CUIDADO É FUNDAMENTAL

RELATIONSHIP BETWEEN NUTRITION AND COGNITIVE CHANGES IN COMMUNITY-DWELLING ELDERLY IN A MUNICIPALITY IN PARANÁ

Relação entre a nutrição e alterações cognitivas em idosos comunitários de um município do Paraná

Relación entre nutrición y cambios cognitivos en personas mayores comunitarias de un municipio de Paraná

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RESUMO

Objetivo: investigar e relacionar a rotina alimentar e o estado cognitivo de idosos. **Método:** trata-se de um estudo descritivo e analítico, realizado com um grupo de idosos adscritos à Unidade Básica de Saúde (UBS) Cidade Alta, no município de Maringá. A coleta de dados ocorreu entre maio e junho de 2024, por meio de entrevista semiestruturada, composta por quatro segmentos: questionário sociodemográfico e clínico; Mini Exame do Estado Mental (MEEM); Questionário de Frequência Alimentar (QFA) adaptado; e questionário aberto sobre a compreensão da escolha dos alimentos e sua relação com a memória. **Resultados:** identificaram-se maiores alterações cognitivas entre mulheres com baixa escolaridade, renda superior a um salário mínimo e múltiplas doenças crônicas. Contudo, idosos com idade entre 70 e 79 anos apresentaram cognição preservada. O baixo consumo de alimentos neuroprotetores reflete o desconhecimento da relação entre dieta e cognição. **Conclusão:** estratégias educativas e a implementação das dietas estudadas são essenciais para promover a saúde cognitiva e prevenir déficits em populações longevas.

DESCRITORES: Neuroproteção; Idoso; Educação em saúde; Alimentos, dieta e nutrição; Envelhecimento cognitivo.

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ABSTRACT

OBJECTIVE: to investigate and relate the eating habits and cognitive status of the elderly. **Method:** T=this descriptive and analytical study was conducted with a group of elderly individuals registered at the Cidade Alta Primary Health Care Unit (Basic Healthcare Unit – UBS) in Maringá, Brazil. Data was collected from May to June 2024 through semi-structured interviews consisting of four segments: a sociodemographic and clinical questionnaire, the Mini-Mental State Examination (MMSE), an adapted Food Frequency Questionnaire (FFQ), and an open-ended questionnaire about understanding food choices and their relationship with memory. **Results:** greater cognitive impairment was identified among women with low education levels, an income above one minimum wage, and multiple chronic diseases. However, elderly aged 70 to 79 years showed preserved cognition. Low intake of neuroprotective foods reflects a lack of awareness of the relationship between diet and cognition. **Conclusion:** educational strategies and the implementation of studied diets are essential to promoting cognitive health and preventing deficits in aging populations.

RESUMEN

Objetivo: investigar y relacionar la rutina alimentaria y el estado cognitivo de personas mayores. **Método**: se trata de un estudio descriptivo y analítico realizado con un grupo de personas mayores adscritas a la Unidad Básica de Salud (UBS) Cidade Alta, en el municipio de Maringá. La recolección de datos se llevó a cabo entre mayo y junio de 2024, mediante entrevista semiestructurada en cuatro segmentos: cuestionario sociodemográfico y clínico; Mini Examen del Estado Mental (MEEM); Cuestionario de Frecuencia Alimentaria (CFA) adaptado; y un cuestionario abierto sobre la comprensión de la elección de alimentos y su relación con la memoria. **Resultados**: se identificaron mayores alteraciones cognitivas en mujeres con bajo nivel educativo, ingresos superiores a un salario mínimo y múltiples enfermedades crónicas. No obstante, los adultos mayores entre 70 y 79 años presentaron cognición preservada. El bajo consumo de alimentos neuroprotectores refleja el desconocimiento de la relación entre dieta y cognición. **Conclusión**: las estrategias educativas y la implementación de las dietas estudiadas son esenciales para promover la salud cognitiva y prevenir déficits en poblaciones longevas.

DESCRIPTORES: Neuroprotección; Persona mayor; Educación en salud; Alimentos, dieta y nutrición; Envejecimiento cognitivo.

INTRODUCTION

Aging is a complex process involving several metabolic changes that affect the function of systems, tissues, and cells. These changes can interfere with the biopsychosocial sphere.[12] This natural and inevitable process for everyone involves unique experiences that reflect genetics and especially the habits of the elderly throughout life. The brain is among the organs most affected by this process of metabolic alterations. Its functions range from commands to perform physical movements, such as holding objects, to skills related to perception, memory, thoughts, and language[3].

In this context, cognitive decline is a common change observed in aging. While elderly people may experience slight changes in intellectual and emotional capacity, these changes should not progress to the point of affecting daily activities. If they do, it may indicate mild dementia.[4]

Several lifestyle habits have the potential to prevent brain deterioration, such as physical activity and maintaining sleep quality, but especially eating behaviors.[5] Among the elderly, there is greater resistance to establishing a balanced diet, which is associated with lifelong bad habits and sometimes a lower level of information.[6] [7]

Dietary patterns have been increasingly studied for their association with cognition because they provide more comprehensive evidence when analyzing the combined effects of nutrients rather than focusing on individual foods.[8] Currently, most studies in this area[9] focus on specific diets, such as the Mediterranean diet, which is characterized by high consumption of olive oil, vegetables, legumes, fruits, cereals, and fish; low consumption of red meat and dairy products; and moderate alcohol intake.[10]

Similarly, the potential of other diets to protect integrity has been studied. One example is the DASH (Dietary Approaches to Stop Hypertension) diet, which focuses on plant-based foods and limits fat, cholesterol, and sodium intake.[11] The MIND (Mediterranean-DASH Intervention for Neurodegenerative Delay) diet was developed based on the DASH diet and the Mediterranean diet. It is composed of foods known to be neuroprotective.[12]

These diets are associated with neuroprotection mainly due to the substances in the foods, including antioxidants, B vitamins, polyphenols, polyunsaturated fatty acids (PUFAs),

monounsaturated fats (MUFAs), and docosahexaenoic acid (DHA). However, although there is evidence of several benefits, the mechanisms by which these compounds act have not yet been fully elucidated.[7] [10]

Thus, it is understood that consuming specific foods can protect against cognitive impairment, as studies show that nutrients with antioxidant and modulating properties can potentially protect neurons.[13] Research increasingly invests in non-pharmacological approaches to manage the progression of chronic conditions, especially those with irreversible consequences, such as Alzheimer's disease (AD).[14] Additionally, diets that promote nutrient diversity tend to improve patients' well-being since they help regulate intestinal microbiota, which includes bacteria that contribute to the etiology of Alzheimer's disease.[15,16] Therefore, the objective of the study was to investigate the relationship between eating habits and cognitive state in elderly people.

METHOD

This descriptive, cross-sectional study was carried out with elderly individuals enrolled in a Basic Health Unit (UBS) in Maringá, Paraná. The participants are part of a group focused on physical activity offered by the aforementioned institution. All thirty members were regularly invited to participate; however, as data collection took place in their households, those who were not present during two visits on different days and at different times were excluded.

Initially, the researchers attended some of the physical activity group's meetings. From these meetings, they formalized the invitation to participate in the study. Then, individual home interviews were scheduled with those who agreed to participate. A total of twenty-five individuals were reached by the end of the data collection period, making up the final sample of the study.

Data collection took place between May and June of 2024 through semi-structured interviews in four segments: 1. A sociodemographic and clinical questionnaire prepared by the authors (sex, age, education level, income, and chronic non-communicable diseases (NCDs)—hypertension, dyslipidemia, diabetes mellitus, thyroid diseases, and osteoporosis);

2. A cognitive assessment using the Mini Mental State Examination (MMSE). In this study, if the subject's score was within the expected range, it was classified as "adequate," and if not, it was considered "inadequate." 3. Eating behavior, as analyzed by the Food Frequency Questionnaire (FFQ), which examines the consumption of certain food groups.

The authors adapted the questionnaire in a playful way, presenting it visually with printed and cut-out pictures of food, emphasizing those considered neuroprotective. 4. Finally, they asked the following question: "Do you think your memory is affected by your food choices?" Tell me more about this issue." This information was recorded with the research collaborator's authorization for later transcription and analysis.

The neuroprotective foods chosen for this study were olive oil, red wine, fatty fish, whole grains, nuts, and vegetables. These foods were selected through a review of observational studies and randomized controlled trials.[7] In view of their specific properties and functions, these foods were arranged according to their potential as neural, vascular, anti-inflammatory, and antioxidant protectors, as shown in Table 1, which relates the neuroprotective effect to the dietary component.

Table 1 - Relationships between foods and their potential neuroprotective effects used in the playful adaptation of the study.

Component	Protection			
	Vascular	Anti-inflamatory	Antioxidant	Neural
Olive Oil		X	X	
Red wine		X	X	
Fatty Fish	X	X	X	X
Whole grains	X	X	X	X
Nuts	X	X	X	X
Vegetables	X	X	X	

Source: Prepared by the authors and adapted from Duplantier, J.; Gardner, E. (2021).

The data collected in the first three parts of the instrument were recorded in an Excel spreadsheet and analyzed using descriptive statistics and simple distribution. The fourth part of the interview underwent content analysis using the thematic method according to Bardin's proposal, which involves four stages to identify recurring themes in the data: pre-analysis, material exploration, formulation of hypotheses, and treatment and interpretation of the results. To preserve the privacy of the interviewees, each was assigned a neuroprotective food for identification purposes, followed by age (e.g., broccoli, 70 y.).

This study is part of larger research called "Analysis of the Living and Health Conditions of Elderly People Assisted in Primary Care in Maringá: A Look at the Integrality of Care for Health Promotion." It was previously submitted to and approved by the Research Ethics Committee of the university (CAAE: 79808024.4.0000.5539). Employees were invited to sign two copies of the Informed Consent Form (ICF).

RESULTS

A total of 25 elderly individuals were interviewed. Most of them were female (92%) and between 60 and 80 years old, with the majority in the 70-79 age range (52%). Most had attended school for one to four years (44%), and most had an income above one minimum wage (72%). The majority of participants had a diagnosis of two to three non-communicable diseases (NCDs) (56%) (Table 2).

Regarding mental status classification, 15 participants (60%) had a demoted profile. Additionally, lowered cognition was prevalent among women (65.2%), elderly people with one to four years of schooling (63.6%), individuals with an income above one minimum wage (61.1%), and individuals with two to three chronic non-communicable diseases (57.1%). Besides, most people in the predominant age group showed adequate cognitive capacity (53.8%) (Table 2).

Table 2 - Distribution of the sociodemographic profiles and clinical conditions of the elderly study participants according to their cognitive condition, as measured by the Mini-Mental State Examination (MMSE). Maringá, Paraná. 2024.

Variable	n	%	Adequate		Demoted	
			n	%	n	%
Sex						
Male	2	8%	2	100%	-	-
Female	23	92%	8	34,8%	15	65,2%
Age						
from 60 to 69	11	44%	3	27,3%	8	72,7%
with 70 to 79	13	52%	7	53,8%	6	46,2%
with or above 80	1	4%	-	-	1	100%
Education						
No education	1	4%	1	100%	-	-
1-4 years	11	44%	4	36,4%	7	63,6%
5-8 years	9	36%	4	44,4%	5	55,6%
9-11 years	4	16%	1	25%	3	75%
+ 12 years	-	-	-	-	-	-
Income						
Up to 1 minimum wage	7	28%	3	42,9%	4	57,1%
>1 MW	18	72%	7	38,9%	11	61,1%
NCDs						
None	3	12%	-	-	3	100%

Variable	n	%	Adequate		Demoted	
			n	%	n	%
I	6	24%	4	66,7%	2	33,3%
2-3	14	56%	6	42,9%	8	57,1%
>3	2	8%	-	-	2	100%

Note: This study considered chronic non-communicable diseases (NCDs), including hypertension, dyslipidemia, diabetes mellitus, thyroid diseases, and osteoporosis.
Source: The Authors.

According to Table 3, most of the participants did not consume the following neuroprotective foods: olive oil (68%), fatty fish (64%), nuts (96%), and whole grains (88%). Conversely, vegetables (92%) were the only food category that most of the elderly interviewed adhered to in their eating routine, which was consumed by a large proportion of the population,

Among those who did not consume olive oil, oilseeds (nuts), and whole grains, there was a predominance of individuals with lowered cognition (53%, 58.3%, and 54.5%, respectively). However, no differences were observed in the adequate and lowered cognitive status of individuals who did not consume fatty fish or vegetables. Conversely, among the vegetable group, there was a high prevalence of elderly individuals with possible cognitive dysfunction (60.9%) (Table 3).

Table 3 - Distribution of the consumption profile of neuroprotective foods among elderly participants in the study, according to their cognitive condition as measured by the Mini-Mental State Examination (MMSE). Maringá, Paraná. 2024.

Food Group	n	%	Adequate		Demoted	
			n	%	n	%
Olive oil						
Yes	8	32%	2	25%	6	75%
No	17	68%	8	47%	9	53%
Fatty fish						
Yes	9	36%	3	33,3%	6	66,7%
No	16	64%	8	50%	8	50%
Nuts						
Yes	I	4%	-	-	I	100%
No	24	96%	10	41,7%	14	58,3%
Cereals and grains - Whole grains						
Yes	3	12%	-	-	3	100%
No	22	88%	10	45,5%	12	54,5%
Seeds and fibers						
Yes	12	48%	6	50%	6	50%
No	13	52%	4	30,8%	9	69,2%

Food Group	n	%	Adequate		Demoted	
			n	%	n	%
Vegetables						
Yes	23	92%	9	39,1%	14	60,9%
No	2	8%	1	50%	1	50%

Source: The Authors.

To better understand the knowledge and practices of long-lived individuals regarding neuroprotective foods, their statements were analyzed. It was perceived that most lacked knowledge about the relationship between food and cognitive health.

> *I don't feel any difference in my head when I eat or don't eat. My eating habits are normal. (Brown rice, 75y).*

> *I don't understand if certain foods make a difference in memory. (Red wine, 64y).*

> *I don't think there's a relationship between my diet and memory problems. I've never considered that connection. (Broccoli, 80y)*

A lack of knowledge about this relationship was also observed among the elderly, who attributed their cognitive condition to other lifestyle habits and/or aging, without considering food as a possible influence.

> *I remember the people, but I confuse the names. However, I think this forgetfulness is normal, especially with age (Cabbage, 67y).*

> *I lived on a farm and ate everything. Memory loss is due to medicine and old age. (Garlic, 71y)*

> *I think being forgotten is due to a lack of attention, not what I eat. (Pumpkin Seed, 71y)*

> *I don't think so, it never made a difference for me. I have a good memory because I never stopped working. (Beetroot, 73y)*

On the other hand, some statements revealed a limited understanding of the importance of nutrition. This is demonstrated by the repetition of popular sayings that attribute health to nutrition. However, there is still no connection made to cognitive function.

> *Eating well makes us healthier, but it has nothing to do with our mental state. (Brazil nut, 78y)*

> *I don't know, I just know that I should have a better diet. But if I changed anything, I don't think it would affect my memory. (Salmon, 75y)*

> *Food helps, yes, but memory comes from sleep and physical activity. Now, I know that caffeine and sugary drinks are harmful. (Chia, 65y)*

Additionally, elderly individuals were identified who claimed that their eating habits are related to how their brains function, citing substances that would have favorable effects on the body. However, they did not demonstrate consolidated knowledge about the existence and importance of neuroprotective foods.

> *They especially emphasized water because it makes the brain function properly. (Walnut, 75y).*

> *Food contains vitamins; if the food lacks the right vitamins, the brain doesn't function properly. (Pumpkin seed, 71y).*

> *I think there must be a relationship between eating, feeling satisfied, and having a full belly. It's as if the brain knows not to get hungry or tell us to eat. (Sardine, 69y).*

In summary, although some elderly people report perceiving a possible relationship between food and cognitive functioning, this understanding is based on intuitive perceptions or personal experiences rather than consolidated knowledge about neuroprotective foods. The statements highlight generic associations between nutrients and mental performance but do not demonstrate an understanding of the importance of specific dietary patterns for preserving cognitive function. Thus, it can be concluded that the elderly individuals interviewed have limited knowledge regarding which foods have neuroprotective effects and the importance of this relationship for brain health.

DISCUSSION

The prevalence of cognitive impairment observed in this study was lower than that reported in other studies with

similar populations, ranging from 79% to 85%. This result can be explained by the fact that the audience of this study is composed of active elderly people in good physical and cognitive condition who participate in physical activity groups. Similar results were found in a study of community-dwelling elderly, which reinforces this hypothesis.[20]

Additionally, cognitive alterations were predominantly observed in women with one to four years of education, an income exceeding one minimum wage, and two to three chronic non-communicable diseases. These findings are similar to those of two other studies that identified a comparable sociodemographic profile associated with cognitive impairment. The only difference was in age; in both studies, the oldest participants exhibited a higher proportion of decline.[19-20]

Regarding the prevalence of women among those with cognitive decline, a study evaluating the presence of cognitive impairment in a population cohort in Porto, Portugal revealed that most of those diagnosed were women.[21] Women have a longer life expectancy and are therefore a predictive factor of cognitive decline. Also, the drop in estrogen caused by menopause affects sleep quality and hippocampal function, both of which are linked to worsening cognition.[22]

Regarding education, the relationship between a low level of education and a higher probability of cognitive impairment is clearer when considering education as a protective factor. Thus, a lack of education would imply a higher incidence of cognitive disorders and dementia, as predicted in underdeveloped countries in the social and economic spheres.[20] Access to education is related to greater cognitive reserve, or the ability to maintain cognitive integrity and related functions despite aggression or stress to the brain.[23]

The economic context of the elderly analyzed in this study aligns with literature on the prevalence of retirees and pensioners but differs regarding predominant family income. Studies indicate that the average income is up to one minimum wage.[24] However, even with a higher income, the value is still unsatisfactory since a quality of life requires housing, food, transportation, medicine, leisure time, and physical activity.[25]

In the context of chronic non-communicable diseases (NCDs), conditions such as diabetes and hypertension cause damage to cerebral irrigation by reducing blood flow. This leads to brain atrophy and an increased generation of reactive oxygen species (ROS), which are harmful to the brain.[26] A previous study used data from 1,310 individuals to correlate the presence of NCD markers in blood tests with brain atrophy and found a significant correlation between the two.[27]

Regarding the age group, literature shows divergent patterns of mental impairment, pointing to an increase in cognitive alterations with aging.[20] [28] A possible explanation for the absence of deterioration in older age groups is the asymptomatic period predicted in neurodegenerative diseases. This period is directly influenced by previous protective lifestyle habits that were not analyzed.[29]

Generally, low consumption of neuroprotective foods aligns with the higher rate of cognitive deficits in the elderly, which can be attributed to their dietary habits. This consumption pattern is attributed to the characteristics of this population, such as low purchasing power and cultural food preferences. This group can be associated with the growing number of elderly Brazilians living in socio-financial fragility, leading them to choose lower-cost foods.[30] This reality makes it difficult to access central items of neuroprotective diets, such as olive oil.[31]

Moreover, the culture in countries such as Brazil is related to greater adherence to the Western diet, characterized by high consumption of prepackaged foods, refined grains, sugary drinks, fried foods, and sweets. These foods act at the opposite extreme of the protective diets by enhancing inflammation and impairing antioxidant status.[32]

A recent study[14] sought to establish an association between specific diets and protection against cognitive decline. The study concluded that diets containing foods that induce ketogenesis, such as the Mediterranean diet and its variations (e.g., the Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) diet and the modified Mediterranean-style ketogenic diet (MMKD)), were the most successful in preventing, protecting against, and treating cognitive impairments non-pharmacologically. These diets were beneficial not only for brain areas but also for gut microbiota, which is indirectly related to the pathogenesis of cognitive impairment ranging from mild to severe, such as in cases of Alzheimer's disease.

However, such consumption was not observed among the elderly participants in the study. One hypothesis is that nutritional health promotion is not effective, as evidenced by misunderstandings about the importance of food. This is concerning given that the participants are elderly people with NCDs who, in theory, should be aware of the need to maintain a balanced diet. Similar behavior was also found in research focused on NCDs, which pointed to low adherence to treatment centered on changing eating habits.[34]

Along with inadequate health promotion, there is also a failure in communication between health professionals and patients. Health professionals play a key role in following up with the elderly and should not only provide care but also promote guidance and encouragement for healthy and

protective practices. Effective guidance arising from interaction between health professionals and patients has been identified as essential for promoting and maintaining health. It is also fundamental for the elderly to manage their own care.[36]

Consequently, based on the findings of the present study and in line with the scientific literature[3,31,32,33] which proves the relationship between consuming neuroprotective foods and reducing cognitive decline and the risk of developing Alzheimer's disease, the absence of this consumption among the participants may be associated with the cognitive deficits observed, at least in part. These results are significant because they reinforce the importance of including adequate dietary prescriptions as part of a therapeutic approach to promote healthy aging and prevent conditions commonly associated with chronic noncommunicable diseases (NCDs). A diet based on neuroprotective foods is a low-cost strategy with the potential to promote the physical and cognitive health of the elderly population.

FINAL CONSIDERATIONS

An evaluation of elderly participants in the activity group revealed a significant number of individuals with cognitive impairment, as well as low adherence to neuroprotective diets. The main reason for this was misinformation on the benefits of these diets. Through recorded statements and analysis of eating habits, little to no association was identified between neural protection and nutrition, which could justify the higher rate of cognitive alterations in these elderly individuals.

This study has limitations, including the small sample size, possible imprecision in participants' food reports, and the lack of statistical testing. Nevertheless, the study is significant because it demonstrates the prevalence of cognitive alterations, even among active and seemingly healthy elderly individuals, as well as the inadequate consumption of foods essential for cognitive maintenance. These findings reinforce the importance of including such themes in health professionals' approaches. This need is further emphasized by the potential social benefits of proving the effectiveness of diets in preventing neurodegenerative diseases. Therefore, future studies offering more robust evidence capable of guiding effective interventions are recommended.

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