Association between nutritional status and cognitive decline in non-institutionalized elderly patients evaluated in a geriatric outpatient setting

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Abstract

This study aims to assess the relationship between nutritional status and cognitive decline in a population of non-institutionalized elderly patients evaluated in a geriatric outpatient setting.

Data from 144 patients admitted to the general geriatric outpatient services of Luigi Vanvitelli University Hospital (Naples, Italy) and San Felice a Cancello Hospital (San Felice a Cancello, Italy) were collected between January 1 and December 31, 2017. Cognitive function was evaluated through the mini-mental state examination and nutritional status was assessed through mini nutritional assessment. Logistic regression was used to assess the association between clinical characteristics and nutritional status, and it is reported as unadjusted, adjusted for age and sex, and adjusted for other potential confounding factors. In the unadjusted model, poor nutritional status was associated with a worse cognitive deficit (odds ratio (OR)=2.36; 95% confidence interval (CI)=1.77-3.55). The association remained significant after adjusting for age and sex (OR=2.36; 95% CI=1.77-3.55) and in the fully adjusted model (OR=2.92; 95% CI=1.90-5.64). In patients with dementia, malnutrition represents a significant burden that grows heavier as the disease progresses.

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Introduction

Malnutrition is a clinical condition caused by an altered imbalance of an individual's intake of energy or nutrients. Anorexia of aging,[1] which is the loss of appetite and/or reduced food intake in the elderly, represents a crucial problem for older adults, as it is associated with higher costs for healthcare,[2] adverse events (*i.e.*, reduced bone mass, immune-deficiency, anemia, delayed healing of surgical wounds and pressure ulcers, poor functional recovery),[3,4] sarcopenia,[5] and worse outcomes in terms of life quality, morbidity, and mortality.[6-8]

Poor nutritional status in the elderly can be related to multiple factors such as aging itself, chronic disease, polypharmacy, oral health and oral dysphagia, texture-modified diets, difficulty in walking or climbing stairs, psychological distress and depression, and social and economic determinants such as isolation and poverty.[9-12]

This study aims to assess the relationship between nutritional status and cognitive decline in a population of non-institutionalized elderly patients evaluated in a geriatric outpatient setting.

Materials and Methods

Study sample

This cross-sectional study was based on data from 144 patients admitted to the general geriatric outpatient services of Luigi Vanvitelli University Hospital (Naples, Italy) and San Felice a Cancello Hospital (San Felice a Cancello, Italy) between

January 1 and December 31, 2017. All patients were 65 years or older and lived in the community, referred by general practitioners or caregivers. Written informed consent was obtained from the patients. In case of the patient's inability, the legally authorized delegate provided informed consent.

Comprehensive geriatric assessment

All patients underwent comprehensive geriatric assessment. Dementia was assessed through the diagnostic and statistical manual of mental disorders criteria. Cognitive function was evaluated through the mini-mental state examination (MMSE, 0-30 points) adjusted for education, identifying patients with mild (21-24.9 points), moderate (11-20 points), and severe (10 points or less) cognitive decline.[13-15] Nutritional status was assessed through mini nutritional assessment (MNA). MNA is composed of two sections – six screening questions (max 14 points) to identify individuals at risk of malnutrition or malnourished, followed by twelve more questions to investigate nutritional status more extensively (0-30 points). According to MNA total score, our sample was classified into normal nutritional status (24-30 points), at risk of malnutrition (17-23.5 points), and malnourished (less than 17 points).[16] Functional abilities were assessed using the activity of daily living (ADL) scale (0-6 points). Depression was assessed through the geriatric depression scale (GDS, 0-15 scale).[17]

Statistical analysis

Continuous variables were expressed as mean±standard deviation (SD), and categorical variables as frequencies by absolute value and percentage (%) of the total. Descriptive statistics were used to describe the demographic and key clinical characteristics of the study population according to nutritional status. The differences in proportions and the means of covariates between subjects with and without cognitive impairment were assessed using Fisher exact test and t-test statistics, respectively. Logistic regression was used to assess the association between clinical characteristics and nutritional status, and it is reported as unadjusted, adjusted for age and sex, and adjusted for other potential confounding factors. Candidate variables to be included in the models were selected based on biological and clinical plausibility. Statistical analysis was performed using R software, version 4.1.2 (Vienna, Austria).

Results

The present study included 144 patients. The population was divided into two groups according to nutritional status, patients who were overtly malnourished (N=114) and individuals who were normal or at risk of malnutrition (N=30). The characteristics of the sample are summarized in Table 1. The mean age was 78 years old (SD=6.0), and 78 (53%) were women. The mean MMSE score in the total sample was 16.6±6.6. Patients with malnutrition scored worse at GDS (8.9±3.2 *vs* 6.2±3.4, P<0.001), and reported a lower number of preserved ADL (2.5±1.4 *vs* 4.4±1.8, P<0.001). Comorbidities and the number of medications were similar between the two groups. Patients with malnutrition reported lower scores at MMSE (14±5.5 *vs* 24±2.9, P<0.001) and higher prevalence of moderate and severe dementia (72% *vs* 7% and 24% *vs* 0%, respectively). Patients with normal nutritional status/at risk of malnourishment reported a higher prevalence of mild dementia and normal cognition (57% *vs* 4% and 37% *vs* 0%, respectively).

The prevalence of malnutrition in the four stages of cognitive decline is shown in Figure 1. Malnutrition was evident in all patients with severe dementia and almost all patients with moderate cognitive decline (96.6%). On the contrary, a considerable part of patients with normal cognition reported normal nutritional status (81.2%) and none of them was malnourished. Among patients with mild cognitive decline, more than half were at risk of malnutrition (59.1%), while the prevalence of patients with normal cog-

Table 1. Characteristics of the sample.

	Total sample (N=144)	Nutritional status: Normal/at risk (N=30)	Nutritional status: Malnourished (N=114)	P-value
Age (years)	78 (6.0)	77 (6.1)	78 (6.0)	0.190
Sex (female)	76 (53%)	15 (50%)	61 (54%)	0.838
MMSE (0-30)	16 (6.6)	24 (2.9)	14 (5.5)	<0.001
Cognitive status				<0.001
Normal	11 (8%)	11 (37%)	0 (0%)	
Mild dementia	22 (15%)	17 (57%)	5 (4%)	
Moderate dementia	84 (58%)	2 (7%)	82 (72%)	
Severe dementia	27 (19%)	0 (0%)	27 (24%)	
GDS (0-15)	8.3 (3.4)	6.2 (3.4)	8.9 (3.2)	<0.001
ADL (0-6)	2.9 (1.7)	4.4 (1.8)	2.5 (1.4)	<0.001
Comorbidities	3.6 (1.2)	3.5 (1.3)	3.7 (1.2)	0.537
Heart diseases	128 (89%)	26 (87%)	102 (89%)	0.744
Cerebrovascular disease	56 (39%)	11 (37%)	45 (39%)	0.836
COPD	52 (36%)	12 (40%)	40 (35%)	0.671
Cancer	11 (8%)	1 (3%)	10 (9%)	0.459
Renal disease	61 (42%)	12 (40%)	49 (43%)	0.837
Liver disease	16 (11%)	3 (10%)	13 (11%)	1.000
Hematopoietic disease	13 (9%)	2 (7%)	11 (10%)	1.000
Other diseases	41 (28%)	8 (27%)	33 (29%)	1.000
Medications	3.7 (1.3)	3.5 (1.3)	3.7 (1.3)	0.537

Continuous variables are expressed as mean and (standard deviation), and categorical variables are expressed as proportion and (%). MMSE, mini-mental state examination; ADL, activities of daily living; COPD, chronic obstructive pulmonary disease; GDS, geriatric depression scale.

nitive status and malnutrition were similar (22.7% *vs* 18.2%, respectively).

Table 2 shows the adjusted and unadjusted association between nutritional status and cognitive decline. In the unadjusted model, poor nutritional status was associated with a worse cognitive deficit (odds ratio (OR)=2.36; 95% confidence interval (CI)=1.77-3.55). The association remained significant after adjusting for age and sex (OR=2.36; 95% CI= 1.77-3.55) and in the fully adjusted model (OR=2.92; 95% CI=1.90-5.64).

Discussion

The present study shows that the severity of cognitive decline is directly correlated with poor nutritional status. All patients with severe dementia and 96.6% of all patients with moderate cognitive decline showed malnourishment, while more than half of the individuals with mild cognitive deterioration were at risk of malnutrition (59.1%). Furthermore, data show a direct correlation between cognitive deterioration and malnutrition. Those results are consistent with the literature and strengthen current evidence, providing a trajectory of nutritional status through different phases of dementia.

People with more severe dementia are at higher risk of malnutrition. Several studies support the protective effects of a balanced dietary intake like the Mediterranean diet on conversion from normal cognition to mild cognitive impairment (MCI) and from MCI to Alzheimer's disease.[18] A study by Jang *et al*. on early diagnosis and prediction of Alzheimer's disease reported a reduction of cortical thickness associated with poor nutritional intake.[19] In mild cognitive deterioration, the decline in the ability to conduct everyday activities such as shopping, storing and preparing food, memory impairment, reduced sense of taste and smell, and change of dietary habits often lead to nutritional deficits and weight loss. In people with mild to moderate dementia, malnutrition is linked with behavioral and psychological symptoms, but the correlation with cognitive decline is controversial.[20-23] In late and more severe stages, dyspraxia, agnosia, behavioral and psychological symptoms, sedative drugs administered for agitation and hyperactivity, oropharyngeal dysphagia, and refusal to eat have a dramatic impact on nutritional status and life quality.[24]

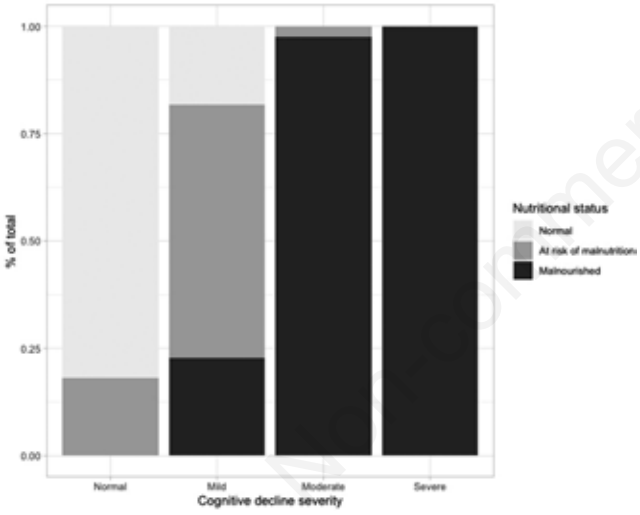

Figure 1. Nutritional status according to the severity of the cognitive decline.

Undernutrition in older adults should be managed with multidimensional interventions.[25] As reported by Marshall *et al*.,[26] the focus should be centered on risk-lowering strategies and preventive education, particularly for family and caregivers. A multidimensional evaluation of eating behaviors and nutritional status should always be considered for elderly patients, especially in primary care.[27,28] In this perspective, the European Society for Clinical Nutrition and Metabolism (ESPEN) provided recommendations on how to approach nutritional needs in patients with dementia.[24] Screening for malnutrition is recommended for every person with dementia, and food should be administered according to the individual's needs and preferences. The use of appetite stimulants is not recommended, as well as that of oral nutritional supplements (ONS) to correct cognitive impairment. As stated by ESPEN guidelines on nutrition and hydration in geriatrics, ONS should be used to prevent and treat protein-energy undernutrition in the elderly.[29] In severe and terminal phases, the use of parenteral or enteral nutrition (including the use of feeding tubes) should be pondered on the patient's prognosis and preferences.

The present study has three main limitations. First, it was conducted on a relatively small group of patients. Second, the analysis involved a small number of variables, and we could not control every possible lifestyle factor. Finally, the cross-sectional nature of this design leaves the possibility of residual confounding.

Conclusions

Malnutrition is directly related to cognitive decline in all models we analyzed (adjusted by sex and age). Our goal as clinicians is to reduce the incidence of malnutrition in elderly patients as it is associated with increased hospitalization, worse outcomes, morbidity, and mortality. In dementia patients, malnutrition is a significant burden that worsens as the disease progresses. Consideration of nutritional factors should be mandatory in clinical practice. To

Table 2. Unadjusted and adjusted association between cognitive decline and malnutrition.

	Unadjusted OR (95% CI)	Age/sex adjusted OR (95% CI)	Fully adjusted (95% CI)
MMSE*	2.36 (1.77-3.55)	2.36 (1.77-3.55)	2.92 (1.90-5.64)
Age**		1.08 (0.946-1.23)	1.12 (0.962-1.35)
Sex (female)		0.688 (0.131-3.34)	0.376 (0.053-2.01)
GDS			0.750 (0.537-0.990)
ADL			0.898 (0.432-1.68)
Comorbidities ≥3			0.265 (0.019-3.36)

OR, odds ratio; CI, confidence interval; GDS, geriatric depression scale; ADL, activities of daily living. *Odds ratio per 1-point mini-mental state examination decrease; **Odds ratio per 1-year increase.

this end, the problem should be approached from a thorough understanding of the patient's needs through a multidimensional assessment to develop the most effective treatment plan, tailored to specific goals. In non-demented people, a healthy and balanced diet can help slow down the development of dementia. In mild to moderate dementia, proper dietary intake can help preserve functional status. Finally, in severe forms, management of malnutrition can help avoid hospitalization and adverse outcomes, leading to a better quality of life.

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