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Nutritional evaluation of geriatric patients with Alzheimer's disease in Southern Brazil: case-control study

Evaluación nutricional de pacientes geriátricos con enfermedad de Alzheimer en el Sur del Brasil: estudio de controles de caso

Flávia Ivanski[1], Lizziane de Paula Nascimento[2], Bárbara Luísa Fermino[3], Juliana Sartori Bonini[3], Weber Cláudio Francisco Nunes da Silva[3], Juliana Maria Silva Valério[4], Roberta Fabbri[5], Anne Karine Bosetto[6] and Elizama de Gregório[6]

Departments of [1]Physiotherapy, [2]Nutrition and [3]Pharmacy. Midwest State University. Brazil. [4]Department of Pharmacy. Federal Institute of Paraná. Brazil. [5]Department of Neuroscience. University of Florence. Florence, Italy. [6]Department of Biological Sciences. Federal University of Rio Grande do Sul. Brazil

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Correspondence: Juliana Sartori Bonini. Department of Pharmacy. Universidade Estadual do Centro Oeste. Campus CEDETEG. Rua Simeão Camargo Varella de Sá, Vila Carli. 85040-080 Guarapuava, PR. Brasil

e-mail: juliana.bonini@gmail.com

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ABSTRACT

Introduction: elderly's malnutrition is linked, among other factors, to chronic-degenerative diseases, requiring an improvement in the clinical evaluation of nutritional status of this population. Studies have tried to find out new tools to assess aged-people nutritional status. One of most used scales to investigate nutritional status on geriatric patients is the Mini Nutritional Assessment (MNA).

Objective: the present study aims to evaluate nutritional status of Alzheimer's disease (AD) patients, by comparison with a control group, via Mini Nutritional Assessment.

Methods: a cross-sectional study, which includes 35 Alzheimer's old-people and 43 control old-people, was performed evaluating nutritional status with MNA.

Results: total score of MNA in the Alzheimer group shows that 71.42% were in malnutrition risk, 14.28% were malnourished and 14.25% presented normal nutritional status. In addition, in the control group 79.06% of patients (n = 34) were classified as having normal nutritional status and 20.93% (n = 9), as being at risk of malnutrition.

Conclusion: results reinforce the purpose that MNA can be used as a proper instrument to evaluate nutritional status in elderly, mainly in AD, because measuring risk and nutritional status of this population is indispensable.

Key words: Nutritional status. Alzheimer's disease. Elderly. Malnutrition.

RESUMEN

Introducción: la malnutrición en ancianos está vinculada, entre otros factores, con patologías crónicas degenerativas, por lo que es necesaria una mejora en la evaluación clínica del estado nutricional de esta población en particular. Algunos estudios han intentado hallar nuevas herramientas para evaluar el estado nutricional de los ancianos. Una de las escalas más utilizadas para la investigación del estado nutricional en pacientes geriátricos es el test Mini Nutritional Assessment (MNA).

Objetivo: el objetivo del presente estudio es evaluar el estado nutricional de pacientes con enfermedad de Alzheimer mediante la comparación con un grupo control, vía Mini Nutritional Assessment.

Resultados: la puntuación total del MNA en el grupo con alzhéimer muestra que el 71,42% de los pacientes estaba en riesgo de malnutrición, el 14,28% estaba desnutrido y el 14,25% presentaba un estado de nutrición normal. Además, en el grupo control, el 79,06% (n = 42) presentó un estado de nutrición normal y el 20,93% (n = 9) mostró riesgo de malnutrición.

Conclusión: los resultados refuerzan la idea de que el MNA puede ser utilizado como un instrumento apropiado para evaluar el estado nutricional en ancianos, principalmente en caso de Alzhéimer, porque la medida del riesgo y del estado nutricional de esa población es indispensable.

Palabras clave: Estado nutricional. Enfermedad de Alzheimer. Ancianos. Malnutrición.

INTRODUCTION

The elderly is the population segment that increases faster, with an estimated boost of more than 4.0% per year, between 2012 and 2020. This tendency has a significant impact on population projection, which, in 2060, should totalize about 73.5 million elderlies (1). With this demographic transition comes an epidemiological one, and the main feature is an increase of chronic-degenerative diseases incidence, among them even Alzheimer's disease (AD) (2).

In the elderly, malnutrition is commonly linked to chronic-degenerative diseases. In this condition, evaluating nutritional status becomes very important and that is why some studies have tried to find reliable tools to assess elderly nutritional status (3). In this sense, one of the most used scales to measure nutritional status on geriatric patients is the Mini Nutritional Assessment (MNA). Even though MNA is a simple test, it is considered as effective and efficient in detecting malnutrition (1,3).

Nutritional status can be strongly altered in AD patients and this can be possibly due to an inability to accept, chew, swallow or assimilate food. When AD progresses, weight loss increases, which is considered to be a determinant mortality factor (2). Higher energetic demand or a dysfunction in body weight regulation, low caloric intake, loss in eating independency (caused by cognitive decline), depression, altered taste and smell, atrophy of cortex, as well as associated diseases (5), are possible reasons of weight loss in AD patients.

The aim of the present research was analyzing nutritional status in AD' people compared to elderly with similar age without AD by using the Mini Nutritional Assessment, since studies show that nutrition is very altered in AD, leading to progressive worsening of health status (2,3). Evaluating this condition may help interventions and improve quality of life for this population.

METHODS

The project was previously approved by the Ethics Committee from the Midwest State University (Universidade Estadual do Centro-Oeste - UNICENTRO), number 026/2011. All patients and caregivers were informed about objectives, methods, risks and benefits prior to signing the informed consent form (ICF). Patients who had any nutritional alteration were forwarded to the Nutrition's Clinic School – UNICENTRO for subsequent monitoring.

The present research is a cross-sectional study, counting 35 elderlies with AD and 43 elderlies in a control group. People previously diagnosed clinically with AD, attended by the Unified Health System (hereby SUS) and assisted by the Association of Studies, Research and Assistance to People with Alzheimer's (In Brazil: Associação de Estudos, Pesquisas e Auxílio à Pessoas com Alzheimer, AEPAPA) from Guarapuava, Paraná (Brazil), were included in the study. The control group included only healthy people, assessed by the Secretariat of Social Assistance from Guarapuava.

Some exclusion criteria were applied: patients not founded for three attempts by visit, those who died, patients who lived in the countryside or moved to a different city, people who rejected to participate in the research after the first visit or those who disagreed with the conditions of the ICF.

Data collection was performed between August 2013 and June 2014. The initial population was composed by 55 patients with AD. However, some people was not found at home, had death record or gave up during the study (Fig. 1). The control group comprehended 43 elderlies, who agreed voluntarily to participate in the study; initially this group included 50 people, however, seven gave up.

Via questionnaires applied to patients or caregivers, we reported socio-demographic data (age, gender, education level, average income, age, marital status, smoking habits and physical activity), comorbidities and medication. In this context, associations between AD and clinical indicators such as high cholesterol, diabetes, and high blood pressure were also reported. According to the Brazilian guidelines, reference values to LDL cholesterol are: 130-159 mg/dl (limit values), 160-189 mg/dl (high values) and ≥ 190 mg/dl (very high values) (6). For diabetes, when fasting, glucose levels are classified as follows: normal (< 100 mg/dl), tolerance (≥ 100 to < 126 mg/dl) and diabetes (≥ 126 mg/dl) (7). In addition, high blood pressure values are: normotensive (≤ 120/80 mmHg), pre-hypertension (121-139/81-89 mmHg) and hypertension (140-159/90-99 mmHg) (8).

Nutritional status was evaluated via Mini Nutritional Assessment (MNA). This tool consists in a questionnaire, divided in four parts: a) anthropometric evaluation, arm and calf circumference and body mass index (BMI: weight [kg]/height [m²]), evaluated according to the classification of the Pan-American Health Organization; b) global evaluation; c) dietetic evaluation; and d) self-evaluation. MNA scores describe nutritional status, beside the risks. The scores were classified as follows: good nutritional status (≥ 24 points), malnutrition risk (17-23.5 points) and malnutrition (< 17 points) according to the classification or values proposed by Cavalcante (9).

When, due to health conditions, weight and height were unmeasurable, they were estimated using formulas with arm and calf circumference' measures, knee height and subscapular skinfold. To obtain weight (kg) in old-age patients, the following formulas were used: a) men's weight = ([1.73 x arm circumference {cm}] + [0.98 x calf circumference {cm}] + [0.37 subscapular skinfold {mm}] + [1.16 x knee height {cm}] – 81.69); and b) women's weight = ([0.98 x arm circumference {cm}] + [1.27 x calf circumference {cm}] + [0.4 x subscapular skinfold {mm}] + [0.87 x knee height {cm}] – 62.35) (24). To estimate elderly's height, the following formulas were used: a) man's height = (64.19 – [0.04 x old-age {in years}] + [2.02 x knee height {cm}]); and b) women's height = (84.88 – [0.24 x old-age {in years}] + [1.83 x knee height {cm}]) (5).

To classify AD patients according to the stage of the disease, the Clinical Dementia Rating (CDR) scale was used, consisting in a questionnaire divided in categories (memory, orientation, judgment and problems solving, community relations, home and hobbies and personal cares) to evaluate patients according to an interview with the caregiver. Each category is classified resulting in total scores corresponding to healthy (CDR 0), questionable (CDR 0.5), mild (CDR 1), moderate (CDR 2) or severe dementia (CDR 3) (10). The CDR scale was applied and evaluated by a trained health professional.

Data were presented as average and standard deviation or absolute and relative frequency. Numeric variables were checked for distribution of the data and homogeneity of variance errors through the Shapiro-Wilk and Levene tests, respectively. The Chi-squared, continuity correction, Chi-squared for tendency and Fisher's correction tests were used to examine possible associations between behavior and the characteristics of subjects with and without AD. In addition, the MANCOVA test, considering sex and group as factors, followed by the Bonferroni test for multiple comparisons, were used to test differences between the control and AD groups, separated by sex. CDR was compared using the MANCOVA test one way. Age was used as co-variable due to the differences observed between the control and AD groups. Therefore, results shown are regardless of age effect. A significance value of $p < 0.05$ had been used and analyses were made using the SPSS 20.0 statistical program.

RESULTS

According to the MNA score, as shown in table I, the majority of Alzheimer's patients had malnutrition risk (71.42% [n = 25]) and 14.28% (n = 5) were malnourished. Also, most of the participants in the control group had normal nutritional status (79.06% [n = 34]), 20.93% (n = 9) had malnutrition risk and no patients were malnourished. Age, gender and average income are also described in table I.

Classifications for AD staging were compared considering age as a co-variable in table II. The CDR 3 group shows lower BMI (23.97 ± 1.13 F: 3.475; p = 0.043) and MNA total score (19.10 ± 0.84 F: 4.290; p = 0.023) than CDR 2 (IMC 28.20 ± 1.24) and CDR 1 (MAN 23.12 ± 1.25) groups, respectively. No significant differences were observed regarding weight and height values between CDR groups.

In table III, there is a comparison between the control and AD groups divided by sex and adjusted to age. Among women, height (1.56 ± 0.01, p = 0.034) and MNA (24.78 ± 0.61, p < 0.001) in the control group are significantly higher than in the AD group (height = 1.52 ± 0.01; MNA = 20.82 ± 0.67). Among men, the control group had only MNA (26.08 ± 0.81, p < 0.01) significantly higher than the AD group. No significant differences were observed regarding other variables.

Table IV reports associations of AD with social and clinical indicators such as civil status, high cholesterol, diabetes, Parkinson's disease and high blood pressure paired by gender, but there were no statistically significant associations. In addition, a significant difference was observed in AD diagnosis and nutritional status using MNA in women (p < 0.001) and men (p < 0.002).

DISCUSSION

Aging implies several alterations in nutritional status as a decrease in odor perception and taste buds' atrophy, which contribute to downfall in dietary intake and lead to nutrient and muscular depletion as well as foods malabsorption (11). Elderly with AD show higher difficulties in mobility, more atrophy and bad motor cordination, which reduce the range of nutritional daily needs (12-14). This is in line with data found in our research, where 71.42% of AD elderly presented malnutrition risk, since elderly people with dementia present loss of appetite, chewing and swallowing difficulties, and indifference and lack of awareness about the importance of power (15,16); by contrast, 79.06% of participants in the control group show normal nutritional status after MNA analysis.

According to Silva (2017) (16), after analyzing AD patients, from 58.3% (n = 14) men, 85.7% (n = 12) are malnourished and, from 41.7% (n = 10) women, all of them are malnourished. This results are similar to those of our research, where women show significant differences in height and MNA scores when compared to the control group. Some explanations were proposed to elucidate women prevalence regarding AD. In average, women have longer life expectancy than men; in other words, they have a higher chance to reach up to 65 years, which is a high risk age to AD (12). In the elderly, gender imbalance is accentuated: 57% are women and 43% are men, against 52% and 48%, respectively, in the non-elderly, and this is due to lower mortality among the female gender (11).

The study by Sturmer et al. (2011) (17) analyzes the nutritional status in AD patients, and 83.3% of the patients under study showed malnutrition risk. Nobre (18) presented a higher percentage of malnutrition risk in the AD group, whereas the control group showed more well-nourished individuals, using the MNA.

In spite of the differences observed between CDR groups, in this study BMI is, on average, at normal levels in the elderly population. However, there is a strong trend to malnutrition as the disease becomes more severe. These results can be observed in table II. There was a lower BMI and a lower result for MNA total score in the elderly group classified as CDR 3, when compared to the other groups. Our results are compatible with those of Goes (18), who found that CDR 3 presented higher weight loss and more malnourished patients. In a study by Goulart et al. (2017) (20), CDR 0.5 and CDR 1 patients show malnutrition risk (65.4%) and in CDR 2 and CDR 3, 65.4% of patients show malnutrition through MNA.

Protein-energy malnutrition is frequent in AD and progresses as diseases severity increases. In mild and moderate stage, malnutrition is around 3%, whereas in severe stage it may be around 50% (14). Furthermore, people with dementia usually present decline in power's abilities and exhibit conducts of low intake. These behaviors are normally linked to dementias and include restrictive nutritional habits as well as refusing swallowing, spitting the food out and keeping the mouth open (18). Low appetite may arise through depression, difficulty in reporting needs, lack of activity, pain, oral problems, medication side-effects or constipation, among others (21).

Malnutrition has been presented as an imbalance between food intake and food requirements, which results in metabolism changes. Disabilities in the ingestion of vitamins may induce changes in cognitive functions (14), harming up elderly's health. Associations between nutritional status and severity from cognitive status prove that, with dementia, nutritional status deteriorates significantly. Elderly with dementia develop dietary needs, requiring a global support to maintain or reestablish weight (22). In addition, weight loss and malnutrition generate complications and lead to infections, respiratory failure and health failure and decrease protein synthesis, increasing mortality. A proper nutrition has a fundamental role in this disease, because it is able to prevent higher vulnerability and provide a better quality of life, delaying symptoms and progressiveness of AD (19).

Due to physiological and psychological alterations, feeding can be really difficult in AD patients. When both disease and age progress, autonomy loss may occur, which has a negative impact in food intake and nutrition. Therefore, AD people meals should be nutritionally rich as well as sensory appealing (colors, consistency, aroma); in other words, they must stimulate the desire to consume foods (24).

It is important to analyze that malnutrition compromises substantially limited populations, as elderly with AD. Nutritional problems, like thinness and loss of lean body mass are associated to morbidity and mortality increase, with a negative impact in quality of life, mainly in advanced ages

(18). Alzheimer progressively makes patients unable to make daily activities, such as eating, independently, causing nutritional problems, weight loss and inadequate nutrients intake. All these things are observed in AD patients, and for this reason, a precocious nutritional assessment is really important (16).

A study limitation was the small sample and the difference in age between groups; however, this was statistically corrected. A review and meta-analysis by Prince et al. showed a significant increase of dementia associated to age, with higher prevalence in women and men in all age groups (10). A major risk factor to AD is age increase, because one in four people aged 85 years and over has dementia (22).

Therefore, nutritional assessment in AD has shown to be of great importance to perform effective interventions aiming to preserve or recover nutritional status in third-age, reducing medical interventions due to fractures and diseases caused by poor nutrition and reduced nutrient absorption, which may be corrected through vitamin and food supplements (20,21).

CONCLUSION

The results of the present study reinforce the hypotheses that MNA can be used as a proper instrument to evaluate nutritional status in the elderly, identifying malnutrition risk before clinical manifestations happen. It is important to measure risk and nutritional status of AD' people to monitor this condition.

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Table I. **Profile of patients with Alzheimer's disease attended by the AEPAPA and control group**

	Alzheimer (n = 35)	*Control group (n = 43)*
Age (years)	78.90 ± 8.72	68.35 ± 5.69
Gender	62.85% (n = 22) female	67.44% (n = 29) female
Average income (Brazilian real)	R$ 1,031.13 ± 67.29	R$ 904 ± 8.99
MNA		
Normal nutritional status	14.25% (n = 5)	79.06% (n = 34)
Malnutrition risk	71.42% (n = 25)	20.93% (n = 9)
Malnutrition	14.28% (n = 5)	

Data presented by average ± standard deviation.

Table II. Comparison of nutritional status according to the Clinical Dementia Rating (CDR)

	CDR 1 (n = 7)		CDR 2 (n = 13)		CDR 3 (n = 15)		F	p
Weight (kg)	69.15	4.79	68.54	3.53	58.30	3.22	2.990	0.065
Height (m)	1.58	0.03	1.56	0.02	1.55	0.02	0.253	0.778
BMI (kg/m²)	27.32	1.68	*28.20**	*1.24*	*23.97**	*1.13*	3.475	*0.043**
MNA total score	*23.12**	*1.25*	21.69	0.92	*19.10**	*0.84*	4.290	*0.023**

CDR 1: mild dementia; CDR 2: moderate dementia; CDR 3: severe dementia; BMI: body mass index; MNA: Mini Nutritional Assessment. Data presented as average ± standard deviation; *$p < 0.05$ showing statistical difference. Comparison was made using ANCOVA one way, followed by Bonferroni test for multiple comparisons. Age as covariable = 78.371.

Table III. Comparison of nutritional status in relation to gender and Alzheimer's disease

	Women					*Men*				
	Control (n = 29)		Alzheimer (n = 23)		*p*	Control (n = 14)		Alzheimer (n = 16)		*p*
Weight (kg)	69.17	2.60	61.30	2.84	0.060	71.53	3.47	73.76	3.38	0.658
Height (m)	*1.56*	*0.01*	*1.52*	*0.01*	*0.034**	1.67	0.02	1.66	0.02	0.471
BMI (kg/m^2)	28.56	1.06	26.46	1.15	0.213	25.51	1.41	27.03	1.37	0.458
MNA total score	*24.78*	*0.61*	*20.82*	*0.67*	*< 0.001**	*26.08*	*0.81*	*21.27*	*0.79*	*< 0.001**

BMI: body mass index; MNA: Mini Nutritional Assessment. Data presented as average ± standard deviation; *$p < 0.05$ showing statistical difference. Comparison between groups was made with MANCOVA and Bonferroni test for multiple comparisons, considering the groups as fixed factor and age as covariable = 73.268.

Table IV. Association between Alzheimer's presence and social and clinical indicators

	Women					*Men*				
	Control (n = 29)		Alzheimer (n = 23)		*p*	Control (n = 14)		Alzheimer (n = 16)		*p*
	n	%	n	%		n	%	n	%	
Civil status					0.427					0.453
Single	3	3.7%	2	2.4%		0	0.0%	1	1.2%	
Married	10	12.2%	5	6.1%		13	15.9%	11	13.4%	
Widower	14	17.1%	17	20.7%		1	1.2%	3	3.7%	
Cohabiting	1	1.2%	0	0.0%		0	0.0%	1	1.2%	
High cholesterol					1.000					0.378
No	18	22.0%	15	18.3%		10	12.2%	14	17.1%	
Yes	8	9.8%	8	9.8%		4	4.9%	2	2.4%	
Unknown	2	2.4%	1	1.2%		0	0.0%	0	0.0%	
Diabetes					0.910					0.552
No	19	23.2%	15	18.3%		13	15.9%	14	17.1%	
Yes	9	11.0%	9	11.0%		1	1.2%	2	2.4%	
Parkinson's disease					0.092					0.228
No	28	34.1%	21	25.6%		14	17.1%	13	15.9%	
Yes	0	0.0%	3	3.7%		0	0.0%	3	3.7%	
High blood pressure					0.496					0.260
No	11	13.4%	8	9.8%		11	13.4%	9	11.0%	
Yes	15	18.3%	16	19.5%		3	3.7%	7	8.5%	
Unknown	2	2.4%	0	0.0%		0	0.0%	0	0.0%	
Nutritional status					< *0.001*					*0.002*
Malnutrition	0	0.0%	5	6.2%		0	0.0%	4	4.9%	
Malnutrion risk	12	14.8%	16	19.8%		5	6.2%	10	12.3%	
Normal	16	19.8%	2	2.5%		9	11.1%	2	2.5%	

*p < 0.05 showing statistical difference. Comparison between groups were made using Pearson's, Chi-squared and Fisher's exact tests.

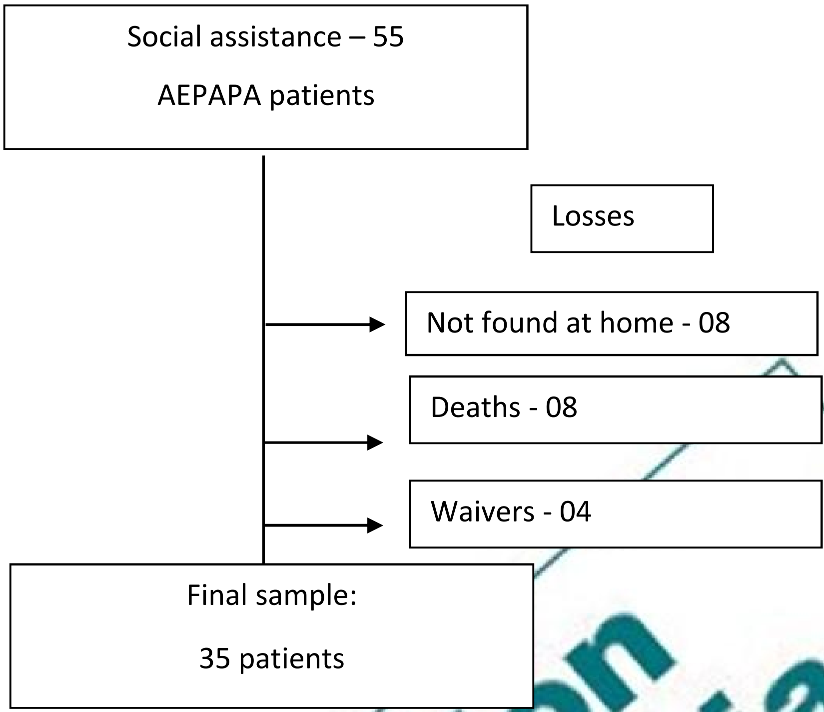

Fig. 1. Recruitment flowchart of the study population.