Factors associated with nutritional status of the elderly in two regions of Brazil

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Summary

Objective: To verify the association of nutritional status with sociodemographic factors, lifestyle, and health status in elderly individuals from two cities in different regions of Brazil. **Methods:** Cross-sectional epidemiological home-based study, involving 477 and 316 elderly individuals (≥ 60 years) from the towns of Antônio Carlos (AC-SC) and Lafaiete Coutinho (LC-BA), respectively. Nutritional status was verified using the body mass index (BMI). Explanatory variables in the study were gender, age, level of schooling, living arrangements, lifelong occupation, smoking status, alcohol consumption, time spent sitting, hypertension, diabetes, osteoarthritis, respiratory diseases, and medications. Logistic regression analyses were used (crude and adjusted). **Results:** Underweight (BMI < 22.0 kg/m^2) was more frequent among the elderly from LC-BA (28.9% *vs.* 8.2%), and overweight (BMI > 27.0 kg/m^2) was more prevalent among individuals from AC-SC (52.8% *vs.* 28.2%). In AC-SC, underweight was positively associated with older age (≥ 75 years) and smoking, and inversely associated with longer periods spent sitting (≥ 6 hrs/day). Overweight was positively associated with longer periods spent sitting, hypertension, and arthritis, and inversely associated with older age, male gender, working in rural areas, and alcohol consumption. In LC-BA, no explanatory variable was associated with underweight. Overweight was positively associated with hypertension, and inversely associated with individuals aged ≥ 75 years, and with living alone. **Conclusion:** Underweight was more prevalent in LC-BA and overweight was more prevalent in AC-SC. Factors associated with nutritional status are specific to each municipality.

Keywords: Body mass index; underweight; overweight; aging.

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Introduction

Underweight and overweight, identified by the body mass index (BMI), are conditions frequently observed in the elderly[1-5], associated with morbidity and mortality risk[6]. Some epidemiological studies have shown differences in the prevalence of underweight and overweight in the elderly, as well as in relation to factors associated with these conditions[1-5].

In Brazil, few studies have investigated the factors associated with nutritional status of elderly people from small towns. However, the geographical, environmental, and socioeconomic differences indicate the need for further research in the elderly from different regions of the country, which will allow for the development of different strategies for health promotion, such as prevention and treatment, so that these individuals can maintain their independence and quality of life for as many years as possible.

Within this context, the present study aimed to evaluate the nutritional status of elderly individuals from two municipalities in different regions of Brazil, and its association with sociodemographic factors, lifestyle, and health conditions.

Methods

Epidemiological, cross-sectional population- and household-based study that used data from the following studies: "Effectiveness of health interventions, physical activity, and nutrition in the elderly from Antônio Carlos, Santa Catarina" (AC-SC) and "Nutritional status, risk behaviors, and health status of the elderly in Lafaiete Coutinho, Bahia (LC-BA)."

The municipality of AC-SC (229 km^2), located 30 km from the state capital of Santa Catarina in Southern Brazil, has good health indicators and quality of life, with a high human development index (HDI: 0.827) and life expectancy of 77.9 years[7]. In 2010 the population of AC-SC consisted of 7,458 inhabitants and 936 (12.8%) elderly individuals (60 years or older)[8].

LC-BA (405 km^2) is located 356 km from Salvador, capital of the state of Bahia, Northeast Brazil. Health indicators and quality of life in the municipality are poor, and it has one of the worst HDI (0.607) in the country, with a life expectancy of 63.1 years[7]. In 2010, its population was 3,901, of whom 598 (15.4%) were elderly[8].

Both towns are assisted by the Family Health Strategy (FHS) program, with three teams in AC-SC and two in LC-BA, which cover 100% of each town[9].

The study protocols were approved by the Ethics Committee on Human Research of the Universidade Federal de Santa Catarina (No. 189/09) on June 29, 2009 and by the Ethics Committee on Human Research of the Universidade Estadual do Sudoeste da Bahia (No. 064/10) on May 24, 2010.

Population and sample

The sample from the municipality of AC-SC consisted of elderly individuals from rural and urban areas registered in the FHS program, considering two age groups. In the age group 80 years and older, all elderly individuals were selected (n = 135). However, an elderly man was hospitalized during the collection period (February-April, 2010), resulting in a total of 134 individuals. The sample calculation of the 60-79 years age group was performed from a list of 782 elderly enrolled in the FHS program. A sample of 471 elderly was calculated, considering a margin of error of five percentage points, prevalence of 50%, power of a statistical test 80%, and 15% sample loss. For this age group, the collection (December 2010 – April 2011) was made by simple random sampling within each of three strata (3 micro FHS areas). At the end, the sample consisted of 343 elderly individuals, increasing the margin of error to 5.4 percentage points. The stratified sample was not proportional; thus, weighted samples were used for data analysis.

The study population from LC-BA included all individuals 60 years and older (n = 355) living in the urban area. Of these, 316 participated in the study (89.0%). Data collection occurred from January to March 2011.

Exclusion criteria were: lack of a suitable informer, if necessary; elderly absent from the town for longer than the field survey, after three visits; lack of access to the residence due to rural road status (in the case of AC-SC). In LC-BA, data was not collected in the countryside due to the large size of the municipality and to the difficult access to rural residences.

In both towns, data were collected in an adequate form, based on the "SABE" (Health, Wellbeing, and Aging) study questionnaire.

Data collection was performed by trained interviewers (undergraduate and graduate students in the health care area). The field interviewers were accompanied by FHS program community health agents, with the authorization of the Secretariat of Health and Social Welfare of each municipality. The coordinators were responsible for checking the information received.

Nutritional status (dependent variable)

Nutritional status was verified by BMI [body mass (kg)/height (m^2)], adopting the following classification[10]: < 22.0, overweight; $22.0 \leq$ BMI ≤ 27.0 kg/m^2, normal weight; > 27.0, overweight. The weight and height measurements were performed according to standard procedures[11] in triplicate, and the mean values of each measurement was used for the analyses. Upon the impossibility or difficulty of performing these measurements, equations to estimate body mass[12] and height[13] were used.

Explanatory variables

Sociodemographic: gender, age (60-74; ≥ 75 years), level of schooling (elementary school; high school/college/university), living arrangements (lives alone; lives with someone), lifelong occupation (agriculture; other professions).

Lifestyle: smoking status (smoker; ex-smoker; nonsmoker), alcohol consumption (does not drink alcohol; drinks alcohol). Sedentary lifestyle was measured by the time spent sitting. This item corresponds to domain 5 of the International Physical Activity Questionnaire (IPAQ)[14].

Health status: The diagnosis of hypertension, diabetes, arthritis, and respiratory diseases was carried out using yes/no questions. Another variable used was number ofmedications (0-3; 4 or more).

Statistical analyses

Means, standard deviations, and proportions were used for the descriptive analysis of variables. The association between nutritional status and explanatory variables was tested by multinomial logistic regression, using a model for each town, performed separately. To enter the multiple regression model of association, the explanatory variables had to reach a level of statistical significance of at least 20% in raw and adjusted analyses. Data analysis related to AC-SC was performed through post-stratification weight, due to the sampling method. The significance level was set at 5%, with 95% confidence intervals (95% CI). For data analysis, the Statistical Package for Social Sciences (SPSS) software release 18.0 was used.

Results

The age of the elderly in AC-SC ranged from 60 to 100 years, with a mean of 74.24 ± 8.44 years. The mean age of the elderly from LC-BA was 74.22 ± 9.75 (60-105 years). Overweight was observed in 52.8% (95% CI: 51.82-53.78) and 28.2% of the elderly from AC-SC and LC-BA, respectively. The prevalence of underweight was 8.2% (95% CI: 7.66-8.73) in AC-SC and 28.9% in LC-BA, respectively.

The elderly from AC-SC and LC-BA were characterized as belonging mostly to the younger age group (< 75 years), with elementary level of schooling, living with someone, working most of his/her life in agriculture (non-mechanized), and not drinking alcohol. Hypertension was the most often reported disease by respondents in both towns. Most of the elderly individuals from AC-SC reported being nonsmokers, taking four or more medications, and spending more time sitting (≥ 6 hrs/day), whereas among the elderly from LC-BA there was a higher prevalence of ex-smokers, who used up to three medications, and who remained ≥ 4 hrs and < 7 hrs/day in a sitting position (Table 1).

The results of the crude analysis of the association between nutritional status and explanatory variables of the study showed that the variables age group, living arrangements, smoking status, hypertension, and number of medications reached statistical significance ($p \leq 0.20$) to enter the multiple regression model in both municipalities, whereas the explanatory variables such as a lifelong occupation, alcohol consumption, time spent in the sitting position, and osteoarthritis were included in the model only in the municipality of AC-SC, while the variable respiratory diseases was included only in the model of LC-BA.

The results of adjusted analysis demonstrated that, for the elderly from AC-SC, overweight was positively associated with high blood pressure, osteoarthritis, and more time spent in the sitting position (≥ 4 hrs and < 6 hrs/day, and ≥ 6 hrs/day). An inverse association was observed between overweight and male gender, age group ≥ 75 years, alcohol consumption, and lifelong agricultural work. There were no associations between overweight and the variables living arrangements, smoking, diabetes, and number of medications (Table 2).

Underweight was positively associated with age group ≥ 75 years and smoking, and inversely associated with longer periods spent in the sitting position (≥ 6 hrs/day). The elderly taking four or more medications tended to be underweight, although this result was not statistically significant. No associations were found between low weight and the variables gender, living arrangements, lifelong occupation, alcohol consumption, hypertension, diabetes, osteoarthritis, and number of medications.

The results of the adjusted analysis for the elderly from LC-BA showed that overweight was inversely associated with the age group ≥ 75 years and living alone, and was positively associated with hypertension. There were no significant associations between overweight and the explanatory variables gender, smoking status, diabetes, respiratory diseases, and number of medications. Elderly smokers showed an inverse tendency to overweight; however, this result was not significant. Underweight was not associated with any explanatory variable analyzed (Table 3).

Discussion

This study investigated the association between nutritional status and sociodemographic factors, lifestyle, and health status among the elderly from two distinct regions of Brazil. The results showed a different scenario in relation to nutritional inadequacy and associated factors, which were specific to each municipality, as expected.

The results demonstrated that underweight was more prevalent among the elderly in LC-BA, while the highest percentage of overweight individuals was observed in AC-SC.

Table 1 – Distribution of elderly individuals according to sociodemographic characteristics, lifestyle, and health status in Antônio Carlos – SC and Lafaiete Coutinho – BA, Brazil, 2010

	Antônio Carlos (AC-SC)			Lafaiete Coutinho (LC-BA)		
Variables	Response rate (%)	n	%	Response rate (%)	n	%
Gender	100.0			100.0		
Male		207	43.4		143	45.3
Female		270	56.6		173	54.7
Age (years)	100.0			99.7		
60-74		275	57.7		175	55.6
≥ 75		202	42.3		140	44.4
Schooling	99.8			86.1		
Elementary school		456	95.8		254	93.4
High school/College/University		20	4.2		18	6.6
Living arrangements	100.0			100.0		
Lives alone		65	13.6		52	16.5
Lives with someone		412	86.4		264	83.5
Lifelong occupation	99.0			95.3		
Agriculture		331	70.1		197	65.4
Other professions		141	29.9		104	34.6
Smoking status	100.0			99.7		
Smoker		34	7.1		35	11.1
Ex-smoker		110	23.1		147	46.7
Nonsmoker		333	69.8		133	42.2
Alcohol consumption	99.8			99.7		
Does not drink		355	74.6		260	82.5
1 + days/week		121	25.4		55	17.5
Time spent sitting[a]	95.4			97.2		
First tertile[b]		109	24.0		73	23.8
Second tertile		158	34.7		119	38.8
Third tertile		188	41.3		115	37.5
Hypertension	100.0			99.4		
Yes		342	71.7		213	67.8
No		135	28.3		101	32.2
Diabetes	99.8			97.5		
Yes		89	18.7		35	11.4
No		387	81.3		273	88.6
Arthrosis	99.4			98.7		
Yes		147	31.0		105	33.7
No		327	69.0		207	66.3
Respiratory diseases	100.0			99.4		
Yes		53	11.1		11	3.5
No		424	88.9		303	96.5
Number of medications	99.6			97.8		
0-3		223	46.9		210	68.0
4 or +		252	53.1		99	32.0

[a]n = 461 elderly from AC-SC and 307 elderly from LC-BA (excluding bedridden and non-ambulatory individuals); [b]tertile time spent sitting for the cities AC-SC and LC-BA. respectively: first tertile: < 4 hrs/day for both cities; second tertile: ≥ 4 hrs and < 6 hrs/day and ≥ 4 hrs and < 7 hrs/day; third tertile: ≥ 6 hrs/day and ≥ 7 hrs/day.

Table 2 – Multiple multinomial logistic model of the association between nutritional status and the explanatory variables of the study in Antônio Carlos – SC, Brazil, 2010

Variables	Underweight		Overweight		p
	OR[a]	95% CI	OR[a]	95% CI	
Gender					< 0.001
Male	0.69	0.29-1.67	0.41	0.27-0.62	
Female	1		1		
Age (years)					< 0.001
60-74	1		1		
≥ 75	4.51	2.32-8.75	0.64	0.45-0.90	
Living arrangements					0.10
Lives alone	0.30	0.08-1.08	0.82	0.53-1.27	
Lives with someone	1		1		
Lifelong occupation					0.02
Agriculture	1.09	0.51-2.35	0.65	0.47-0.90	
Other professions	1		1		
Smoking status					0.02
Smoker	4.48	1.54-13.04	0.93	0.48-1.80	
Ex-smoker	2.05	0.85-4.96	1.43	0.92-2.23	
Non-smoker	1		1		
Alcohol consumption					0.03
Does not drink	1		1		
1 or + days/week	0.51	0.24-1.11	0.65	0.45-0.95	
Time spent sitting[b]					0.004
< 4 hrs/day	1		1		
≥ 4 hrs and < 6 hrs/day	1.05	0.49-2.27	1.56	1.03-2.37	
≥ 6 hrs/day	0.40	0.17-0.96	1.60	1.08-2.39	
Hypertension					< 0.001
Yes	0.68	0.35-1.33	2.73	1.91-3.91	
No	1		1		
Arthrosis					0.002
Yes	0.68	0.31-1.48	1.68	1.21-2.33	
No	1		1		
Number of medications					0.08
0-3	1		1		
4 or +	0.45	0.22-0.93	0.94	0.67-1.31	

[a]Adjusted for all variables of the table; [b]n = 461 elderly individuals from AC-SC and 307 from LC-BA (excluding bedridden and non-ambulatory individuals); CI, confidence interval; OR, odds ratio.

Underweight was positively associated with older individuals and smokers, and inversely associated with longer periods in the sitting position (≥ 6 hrs/day) among the elderly in AC-SC. No factors were identified as being associated with underweight among the elderly in LC-BA.

Overweight was positively associated with longer periods of time in the sitting position, hypertension, and osteoarthritis among the elders of AC-SC, and inversely associated with the oldest age group (≥ 75 years), males, lifelong work in the rural area, and alcohol consumption.

Table 3 – Multiple multinomial logistic model of the association between nutritional status and the explanatory variables of the study in Lafaiete Coutinho – BA, Brazil, 2010

Variables	Underweight		Overweight		p
	OR*	95% CI	OR*	95% CI	
Age (years)					< 0.002
60-74	1		1		
≥ 75	0.78	0.43-1.39	0.33	0.17-0.61	
Living arrangements					< 0.001
Lives alone	0.49	0.23-1.06	0.14	0.04-0.43	
Lives with someone	1		1		
Smoking status					0.08
Smoker	1.27	0.51-3.17	0.19	0.04-0.95	
Ex-smoker	1.43	0.77-2.65	1.04	0.56-1.91	
Non-smoker	1		1		
Hypertension					0.01
Yes	0.90	0.48-1.72	2.70	1.25-5.84	
No	1		1		
Respiratory diseases					0.13
Yes	4.36	0.98-19.32	2.10	0.28-15.56	
No	1		1		
Medications					0.16
0-3	1		1		
4 or +	1.71	0.85-3.44	0.85	0.45-1.63	

*Adjusted for all variables of the table; OR, odds ratio; CI, confidence interval.

In LC-BA, overweight was positively associated with hypertension, and inversely associated with oldest age group, smokers, and living alone. Smokers showed an inverse tendency to overweight, even though the association was not significant.

The differences in the prevalence of low and overweight observed among the elderly from both towns can be explained by environmental (climate, geography), cultural, and socioeconomic characteristics, which can be illustrated by the higher monthly income in the South compared to the Northeast region[8], and by municipal HDI, which was 0.882 in AC-SC and 0.607 in LC-BA[7]. These factors can affect the lifestyle and even the availability and/or access to food, possibly affecting dietary choices and patterns of individuals throughout life. The environmental, cultural, socioeconomic, and lifestyle characteristics appear to further explain the divergence regarding factors associated with nutritional status in each town, although the actual nutritional status - high prevalence of underweight in LC-BA and overweight in AC-SC - can explain some associations.

The association between older age and underweight is consistent with other studies[1,2,4,5,15] and can be explained by the aging process itself. The aging process is accompanied by biological, physiological, and psychological alterations, such as oral cavity problems, decreased sense of smell and taste, and reduced cognitive and functional capacity[16], all of which may result in underweight and/or malnutrition. The lack of association between underweight and the study variables among the patients from LC-BA can be explained by the high prevalence of this condition among the elderly.

The differences between the genders in relation to overweight may be biological. Women have more body fat and lose it at older ages than men, who have more muscle mass[17]. This association has also been observed in other studies, regardless of the cutoff point to characterize overweight[3-5]. The lack of association between gender and overweight among the elderly from LC-BA can be explained by the town's economic status, which affects men and women equally, creating a generalized low prevalence of overweight.

The association between underweight and living alone, observed in LC-BA, was found in other studies[18,19]. Elderly individuals who live alone tend to have psychological[20] and health[21] problems, which may reflect on appetite changes and food acquisition, predisposing the individual to underweight and/or malnutrition[19]. For the elderly from AC-SC, living alone was not associated with nutritional status. This may be due to cultural differences, socioeconomic status, personal preferences of the elderly[22], and the migration process, which is varies in different regions of the country[23]. In AC-SC, most family members, even though they do not live in the same household as the elderly, tend to live nearby, which can mean greater family support.

Some studies have shown an association between smoking and underweight[1,4], as observed in this study. This association may be due to the effects that nicotine plays in reducing appetite and in thyroid hormone secretion[24], increasing the metabolic rate and favoring the oxidation of body fat, which results in lower weight.

The association between alcohol consumption and nutritional status is controversial. While some studies have found that it is related to underweight[19,25], another study associated alcohol consumption with weight gain[26]. It is believed that the controversy is due to differences in the criteria regarding alcohol consumption in different studies. The present study did not analyze the amount of alcohol consumed, making the comparison difficult. However, it is noteworthy that excessive alcohol consumption can cause vitamin and mineral deficiencies and interfere with fat metabolism, which can cause weight loss (anorexia), leading to alterations in the body composition of individuals[25].

Some factors may explain the association between hypertension and overweight observed in this study and others[1,4,26,27] analyzing elderly individuals: increased plasma renin activity, increased plasma levels of angiotensinogen, increased tissue-conversion enzyme activity, and increased plasma levels of aldosterone in obese individuals, contributing to an increased arterial stiffness and resistance to blood flow through the vessels[28].

There are some reasons that explain the association between overweight and osteoarthritis observed in the present study, only in AC-SC, and by other authors[5,29]. It is likely that osteoarthritis triggers increased fatigue, pain, stiffness, and difficulty in performing movements, creating barriers to physical activity[30] and lowering energy expenditure[31], resulting in overweight.

Some considerations must be made regarding the study data. Except for anthropometric measurements, the other data were self-reported. Such information provides important data for the planning of health services[4]. The reporting of the presence of chronic diseases can identify individuals who have been diagnosed; however, it can omit the presence of comorbidities in the elderly who are not aware of them[32]. The information related to the time spent sitting has not been extensively examined, but showed good reliability and moderate validity[33]. Furthermore, the type of study, i.e., cross-sectional, has low power to establish causality between the observed associations.

Conclusion

In conclusion, nutritional inadequacy is prevalent and differentiated in the elderly from the two locations, as well as factors associated with overweight and underweight. The identification of nutritional status and related factors allows interventions directed to the real needs of the elderly population of each municipality, aimed at healthy aging and quality of life for all.

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