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Nutritional status in the oldest elderly and associated factors☆

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A B S T R A C T

Objective: To verify factors associated with nutritional status in an oldest elderly community-dwelling population in Southern Brazil.

Methods: This cross-sectional epidemiological and household-based study involved all subjects (n = 134) aged ≥ 80 years who were living in Antônio Carlos (Santa Catarina state, Brazil). Nutritional status was assessed by body mass index (BMI < 22.0 kg/m^2, underweight; BMI > 27.0 kg/m^2, overweight). Explanatory variables in the study were: gender (women/men), literacy (knows how to write and read – yes/no), living conditions (lives alone/with company), cognitive function (normal/altered), eating difficulty (yes/no), medication use (none to two/three or more), morbidity (none to two/three or more diseases), alimentary pattern (adequate/inadequate), alcohol consumption (none to one day a week, two or more days a week), cigarette smoking (never/current or former smoker), physical activity level (< 150 min/week; ≥ 150 min/week), and sitting time (< 4 hours/day; ≥ 4 hours but < 6 hours/day; ≥ 6 hours/day).

Results: Prevalence of underweight was 27.3% in men and 12.8% in women (p < 0.01), and was positively associated with altered cognitive function (OR: 3.52) and inversely related with greater medication use (OR: 0.34). Overweight affected 25.5% of men and 53.8% of women. It was negatively associated with illiteracy (OR: 0.12) and positively associated with female gender (OR: 2.58).

Conclusion: There are differences between men and women regarding nutritional status. The factors associated to nutritional status of the oldest elderly from Antônio Carlos are specific to the vulnerability condition (underweight and overweight).

☆Study conducted at the Centro de Desportos, Universidade Federal de Santa Catarina, Florianópolis, SC, Brazil

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Estado nutricional de idosos longevos e fatores associados

Palavras-chave:
Índice de massa corporal
Idoso de 80 anos ou mais
Baixo peso
Sobrepeso

RESUMO

Objetivo: Verificar os fatores associados ao estado nutricional de uma população de idosos longevos vivendo em comunidade no sul do Brasil.
Métodos: Este estudo epidemiológico, transversal, de base domiciliar, envolveu todos os idosos (n = 134), com idade ≥ 80 anos, residentes no município de Antônio Carlos (Santa Catarina). O estado nutricional foi verificado por meio do índice de massa corporal: (IMC < 22,0 kg/m^2, baixo peso; IMC > 27,0, excesso de peso). As variáveis exploratórias do estudo foram: sexo, saber ler e escrever (sim/não); arranjo familiar (mora só/acompanhado); função cognitiva (normal/alterada); dificuldade para comer (sim/não); uso de medicamentos (0-2/3 ou mais); morbidades (0-2/ 3 ou mais), padrão alimentar (adequado/não adequado); consumo de bebidas alcoólicas (0-1 dia/sem. ou 2 ou mais dias/sem); tabagismo (nunca/fumante ou ex-fumante); nível de atividade física (< 150 min./sem.; ≥ 150 min./sem.); tempo sentado (< 4 horas/dia; ≥ 4 horas mas < 6 horas/dia; ≥ 6 horas/dia).
Resultados: A prevalência de baixo peso foi de 27,3% nos homens e 12,8% nas mulheres (p < 0,01) e foi positivamente associada à função cognitiva alterada (OR: 3,52) e inversamente relacionada ao uso de mais medicamentos (OR: 0,34). O excesso de peso afetou 25,5% dos homens e 53,8% das mulheres e foi negativamente associado a não saber ler (OR: 0,12) e positivamente associado ao sexo feminino (OR: 2,58).
Conclusão: Existem diferenças no estado nutricional de homens e mulheres. Os fatores associados ao estado nutricional dos idosos longevos de Antônio Carlos são específicos à condição de vulnerabilidade (baixo peso e excesso de peso).

Introduction

In the elderly population, underweight and overweight are important issues to be considered.[1-3] Many factors appear to contribute to the nutritional condition evidenced with aging. Physical or physiologic problems related to chewing, digestion and absorption of food, lack of appetite or motivation to prepare meals, and difficulty accessing or preparing meals, among others factors, can contribute to underweight.[4] In addition, smoking, alcohol consumption, and excessive use of medication also play a role in malnutrition.[5-7] Conversely, lifestyle (sedentary behavior, physical inactivity, poor diet), hormonal changes, and diseases can contribute to overweight.[2,5]

Considering the seriousness of underweight and overweight in elderly people, it is important that an evaluation contemplating the different dimensions of health conditions and lifestyle should be conducted to identify the factors that affect nutritional status and, possibly, to develop strategies to promote health and quality of life. Although there are different procedures to evaluate the nutritional status in the elderly, the body mass index (BMI) is commonly used in epidemiological studies,[3,5,8–10] having the advantage of being simple, easy to apply, and noninvasive.

There are few studies that address the nutritional status of the oldest elderly population in Brazilian communities. Studies on the elderly aged 60 years and above living in larger urban centers and small municipalities[3,9,10-12] have demonstrated that factors related to nutritional status vary, highlighting the need for more studies on the factors associated with underweight and overweight in the oldest elderly.

Thus, the purpose of this study was to examine the association between nutritional status and socio-demographic variables, health conditions, and lifestyle of an oldest elderly community-dwelling population in Southern Brazil.

Methods

Area of study

The city of Antônio Carlos (229 km^2) is located 30 km from the capital of the state of Santa Catarina, in Southern Brazil. Data from the 2010 census found 7,458 inhabitants, and 12.8% (n = 936) were over 60 years of age.[13] The city has good health and quality of life indicators, presenting high (0.827) Human Development Index (HDI).[14] Antônio Carlos has one health service unit, located downtown, which attends individuals of all ages. Three Family Health Program (FHP) teams (composed by one doctor, one nurse, auxiliary nurses, and community health agents) cover the entire town. This program aims to increase population access to primary care.[15]

Delineation and attendees

This was a cross-sectional and epidemiological study of a household-based population, which uses part of the initial data of the "Effectiveness of health actions, physical activity and nutrition in the elderly of Antônio Carlos – SC" (SAÚDE-AC) research.[16,17]

The study population comprises all oldest elderly aged 80 years and above (n = 135), registered in the town's FHP; however, one person was absent during the data collection period (from February to April 2010), resulting in 134 participants. The data were obtained using the SABE survey questionnaire, applied in seven countries in Latin America and Caribbean.[18]

Two trained interviewers (graduated students) collected the data, accompanied by FHP health community agents. In cases when the elderly was unable to respond, the information was obtained from a proxy. The Board of Health and the town's Social Assistance authorized the study. The precision and accuracy of the anthropometric measurements were tested before data collection. The reproducibility of the measurements was performed with 15 individuals, with one week between the first and the second measurements.

Nutritional status

Body mass, weight, and height were measured with the subject barefoot and lightly dressed, following standard procedures[19] and using calibrated equipment (electronic scales, Britânia – Brazil; wall-mounted stadiometer, Harpender – United Kingdom). Mean values of three measurements were considered in the analyses. BMI was calculated to verify the nutritional status based on the following classification:[20] BMI < 22.0 kg/m^2, underweight; 22.0 ≤ BMI ≤ 27.0 kg/m^2, normal range; BMI > 27.0 kg/m^2, overweight. When it was impossible or difficult to obtain BMI (due to nonambulatory or bedridden conditions), equations were utilized to estimate body mass,[21] and height[19] (n = 10). One subject refused anthropometric measurement.

Explanatory variables

Socio-demographic: gender (women/men); literacy (knows how to write and read - yes/no); living conditions (lives alone/with company).

Health conditions: the cognitive function was assessed using the modified and validated Mini Mental State Examination[22,23] (normal/altered); eating difficulty (yes/no); medication use was reported by interview and confirmed by the Health Service (none to two/three or more medicines); morbidity (none to two/three or more diseases).

Lifestyle: alimentary pattern based on Mini Nutritional Assessment, Short Form (MNA-SF) (adequate [ingestion of all food groups: meat, legumes, eggs three times a week or more; milk and other dairy products once a day or more; fruits and vegetables four times a week or more]/inadequate),[24] consumption of alcohol(none to one day a week/ two or more days a week), cigarette smoking (never smoked/current or former smoker), physical activity level (PAL) (< 150 min/week; ≥ 150 min/week), self-reported sitting time (ST), in tertiles (< 4 h/day; ≥ 4 h and < 6 h/day; ≥ 6 h/day).[25] The bedridden and nonambulatory subjects were excluded from the PAL and ST evaluations.

Statistical procedures

Mean, standard deviation, and proportions were used in the descriptive analyses of the variables. The association between nutritional status and explanatory variables was tested through multinomial logistic regression (crude and hierarchical adjusted analysis). Any variable that displayed a statistical significance of at least 20% ($p \leq 0.20$) in the crude analysis were included in the adjusted analysis. First, all level 1 variables were adjusted among themselves, and those that obtained $p \leq 0.20$ were kept in the models for adjustment of variables in the following levels. Then, all level 2 variables ($p \leq 0.20$ in the crude analysis) were included. Any variables remaining with a statistical significance of at least 20% were kept in the models, together with level 1 variables, so that the adjustment of level 3 variables could be carried out, to which were added any variable that obtained a p-value ≤ 0.20 in the crude analysis. In this phase, any variables that kept a statistical significance of at least 20% were maintained in the final models, together with level 1 and 2 variables. The normal BMI range was defined as the reference category, and a significance level of 5% was used for the construction of confidence intervals of 95% (95% CI) for odds ratios (OR).

The analysis was conducted using the Statistical Package for the Social Sciences (SPSS) version 16.0 (SPSS, Inc. – Chicago, IL, USA).

The ethics committee of the Universidade Federal de Santa Catarina (Case No. 189/09) approved the study. Participants were informed of the study's purposes and procedures, and signed an informed consent.

Results

The sample was composed of 78 women (58.2%), and 56 men (41.8%), aged between 80 and 100 years (84.7 ± 4.6 years). 76.9% of the participants have performed fieldwork all their lives. There was one refusal of the anthropometric measurements.

The overall BMI mean was 25.96 ± 4.55 kg/m^2. Mean BMI among women was 26.9 ± 4.83 kg/m^2, and among men was 24.64 ± 3.80 kg/m^2. The total prevalence of underweight was 18.8% and that of overweight was 42.1%. Table 1 shows that the majority of the oldest elderly who lived with company did not demonstrate altered cognitive function, had more than two chronic diseases, never smoked, drank less alcohol per week, and had an adequate alimentary pattern.

Table 2 shows the prevalence of underweight, normal range, and overweight according to the explanatory variables of the study. Underweight was significantly more frequent only in elderly that used up to two medications. Overweight was significantly more prevalent among females and literate elderly. However, it was less frequent among those who are smokers or have smoked.

The crude analysis results demonstrated that the explanatory variables gender, literacy, living arrangements, altered cognitive function, medication use, alcohol consumption, and smoker status were statistically significant ($p \leq 0.20$), and were included in the hierarchical model.

Table 3 presents the results of the adjusted analysis (hierarchical multinomial logistic model) for nutritional status in relation to the explanatory variables in the study. Underweight was positively associated with altered cognitive

Table 1 – Distribution of the oldest elderly according to nutritional status (BMI) and explanatory variables (Antônio Carlos, Santa Catarina, Brazil, 2010).

	Underweight		Normal range		Overweight	
	n	%	n	%	n	%
Gender						
Female	10	12.8	26	33.3	42	53.8
Male	15	27.3	26	47.3	14	25.5
Literacy (writes and reads)						
Yes	18	16.4	38	34.5	54	49.1
No	07	30.4	14	60.9	02	8.7
Living conditions						
With company	23	20.9	44	40.0	43	39.1
Lives alone	02	8.7	08	34.8	13	56.5
Cognitive function						
Normal	14	14.3	40	40.8	44	44.9
Altered	11	31.4	12	34.3	12	34.3
Eating difficulty						
No	23	18.5	49	39.5	52	41.9
Yes	02	22.2	03	33.3	04	44.4
Medication						
0-2	15	36.6	16	39.0	10	24.4
3 or more	10	10.9	36	39.1	46	50.0
Morbidity						
0-2	19	22.4	34	40.0	32	37.6
3 or more	06	12.5	18	37.5	24	50.0
Alimentary pattern						
Adequate	17	18.7	35	38.5	39	42.9
Inadequate	08	19.0	17	40.5	17	40.5
Alcohol consumption						
0-1 day/week	20	16.7	46	38.3	54	45.0
2 or more days/week	05	38.5	06	46.2	02	15.4
Smoking						
Never	14	15.2	31	33.7	47	51.1
Current/former-smoker	11	26.8	21	51.2	09	22.0
Physical activity[a]						
< 150 min/week	10	14.7	28	41.2	30	44.1
≥ 150 min/week	11	19.6	21	37.5	24	42.9
Sitting time[a]						
< 4 h/day	10	27.0	13	35.1	14	37.8
≥ 4 h and < 6 h/day	05	11.1	22	48.9	18	40.0
≥ 6 h/day	06	14.3	14	33.3	22	52.4

BMI, body mass index.
[a]n = 124; the bedridden and nonambulatory oldest elderly were excluded.

function and negatively associated with use of three or more medications, regardless of socio-demographic factors, health status, and lifestyle. Overweight was positively associated with female gender and negatively associated with illiteracy. There were no associations observed between nutritional status and the other explanatory variables

Discussion

This study verified the association between nutritional status and socio-demographic variables, health conditions, and lifestyle in the oldest elderly in a county-rural community in Southern Brazil. It is worth highlighting that 76.9% of the

Table 2 – Association of underweight and overweight with selected characteristics in the crude analysis (Antônio Carlos, Santa Catarina, Brazil, 2010).

Level	Variables	Ref.[a]	Underweight		Overweight		p-value
		%	%	OR (95% CI)	%	OR (95% CI)	
1	*Gender*						
	Female	33.3	12.8	0.67 (0.25-1.75)	53.8	3.00 (1.33-6.77)	0.003
	Male	47.3	27.3	1	25.5	1	
	Literacy						
	Yes	34.9	16.5	1	48.6	1	0.001
	No	60.9	30.4	1.06 (0.36-3.07)	8.7	0.10 (0.02-0.48)	
	Living arrangements						
	With company	40.0	20.9	1	9.1	1	0.200
	Lives alone	34.8	8.7	0.48 (0.09-2.44)	56.5	1.66 (0.63-4.41)	
2	*Cognitive function*						
	Normal	40.8	14.3	1	44.9	1	0.099
	Alltered	34.3	31.4	2.62 (0.94-7.26)	34.3	0.91 (0.37-2.25)	
	Eating difficulty						
	No	39.5	18.5	1	41.9	1	0.925
	Yes	33.3	22.2	1.42 (0.22-9.01)	44.4	1.26 (0.27-5.92)	
	Medication						
	0-2	39.0	36.6	1	24.4	1	0.001
	3 or more	39.1	10.9	0.30 (0.11-0.80)	50.0	2.04 (0.83-5.04)	
	Morbidity						
	0-2	40.0	22.4	1	37.6	1	0.244
	3 or more	37.5	12.5	0.60 (0.20-1.76)	50.0	1.42 (0.65-3.09)	
3	*Alimentary pattern*						
	Adequate	38.5	18.7	1	42.9	1	0.965
	Inadequate	40.5	19.0	0.97 (0.35-2.69)	40.5	0.90 (0.40-2.02)	
	Alcohol consumption						
	0-1 day/week	38.3	16.7	1	45.0	1	0.059
	2 or more days/week	46.2	38.5	1.92 (0.52-7.02)	15.4	0.28 (0.05-1.47)	
	Smoking						
	Never	33.7	15.2	1	51.1	1	0.005
	Current/former-smoker	51.2	26.8	1.16 (0.44-3.04)	22.0	0.28 (0.11-0.70)	
	Physical activity						
	< 150 min/week	41.0	17.9	0.79 (0.30-2.09)	41.0	0.83 (0.39-1.80)	0.859
	≥ 150 min/week	36.4	20.0	1	43.6	1	
	Sitting time						
	< 4 h/day	35.0	30.0	1	35.0	1	0.270
	≥ 4 h and < 6 h/day	43.1	12.3	0.33 (0.11-1.00)	44.6	1.04 (0.42-2.56)	
	≥ 6 h/day	35.7	17.9	0.58 (0.16-2.19)	46.4	1.30 (0.43-3.94)	

BMI, body mass index; OR, odds ratio; 95% CI, confidence interval.
[a]Normal range.

elderly interviewed performed fieldwork (non-mechanized) all their lives. The study was able to evaluate all the oldest elderly aged 80 years or older, considering several dimensions on the evaluation, and providing a valuable knowledge of the conditions of this population's life.

The results showed that altered cognitive function and female gender were independently and positively associated with underweight and overweight, respectively. The use of three or more medications was negatively associated with underweight, and illiteracy was negatively associated with

Table 3 – Association of underweight and overweight with selected characteristics in the multiple multinomial logistic model (hierarchical) (Antônio Carlos, Santa Catarina, Brazil, 2010).

Variables	Underweight			Overweight		
	OR	95% CI	p-value	OR	95% CI	p-value
Gender						
Female	0.67	0.25-1.77	0.415	2.58	1.11-6.01	0.028
Male	1			1		
Literacy						
Yes	1			1		
No	1.00	0.34-2.94	0.999	0.12	0.02-0.55	0.007
Cognitive function						
Normal	1			1		
Altered	3.52	1.03-12.03	0.045	1.38	0.47-4.01	0.559
Medication						
0-2	1			1		
3 or more	0.34	0.12-0.95	0.041	1.72	0.63-4.67	0.287

OR, odds ratio; 95% CI, confidence interval.

overweight. Smoking showed a positive association with underweight, and negative association with overweight on the crude model; however, the association power was reduced after adjustments. Associations between underweight and/or overweight and the other variables were not observed in this study.

Among Antônio Carlos' oldest elderly, a significantly higher prevalence of underweight was observed in men, and of overweight in women, as observed in other national studies.[3,11,12] The frequency of underweight between men and women of Antônio Carlos was lower than the one observed in the elderly (≥ 80 years) from São Paulo,[11] but higher than that observed in men from Viçosa.[12] Prevalence of overweight was greater in this study compared with São Paulo and Bambuí[3] (men and women), and with Viçosa (women). However, these studies were conducted in populations with different regional characteristics. In São Paulo and Bambuí, the cutoff points used in the categorization of underweight and overweight were different from the ones used in the current study.

According to adjusted analysis, altered cognitive function was positively associated with underweight. It is possible that malnutrition contributes to the altered cognitive function because of the lack of nutrients,[26] and thus, individuals who have cognitive deficit can forget to take medication, have lack of appetite, and may have difficulty eating and preparing their own food.[27]

The association between nutritional status and altered cognitive function has been observed by other authors, despite different methodologies in assessing nutritional status.[28,29] The study by Ferdous et al.[29] involving 457 elderly (60 years and older) from the rural area of Bangladesh has found a significant association between best nutritional status (MNA) and best performance on tests of cognitive function. In a study involving 2,114 elderly (mean age: 82 years) of all the long-term care institutions of Helsinki, malnutrition (MNA) predicted altered cognitive function, regardless of gender and age.[28]

The negative and independent association between the use of more medications and underweight contrasts that described in literature,[6,7] which shows that the abusive use of medication is one of the main reasons for weight loss in the elderly. It is believed that the disparity between the studies is due to the difference in categorizing the use of multiple medications.[7] A consensus has not been reached on the number of medications that express polypharmacy;[6,7] however, the administration can categorize this as a higher number of medications than those clinically prescribed or as the use of five or more concomitant drugs.[28] The current study only evaluated noninstitutionalized elderly, with 36.6% of these using five or more medications, and none taking more than ten medications, as in the study by Jykkar et al.[7] It is worth highlighting that all the interviewed elderly received free medication from the Board of Health and the town's Social Assistance, suggesting that there was no socio-economic effect on medication usage.

The positive association among female gender and overweight is consistent with other studies,[3,5,9,12] regardless of the classification used to define overweight. Differences in lifestyle and menopause appear to be the main causes of the increased risk of overweight in women.[2]

In the present study, illiteracy was negatively associated with overweight. Although educational level is inversely correlated with adequacy of nutrition in the elderly,[3] in the present study men were to a large extent illiterate, and their nutritional status was worse than that of women, which can explain this association.

The results of the crude analysis demonstrated that the only variable related to lifestyle that was associated with nutritional status was smoking. However, on the adjusted analysis, this association did not persist. This probably occurred because of the small number of individuals (n = 9) that reported to be current/former smoker. The association

between smoking and nutritional status can be related to the multiple effects that smoking has on the thyroid gland, changing metabolic control.[30]

This study has points of strength. It was possible to evaluate all the residents aged 80 years and older, from a city in a rural area of Southern Brazil, with no refusals to participate. Data collection occurred with the assistance of community health agents, who knew all the oldest elderly and their illnesses. Thus, the utilization of information referred to the use of medications and the presence of morbidities could be confirmed. However, the cross-sectional design, where exposition and outcomes were verified in the same period, did not permit the establishment of a temporal relationship between cause and effect.

Although this study did not observe an association between underweight and/or overweight and health and lifestyle variables, it appears that these must be the strategies used to promote a healthier lifestyle.

Considering the population of the elderly, and the increases in longevity, further studies that evaluate the oldest elderly from different regions of the globe are recommended so that factors that affect with morbidity and mortality can be identified, with the purpose of developing strategies that can contribute to a better quality of life.

In conclusion, it was determined that Antonio Carlos' oldest elderly population demonstrated a vulnerable nutritional status because of the prevalence of underweight and overweight. Underweight was associated positively with male gender and altered cognitive function, and negatively associated with the consumption of two or more medications.

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The study protocol was approved by the Ethics Committee of Universidade Federal de Santa Catarina (No. 189/2009). All subjects signed an informed consent.

Conflict of interest

All authors declare to have no conflict of interest.

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