2015) [4].

The biggest concern is that the poorest countries, of course, have less savings and professional human resources for the needs of health care and social assistance for populations that age rapidly and consequently for those who develop chronic

diseases such as dementia [4]. Mayeda et al. (2016) pointed out the results of their study on inequalities in the incidence of dementia with six racial and ethnic groups over 14 years. The results showed that the dementia incidence was highest for African-Americans (26.6/1,000 person-years) and American Indian/Alaska Native (AIANs) (22.2/1,000 person-years); intermediate for Latinos (19.6/1,000 person years), Pacific Islanders (19.6/1,000 person-years), and Whites (19.3/1,000 person-years) and lowest among Asian-Americans (15.2/1,000 person-years). Risk was 65% greater for African Americans versus Asian-Americans. These inequalities in dementia incidence were observed among women and men and across all ages and estimated cumulative incidence of dementia over 25 years was high for all groups [6].

Worldwide, a significant portion of the elderly population has nutritional problems such as malnutrition (for example, micronutrient deficiencies, like B vitamins, vitamin C, E, D, Se, Zn, Ca and Fe) and over-nutrition (ie, obesity); often existing together [7]. A growing body of evidence has been focused on the association between dietary habits and cognitive performance/dementia. Numerous studies have pointed out that various dietary patterns and nutritional components such as (Mediterranean diet, unsaturated fatty acids, antioxidants (such as vitamin E, vitamin C and flavonoids, vitamin B) are associated with a significantly reduced risk of dementia [8]. In addition, low concentrations of vitamin D were related to an increased risk of cognitive decline [8]. The understanding that nutritional components can play a protective role and favorably influence the cognitive trajectory from the adoption of specific nutritional habits has been widely investigated. Although substantial progress has been made in identifying predictors of healthy aging the impact of certain interventions have proven to be increasingly challenging. This is due, in partly due to the cost and difficulty of studying the long latency disability and illness, and the subjective nature of some predictors of healthy aging.

Marsman et al. appointed: "Identify inequalities and identify social, economic and other policies that can reduce unjust processes within and between countries are essential to improving the lives of all chances of optimizing healthy aging. However, measuring healthy aging and the impact of interventions on life style remains an area of research focus. Metabolomics and transcriptomics led to the emergence of biomarkers that can be used to assess the impact of various interventions in the healthy aging process. Clearly, the role of diet and nutrition is central to maintaining life" [7].

2. Diet

There is currently no cure for dementia. Thus, strategies to prevent or delay onset of dementia by changes in lifestyle factors, such as diet, are important as non-pharmacological therapy. In, 2014, The World Alzheimer Report pointed the evidence from cross-sectional studies has shown that, compared to adults with dementia, healthy elderly people tend to have a healthier life diet, richer in fruits and vegetables, instead of meat, processed carbohydrates and fats [9]. It is not yet known why eating habits can contribute to the development of dementia, but studies that have been carried out so far have given rise to hypotheses fats [9].

A healthy nutrition contributes in delaying the cognitive decline for the elderly people and dementia patients [10]. Cognitive decline is a normal part of the aging process [11] and it is a main clinical identification in between elderly and dementia. The group of B Vitamins (B1, B2, B6, B12) are significantly associated with healthy neuropsychological function [12]. The lack of B12 can show impairment of cognition and neurologic deficit and impacts on educational achievements [13]. The cognitive impairment is a main clinical symptom of dementia which can raise the prevalence rates of cognitive impairment that can be dementia accordingly at the end of life.

ADI reinforces that dementia is a multifactorial chronic condition with a long latency period between the beginning of the complex pathophysiological and clinical mechanisms and the surgeries of the first symptoms, difficulty and limitation to the performance of definitive trials that test the effect of the diet on it [9]. Prospective cohort studies with long follow-up intervals can obtain associations in their results biologically plausible with epidemiological evidence that guide dietary recommendations to reduce the risk of dementia in populations [9]. Researchers recognize B vitamins as essential after cellular metabolism and that needs supplementary dietary intake because our bodies cannot synthesize necessary quantities. There are eight different chemically distinct types of vitamin B, with B6, B9 and B12 all being linked to protective roles in cognition [9], as well as exogenous antioxidants, including vitamins A (eg, b-carotene), C and E (tocopherols), and minerals, such as manganese, copper, selenium and zinc [14]. In 2004, Garcia and Zanibbi researched the mechanisms of action of homocysteine and speculated that the effects of elevated homocysteine on the brain may be irreversible, in cases where neuropathological changes were already observed [9, 15]. Studies identified that when folate or vitamin B12 are deficient, homocysteine levels rise, which may contribute to amyloid and tau protein accumulation and neuronal death. Homocysteine stimulates apoptosis and neurotoxicity (leading to nerve cell death), and platelet activation (contributing to white matter lesions, vascular injury and ischaemic strokes [9, 15]. The association between B vitamins and cognition has been the subject of several recent systematic reviews [9, 15]. Antioxidants has been the subject of investigation. Studies try to understand how they can inhibit the production of toxic substances and reduce the damage caused by free radicals and, consequently, neurodegeneration [9]. PUFA (polyunsaturated fatty acids) Omega-3 which are not synthesized by the human body, is an essential food constituent in view of its importance for the brain [9, 15]. Research suggests that Omega-3 may be involved in the vascular and inflammatory system and the amyloid pathways of dementia, and be therefore, potentially important in vascular dementia, Alzheimer's disease and mixed forms [9]. Evidence on the beneficial effects of fish consumption for preventing the incidence of dementia are inconsistent. However, healthy lifestyles and circumstances of life (including socioeconomic and educational level) that are associated with higher fish consumption and lower risk of dementia can explain the positive results found by some studies [9, 16]. The Mediterranean diet, which consists of a high intake of cereals, fruits, fish, legumes and vegetables, was associated with reduced risk for a number results, including cardiovascular disease, type 2 diabetes, some forms of cancer and in general mortality studies [9, 17]. The main biological mechanisms are related to the impact on the vascular system, oxidative stress and attenuation of the inflammatory pathway, proposals to support these associations can reduce the risk of cardiovascular disease, which in itself is a risk factor for dementia [9, 18–20].

The Mediterranean foods including olive Oil, consumption of fish (it is rich in omega-3), are important to maintain the proper brain functions [21] and regulate the oxidative stress [15, 22]. In Indian and Nepali food culture people use the daily cumin, Curcumin (Turmeric) in their kitchen which has been used since long century and is believed to heal various medical conditions like; gastric, ulcer, arthritis, liver disease including and traumatic brain injury and treatments for dementia [23, 24]. The another herbal called Gingo biloba prescribed to preserve the memory as medication for the dementia patients as the primary prevention [25]. It is also, suggest by vitro study that Gingo biloba helps as anti-amyloid aggregation effect and beneficial in dementia prevention [26]. A study finds that a higher intake of red meat in midlife was associated to increase the cognitive impairment at the end of life. However, the poultry/Sell-fish food reduced the risk in the population of Chinese people [27]. Likewise, lacking of iron is associated to be cognition impairment [10]. Animal study

showed capacity of brain can be strong if the dietary of Iron is in balance. Similarly, a human model study documented that iron treatment helped positively to concentrate [11]. Iron deficiency in child age also risk to have poorer cognitive impairment in four countries study, India, Mexico, Zanzibar and Chile [12]. Besides this protein deficiency is also most important cause of poor attention, motivation, motor control and perception of the children that leads to the ends of life [13]. Thus, overall lacking of nutrients (B12, iron, protein, Zink, energy) can irreversible effects to the developing children and impacts cognitive functions and quality of life [28].

Inadequate childhood nutrition is associated with poor short-term academic and cognitive outcomes inadequate childhood nutrition is associated with poor short-term academic and cognitive impairment in later life, while substitution of red meat intake with poultry or fresh fish/shellfish was associated with reduced risk. While substitution of red meat intake with poultry or fresh fish/shellfish was associated with reduced risk [29].

3. Conclusion

Despite the association evidenced by the studies described so far between the protective role of nutrition and cognitive decline, no observational or randomized controlled study has been conclusive regarding the effectiveness of a type of nutritional intervention. As dementia is a multifactorial chronic condition, health professionals before the proportion of consumption of a given nutritional diet, should consider the nutritional resources accessible to the elderly according to social, economic, cultural, educational and regional aspects. While observational studies use self-report questionnaires that assess the individual at a single point in time and may have several variations in nutritional consumption that are not reported or that may have interference from experiences prior to evaluation, longitudinal studies (RCT) can adjust some variables such as the level of education of the subjects in their analysis, but indicators such as social and economic level are less frequently considered.

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