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Research Article

Association Between Cognitive Changes and Eating Habits in Older Individuals

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Abstract

Objective: To verify the association between eating habits and cognitive changes in the older population.
Methods: A cross-sectional study with data analysis of older patients treated in an Outpatient Hearing Health Service (SASA, in Portuguese) accredited to the Unified Health System from May 2021 to July 2022. The research consisted of older individuals aged 60 years or older who attended the Outpatient Hearing Health Service for evaluation and performance of the Tonal and Vocal Audiometry exam and began the hearing rehabilitation process using the Individual Sound Amplification Device.
Result: Healthy dietary patterns, specific foods, and dietary supplements can improve memory, language, attention and concentration, executive functions, and other cognitive domains. Participants with a higher consumption of foods considered healthy and not industrialized presented more positive results than those with a lower consumption of these foods.
Conclusion: High diet quality and diverse vegetable consumption are associated with a lower risk of cognitive decline in older individuals. In addition, individuals with dietary changes in middle age are less likely to acquire cognitive changes in the future.
Keywords: food; diet; and nutrition; health promotion; healthy aging; neurocognitive disorders; cognition

Introduction

Cognitive changes are one of the most worrying health conditions for patients and health professionals. Preventing or even delaying their onset would significantly reduce the burden of many diseases [1]. Projections show that the number of people worldwide with some cognitive impairment will increase to about 152 million by 2050 [2]. Lifestyle adjustment can be essential for preventing cognitive decline in the absence of a pharmacological or disease-modifying agent [1,3,4].

The progressive decline in cognitive functions causes memory loss and motor impairment, negatively affecting older individuals' quality of life (QOL) and preventing them from making important decisions in their daily activities (DA). Genetic factors, environmental toxicants, socioeconomic conditions, oxidative stress, and neuronal inflammation are precursors for the onset of age-related chronic brain diseases [5].

Oxidative stress, known as an imbalance in the production of reactive oxygen species and the biological antioxidant defense system, increases over time, representing a significant risk factor for age-associated cognitive decline [6,7]. The World Health Organization [8], suggests that dietary modifications as one of the lifestyle interventions can reduce the risk of developing cognitive decline or dementia. The ketogenic [1] and

Mediterranean diets [9,10] are the most discussed among many dietary approaches proposed to improve brain health.

Bidirectional communication between the microbial organisms that inhabit the gut (gut microbiota) and the brain occurs through several pathways, including the vagus nerve (VN), immune system, and bacteria-derived neuroendocrine pathways. The microbiota-gut-brain axis is involved in neurodegeneration, thus affecting several aspects of health related to energy metabolism, the immune system, and neuronal function. Numerous factors have been highlighted to influence gut microbiota composition, including diet composition and nutritional status. Optimal nutritional status and healthy gut microbiota are crucial to maintaining brain health. Unbalanced dietary patterns can affect the microbial community and compromise brain physiology and its predisposition to neurodegenerative diseases [11].

Thus, this study aimed to verify the association between age-related cognitive status and eating habits in the older population.

Material and Methods

Ethical Aspects

This study was approved by the Research Ethics Committee (CEP): CAAE: 39562720.8.0000.012.

Database: This is a cross-sectional study with data analysis of older patients treated in an Outpatient Hearing Health Service (SASA, in Portuguese) accredited to the Unified Health System from May 2021 to July 2022. The vulnerability indicators of older individuals were analyzed, and the type and degree of hearing loss proposed by the World Health Organization [8] were classified to evaluate the protocol application quality. The inclusion criteria were older individuals aged 60 years or older who attended the SASA to assess and perform the Tonal and Vocal Audiometry exam and begin the hearing rehabilitation process from the Individual Sound Amplification Device (ISAD).

Data collection: Sociodemographic information (gender, age, education, income) was collected to characterize the population. The variables were analyzed in female or male, income in minimum wages, and illiterate, elementary, high school, or higher education schooling. The dietary habits were evaluated through the Qualitative Assessment Protocol of the Diet of Older Individuals based on the Dietary Guide for the Brazilian Population. The *Montreal Cognitive Assessment (MoCA) protocol* [12] was used to evaluate the cognitive state by assessing overall cognition in various domains, such as Visuospatial/Executive, Naming, Memory, Attention, Language, Abstraction, Delayed Recall, and Orientation (for time and place).

Data analysis: The categorical variables of the study population were described using a comparative analysis of nonparametric data using the Mann-Whitney test for independent groups. Subsequently, the data regarding sociodemographic information, eating habits, and cognitive status were organized in spreadsheets of the Microsoft Excel® program and exported and analyzed in the *MedCalc® Statistical Software, version* 20.027 (*StataCorp, College Station*, TX, USA).

Results

The study population comprised 654 older participants, 48.3% male and 51.6% female, aged between 60 and 97. Concerning the sociodemographic data, approximately 87.0% of participants had income between one and three minimum wages; 73.1% had education up to elementary school; 87.7% were retired, and 21.8% of individuals stated that they lived alone (Table 1).

		n	%	CI (95%)	*p*-value[1]
Gender	Male	316	48.3	44.43-52.23	0.390
	Female	338	51.6	47.78-55.57	
Income	Below one minimum wage	23	3.5	2.25-5.25	< **0.001***
	Between one and three minimum wages	567	87.0	84.28-89.58	
	Between four and ten minimum wages	50	7.68	5.75-10.00	
	More than ten minimum wages	11	1.69	0.85-3.00	
Schooling	Illiterate	45	6.9	5.11-9.18	< **0.001***
	Primary education	474	73.14	69.56-76.53	
	High School	87	13.42	10.89-16.29	
	Higher Education	42	6.48	4.71-8.66	
Retiree	No	79	12.3	9.76-15.36	< **0.001***
	Yes	562	87.7	8.58-35.23	
Live alone	No	394	78.1	70.65-86.29	< **0.001***
	Yes	110	21.8	17.94-26.31	

Caption: n: Number; %: Percentage; CI: Confidence Interval; [1]: Statistical test: Pearson's Chi-square.

Table 1. Characterization of the sample regarding sociodemographic data

Table 2 shows eating habits regarding the consumption of different types of food compared to the MoCA [12] protocol in total scores. The analyses showed that the consumption of certain foods, such as tea, meat, fruits, chocolate, and fish, affected the cognitive status (Table 2).

Variable		MoCA (total scores)					*p*-value[1]
		n	min	max	median	Interquartile range	
Rice consumption	No	10	8.0	21.0	15.0	10.0 – 18.0	0.360
	Yes	512	0.0	29.0	16.0	13.0 – 20.0	
Coffee consumption	No	25	3.0	26.0	16.0	15.0 – 21.0	0.188
	Yes	497	0.0	29.0	16.0	13.0 – 20.0	
Fatty meat consumption	No	223	1.0	28.0	16.0	12.0 – 19.0	**0.024***
	Yes	297	0.0	29.0	17.0	13.0 – 21.0	
Meat consumption	No	14	7.0	26.0	17.0	14.0 – 21.0	0.421
	Yes	508	0.0	290	16.0	13.0 – 20.0	
Tea consumption	No	156	3.0	28.0	17.0	14.0 – 21.0	**0.024***
	Yes	365	0.0	29.0	16.0	12.0 – 20.0	
Chocolate consumption	No	182	2.0	28.0	16.0	11.0 – 19.0	**0.007***
	Yes	340	0.0	29.0	16.5	13.0 – 20.5	
Sweets consumption	No	105	2.0	28.0	15.0	11.0 – 20.0	0.100
	Yes	417	0.0	29.0	16.0	13.0 – 20.0	
Beans consumption	No	27	7.0	25.0	15.0	10.2 – 18.0	0.346
	Yes	495	0.0	29.0	16.0	13.0 – 20.0	
Beans and rice consumption	No	20	7.0	25.0	15.0	11.5 – 19.5	0.523
	Yes	500	0.0	29.0	16.0	13.0 – 20.0	
Fried foods consumption	No	125	3.0	29.0	16.0	12.0 – 21.0	0.953
	Yes	397	0.0	29.0	16.0	13.0 – 20.0	
Fruit consumption	No	8	7.0	18.0	11.5	7.5 – 15.0	**0.018***
	Yes	514	0.0	29.0	16.0	13.0 – 20.0	
Milk consumption	No	56	2.0	28.0	16.0	12.5 – 19.0	0.670
	Yes	466	0.0	29.0	16.0	13.0 – 20.0	
Bread consumption	No	18	3.0	24.0	15.5	9.0 – 21.0	0.325
	Yes	504	0.0	29.0	16.0	13.0 – 20.0	
Fish consumption	No	53	1.0	28.0	14.0	8.0 – 18.2	**0.004***
	Yes	469	0.0	29.0	16.0	13.0 – 20.0	
Soda consumption	No	201	2.0	29.0	17.0	13.0 – 21.0	0.076
	Yes	321	0.0	29.0	16.0	13.0 – 19.0	

Caption: N: Number; [1]: Test: *Mann-Whitney test*; *: p-value

Table 2. Eating habits and score in the MoCA protocol.

Discussion

Diet represents a possible preventive measure against cognitive impairment. The cumulative effects of dietary components and variety on cognitive function may differ from that of a single nutrient or food item because meals contain complex combinations of nutrients. As a quick, easy-to-use, and cost-effective tool, food diversity is widely used to assess the quality of food and general diet. This tool can provide an overall assessment of eating behavior, evaluate the effect of multiple food items on health simultaneously, and facilitate a more comprehensive approach to disease control and prevention [4].

The population was represented by older individuals aged between 60 and 97 years, 48.3% male and 51.6% female, with no differences between the genders (p=0.390). Sociodemographic data showed that most of the sample (p<0.001) presented income between one and three minimum wages. This aspect was reported [13], who reported that one of the striking characteristics of the older population in Brazil is the low purchasing power, which results in the acquisition of more affordable food and contributes to food monotony. Demographic, cultural, socioeconomic, and environmental factors influence older individuals' food consumption and nutrition [14] . Thus, this study included 73.1% of the population with schooling up to elementary school, 87.7% of participants were retired, and 21.8% of individuals lived alone, which influenced the characteristics of this population regarding eating

habits. Recognizing what influences eating behavior can allow appropriate interventions to why older individuals eat what foods, which may be related to the perception of hunger and appetite, i.e., whether they have autonomy and maintain the functional capacity to eat correctly and how often they eat [15].

The worldwide population has been aging very rapidly. Healthy eating plays a fundamental role in aging and preventing and controlling chronic non-communicable diseases. It is essential to evaluate the eating habits of older individuals, which diet quality indicators can facilitate. These methods are based on dietary guidelines for the population and are aimed at preventing diseases or traditional eating patterns [16].

The present study showed that older adults with healthy food consumption had higher scores in the MoCA [12] protocol than participants with a lower consumption of these foods. The results would be consistent with the beneficial effect of some diets and dietary components on cognitive health. In short, the results suggest that food consumption is essential in dementia-free individuals and should be considered when designing interventions to slow cognitive decline.

Lifestyle choices based on a healthy dietary management strategy with dietary patterns, foods, and dietary supplements may prevent cognitive impairment since inflammation and oxidative stress play an important role in cognitive impairment. Food compounds with these functions are included in daily meals. Therefore, maintaining eating habits is essential for maintaining health in old age [17].

Greater adherence to plant-based eating habits and high consumption of plant-based foods such as vegetables, fruits, legumes, and whole grains are useful for preserving and strengthening cognitive health [18]. Oxidative stress has long played an important role in cognitive decline and neurodegenerative disorders. Thus, it is plausible that antioxidant-rich foods may offer protection against neurodegenerative diseases by neutralizing oxidative stress [3].

The Mediterranean diet is an antioxidant-rich, plant-based dietary pattern known for its health benefits [19]. Results from experimental studies have associated dietary supplementation with nuts with better cognitive outcomes in older animals [20,21]. A previous sub-study with a larger sample size indicated that the Mediterranean diet and nut consumption reduced the incidence of cognitive changes among participants [22].

Conclusion

The study's results suggest that the consumption of healthy foods, such as diversified vegetables, is associated with a lower risk of cognitive decline in older individuals. In addition, individuals with dietary changes in middle age are less likely to acquire cognitive changes in the future. Individuals who have a food window with more significant restriction and high nutrient quality demonstrate a lower chance of presenting some cognitive disorder from the implementation of the screening protocol for mild cognitive decline. Changes in eating behavior often occur in normal aging and neurodegenerative dementias, ranging from subtle alterations to relevant diagnostic features, as in the case of frontotemporal dementia. Proper screening of dietary patterns and nutrient consumption of older individuals allows early intervention by health professionals and can be essential in patient management. During neurodegenerative dementia, it must be considered that cognitive impairment affects the patient's ability to perform basic and instrumental skills of daily life and that behavioral or movement disorders can occur.

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