

Prevalence of overweight and obesity in elderly people from Vitória-ES, Brazil

Prevalência de sobrepeso e obesidade
em idosos da cidade de Vitória-ES, Brasil

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Abstract *The scope of this study was to estimate the prevalence of overweight and obesity and its association with socio-economic status in a sample of non-institutionalized elderly people from Vitória-ES, Brazil. This was a cross-sectional survey with a sample of 882 elderly people aged 60 and over. Obesity and overweight were assessed using the body mass index (BMI) and waist circumference (WC). All subjects answered a personal and socio-demographic questionnaire in relation to age, gender, marital status, physical activity, number of children, chronic diseases and smoking. Associations between categorical variables were tested using chi-square analysis with a 5% significance level. The prevalence of overweight and obesity was high (41.8% and 23.4%, respectively) and 50.7% of the elderly had a substantially increased waist circumference. About 4.3% of the individuals had diabetes, 50.4% had hypertension and 14.9% were found to have both diseases. It was observed that both the BMI and WC were significant associated ($p < 0.05$) with sex, marital status, the presence of diseases and with cigarette smoking.*

Key words *Nutritional status, Elderly people, Obesity, Overweight*

Resumo *O objetivo deste estudo foi avaliar a prevalência de sobrepeso e de obesidade associados a fatores socioeconômicos, em uma amostra de idosos não institucionalizados de Vitória-ES, Brasil. Foi realizado um estudo transversal com uma amostra de 882 idosos com 60 anos ou mais. Estes parâmetros foram avaliados por meio do índice de massa corporal (IMC) e da circunferência da cintura (CC). Todos os participantes responderam a um questionário de dados pessoais e sociodemográficos em relação à idade, sexo, grau de instrução, estado civil, atividade física, número de filhos, doenças crônicas e tabagismo. Associações entre as variáveis categóricas foram testadas utilizando o teste qui-quadrado com um nível de significância 5%. Observou-se que prevalência de sobrepeso e obesidade de acordo com o IMC foi alta (41,8% e 23,4%, respectivamente) e 50,7% dos idosos apresentaram um substancial aumento da circunferência abdominal. Verificou-se que 4,3% dos indivíduos eram diabéticos, 50,4% hipertensos e 14,9% apresentaram ambas as doenças. Observou-se que tanto o IMC como a CC foram significativamente associados ($p < 0,05$) com o sexo, estado civil, presença de doenças e tabagismo.*

Palavras-chave *Estado nutricional, Idoso, Obesidade, Sobrepeso*

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Introduction

The improvement in basic sanitation and health care during the last decades enabled a significant increase in life expectancy and, therefore, in the number of elderly people throughout the world. Today, the proportion of elderly is growing faster than the proportion of children and in the next 20 years the population of elderly in Brazil might exceed 30 million people and should represent nearly 13% of the population at the end of this period¹, including the country among the ten with the largest population of older persons in the world².

This demographic transition has been followed by a change in the epidemiological profile of the population. There is a large number of evidence³⁻⁷ indicating an increased frequency of overweight and obesity worldwide which are among the risk factors for chronic diseases such as diabetes mellitus, hypertension and coronary heart disease. Despite this fact the obesity and overweight among elderly people is still inadequately documented⁸⁻¹⁰, especially in developing countries^{2,11}.

Overweight and obesity are a reflection of the combination of a variety of factors including a range of sociodemographic variables¹²⁻¹⁴ which differs among regions, thereby influencing the prevalence of these diseases. According to the existing evidence, the Body Mass Index is greater in women than in men^{15,16}, its distribution by age shifts to the left in elderly people¹⁷ and it is related to the educational level^{3,10} but there are still a controversy in relation to the direction of these association within the schooling groups. Some studies indicated a higher prevalence in higher income and educated groups^{13,16} while others found a negative association between the risk of being obese or overweight and educational level³. Bovet *et al.*¹⁸ observed that overweight was related with both occupation and education and the association was direct in men and inverse in women. In a view of this, the different associations of overweight and obesity with gender and SES emphasize the need to better understand the role of these independent variables in the nutritional status in order to develop appropriate health policy. Thus, the aim of this study was to estimate the prevalence of overweight and obesity and the association between these conditions and the socioeconomic status, in a sample of Brazilian non-institutionalized elderly people from Vitória-ES, Brazil.

Methods

This study is part of a cross-sectional study of oral health and nutritional status in non-institutionalized elderly people that was carried out in 2006. The sample comprised elderly people aged 60 and over. Participants were randomly selected from the Family Health Programme and from the Community Agents Health Programme in the city of Vitória-ES, Brazil. The sampling was made by clusters in three stages: in the first stage the districts were selected, in the second, the microareas and in the third stage, the elderly. The individuals who were physically (e.g. bedridden patients, wheelchair subjects and those not able to stand up) and/or mentally unable to undergo the examinations or answer the questionnaires were not considered in the sampling procedure. In order to estimate the proportion of elderly with overweight/obesity and an increased waist circumference the sample size was determined considering: the total number of non-institutionalized elderly people in the city of Vitória (31.177), a 3.5% error, 95% confidence level, a 60.0% and 72.0% expected prevalence of general overweight and increase waist circumference, respectively, which were found in a previous pilot study. Thus, 735 individuals were required but a 20% was added to this number to compensate for refusals, adding up to a total sample of 882 participants.

This project was approved by the Ethics in Research Commission of the University of Pernambuco and all the subjects signed an informed consent form immediately before the interview.

Trained staff conducted a face-to-face interview in the participants' homes and obtained information on demographic, socioeconomic and health status with focus on hypertension and diabetes mellitus, tobacco use and physical activity. Regular physical activity was defined as at least 30 minutes of moderate-intensity physical activity 3 times or more per week. With regard to the chronic diseases, subjects were considered as hypertensive or diabetics if they reported current use of anti-hypertensive or hypoglycemic agents.

Anthropometric measurements included weight, height and waist circumference (WC). Body Mass Index (BMI) was calculated as body weight divided by the square of the height in meters and the cut-offs set were those established by World Health Organization¹¹ as follows: underweight (<18.5), normal range (18.5-24.99), overweight (25-29.99) and obese (≥ 30). Height was measured with a portable stadiometer, participants being measured barefoot and with the head hor-

horizontal in the Frankfurt plane. Weight was measured to the nearest 100 grams using a digital personal scale. Individuals were asked to stand still in centre of the platform, with body weight distributed between both feet. All participants wore light indoor clothes and were barefoot.

Waist circumference was used as a measure of abdominal adiposity. WC was taken midway between the lowest rib and iliac crest using a flexible tape applied directly to uncover skin at the end of normal expiration and was measured to the nearest millimeter. Men with WC <94, 94-101.9 and ≥ 102 cm were classified as normal, increased and substantially increased WC, respectively, while women were classified on the same categories on the basis of WC <80, 80-87.9 and ≥ 88 cm. These cut-off values were established according to the World Health Organization¹⁴.

The statistical analysis included descriptive and inferential analyses, using a 5% significance level. Associations between categorical variables were tested using chi-square analysis. Data was tabulated using Epi Info 6.04 and was converted for analysis by the SPSS version 11.0 software.

Results

A sample of 833 participants completed the study, 49 individuals (5.6%) were not at home, after at least three visits, or refused to complete the study for unknown reasons. There was a large percentage of females (67.6%). Age ranged from 60 to 96 years (mean, 70.0 median), with 46.5% of the respondents in the 60 to 69-year-old group. About 43.4% of the individuals were earning the minimum wage (US\$ 169/month), 30.1% from 2 to 5 times the minimum wage (US\$ 338-845/month) and 11.1% 5 or more times the minimum wage. The results showed that in the overall sample 4.3% had diabetes, 50.4% hypertension and 14.9% had both diseases.

It was observed that the mean BMI was 27.05 (SD 4.95) and the mean WC was 93.11cm (SD 12.19). The prevalence of overweight and obesity based on BMI according to socioeconomic status (SES), presence of disease and physical activity are shown in Table 1. From this table it can be seen that the overall prevalence of overweight/obesity was 65.2%. It was observed that there were significant difference between BMI and sex ($p < 0.05$). Women had a higher prevalence of obesity than man and an inverse pattern was found for overweight. Neither educational level nor physical activity were associated with BMI

($p > 0.05$). With regard to marital status, it was found that overweight was the most prevalent within all groups and the single subjects were the ones with the lowest prevalence of overweight and obesity.

In relation to the WC, most of the elders (50.7%) had a substantially increased abdominal adiposity (WC ≥ 102 and ≥ 88 cm for men and women, respectively). About 26.1% had an increased risk and 23.2% had a normal WC. The association between WC, SES, physical activity and presence of disease are displayed in Table 2.

Discussion

From a review of the literature, it can be seen that there is still few information about the frequency of overweight and obesity in elderly people, specifically the ones from population-based studies. From this study, it was observed that there was no risk of underweight among the individuals. Studies have shown an increase of underweight with aging, however, the prevalence is very small and in most cases it does not includes a significant proportion of the population¹⁹⁻²¹ which is in accordance with the findings of this study. About 2.4% of the elderly had a BMI below 18.5, though this low prevalence is not relevant because it is included within the 3 to 5% of the fraction of the population that are biologically thin¹¹.

Unfortunately, the prevalence of overweight largely overcomes the underweight and/or normal range people, thereby demonstrating that this epidemiologic context should be evaluated carefully when considering the elderly population, especially due to their close relationship with the development of chronic diseases. In the present study, 41.8% and 23.4% of the non-institutionalized elderly were overweight and obesity, respectively, and 50.7% of the individuals had a substantially increased WC corroborating the worldwide concerning about a global epidemic^{22,23}. Our results are also similar to the ones described in the last epidemiological survey carried out in Brazil²⁰.

In relation to gender, it was found a significant association between sex and both the obesity indicators. Women had a higher prevalence of substantially increased WC (62.7% vs 25.6%) and obesity (29.7% vs 10.4), on the other hand more men had an increased abdominal adiposity (29.6% vs 24.4%) and were more overweight (50.0 vs 37.8) than women. This trend is in accordance with the results from other community-based surveys^{3,6,24,25} and, particularly, the ones

Table 1. Distribution of BMI according to the socio-economic status (SES), presence of disease, smoking and physical activity.

	Underweight		Normal		Overweight		Obese		Total		p-value
	N	%	N	%	N	%	N	%	N	%	
Total group	17	2.0	273	32.8	348	41.8	195	23.4	833	100.0	
Sex*											p<0.001
Male	4	1.5	103	38.1	135	50.0	28	10.4	270	100.0	
Female	13	2.3	170	30.2	213	37.8	167	29.7	563	100.0	
Age*											p=0.047
60-69 years	9	2.3	113	29.2	162	41.9	103	26.6	387	100.0	
70-79 years	3	1.0	104	33.9	130	42.3	70	22.8	307	100.0	
≥ 80 years	5	3.6	56	40.3	56	40.3	22	15.8	139	100.0	
Educational level*											p=0.131
Low	14	2.2	193	30.7	272	43.2	150	23.8	629	100.0	
Mid	1	0.6	64	39.5	64	39.5	33	20.4	162	100.0	
High	2	4.9	16	39.0	12	29.3	11	26.8	41	100.0	
Marital status*											p=0.040
Married	6	1.5	124	31.0	185	46.3	85	21.3	400	100.0	
Single/divorced	6	3.9	58	37.9	59	38.6	30	19.6	153	100.0	
Widowed	5	1.8	90	32.4	104	37.4	79	28.4	278	100.0	
Nº of children*											p<0.005
0	5	8.2	29	47.5	16	26.2	11	18.0	61	100.0	
1-2	4	2.1	60	31.4	77	40.3	50	26.2	191	100.0	
3-4	5	2.0	75	30.2	111	44.8	57	23.0	248	100.0	
≥5	3	0.9	109	32.7	144	43.2	77	23.1	333	100.0	
Disease*											p<0.001
Diabetes	1	2.8	11	30.6	18	50.0	6	16.7	36	100.0	
Hypertension	6	1.4	115	27.4	183	43.7	115	27.4	419	100.0	
Diabetes/ Hypertension	-	-	32	25.8	55	44.4	37	29.8	124	100.0	
Others	6	4.4	59	43.4	51	37.5	20	14.7	136	100.0	
None	4	3.4	55	47.4	40	34.5	17	14.7	116	100.0	
Physical activity*											p=0.397
Yes	2	1.0	72	34.3	93	44.3	43	20.5	210	100.0	
No	14	2.3	194	32.2	249	41.3	146	24.2	603	100.0	
Smoking*											p<0.001
Yes	8	11.1	37	50.7	21	28.8	7	9.6	73	100.0	
No	9	1.2	232	30.9	324	43.1	187	24.9	752	100.0	

* Difference in the number of total individual is due to missing data.

carried out in Brazil were women had a higher proportion of excessive BMI than men²⁶ and the mean BMI was also significantly lower for males than females^{12,13,15}. According to the literature this association might occur due to the fact that men have more lean mass in comparison to women while the latter have a greater tendency to accumulate fat⁹.

In analyzing the relationship between age and body fat distribution, studies have shown that overweight and obesity increases with age until about 70 years of age and then decline⁵ and the reduction in lean mass together with weight loss

that occurs with aging has also been pointed out as a reason for the decrease in BMI¹¹. In addition, according to some authors⁹ the selective survival of health elderly could play an important role in this relation, thereby accounting for the lower prevalence of obesity among the very old people. Barreto et al.¹³ found a significant decrease in the mean BMI with age but in relation to obesity this decrease was only statistically significant among women. Like other surveys^{12,27} in the present study the results showed a significant association between BMI and age (p=0.047). From Table 1 it can be seen a liner trend in which

Table 2. Distribution of WC according to the socio-economic status (SES), presence of disease, smoking and physical activity.

	Increased		Substantially increased		Normal		Total		p-value
	N	%	N	%	N	%	N	%	
Total group	217	26.1	421	50.7	193	23.2	831	100.0	
Sex*									p=0.000
Male	80	29.6	69	25.6	121	44.8	270	100.0	
Female	137	24.4	352	62.7	72	12.8	561	100.0	
Age*									p=0.803
60-69 years	107	27.7	187	48.4	92	23.8	386	100.0	
70-79 years	75	24.4	163	53.1	69	22.5	307	100.0	
≥ 80 years	35	25.4	71	51.4	32	23.2	138	100.0	
Educational level*									p=0,013
Low	148	23.6	339	54.1	140	22.3	627	100.0	
Mid	53	32.7	67	41.4	42	25.9	162	100.0	
High	15	36.6	15	36.6	11	26.8	41	100.0	
Marital status*									p=0.001
Married	112	28.1	180	45.2	106	26.6	398	100.0	
Single/divorced	40	26.1	72	47.1	41	26.8	153	100.0	
Widowed	64	23.0	168	60.4	46	16.5	278	100.0	
Nº of children*									p=0.220
0	16	26.2	23	37.7	22	36.1	61	100.0	
1-2	55	28.8	95	49.7	41	21.5	191	100.0	
3-4	65	26.4	125	50.8	56	22.8	246	100.0	
≥5	81	24.3	178	53.5	74	22.2	333	100.0	
Disease*									p=0.000
Diabetes	6	2.8	21	5.0	9	4.7	36	4.3	
Hypertension	105	48.6	238	56.5	74	38.5	417	50.3	
Diabetes/Hypertension	31	14.4	70	16.6	22	11.5	123	14.8	
Others	38	17.6	58	13.8	41	21.4	137	16.5	
None	36	16.7	34	8.1	46	24.0	116	14.0	
Total group	216	100.0	421	100.0	192	100.0	829	100.0	
Physical activity*									p=0,03
Yes	65	31.0	90	42.9	55	26.1	210	100.0	
No	148	24.6	321	53.4	132	22.0	601	100.0	
Smoking*									p=0.000
Yes	20	27.4	16	21.9	37	50.7	73	100.0	
No	193	25.7	402	53.6	155	20.7	750	100.0	

*Difference in the number of total individual is due to missing data.

obesity decreases within the age groups and the lower prevalence is observed among those with 80 years or older. With regard to the overweight, it can be seen a slightly increase from 60-69 year of age to 70-79 years and then it decreases again. The same was not true in relation to the WC ($p>0,05$), but it is noteworthy that the oldest people had the highest prevalence of increased and substantially increased WC.

Studies have demonstrated significant correlations between SES and health indicators^{3,28}. WHO¹⁴ reported that the distribution of BMI varies significantly according to the stage of de-

velopment reached by societies, and there is a trend of decrease in the number of people with low BMI and an increase in the overweight and obesity, according to the improvement of socio-economic conditions. Kamadjeu et al.²⁹ found that the likelihood of overweight or obesity was about 2 and 3.5 fold for adult people with 7-14 years and >14 years of education, respectively, corroborating the findings from Barreto et al.¹³ who observed that obesity was more common among subjects with higher educational levels. Different from those findings Bowie et al.³ reported that educational level was inversely asso-

ciated with the risk of being overweight or obese for all Mexican American investigated with ≥ 15 years of age. Furthermore, Sulander & Uutela¹⁰ found that, among elderly people, those with lower educational level had a higher risk of obesity confirming the results of other surveys carried out with older people^{27,30}. In the present study, it was observed a significant association between educational level and WC, subjects with higher educational level had the lowest prevalence of increased abdominal adiposity. This relation may be justified by the fact that high educated people might be more aware about the risks related to an increased abdominal adiposity and they also might be more worried about their appearance which is also related to culture concerns and social behaviors, but further studies is needed for better understating of this relation. With regard to BMI, the present findings showed no difference between BMI and the educational level.

In this study it was observed, a high prevalence of both hypertension and diabetes mellitus among non-institutionalized elderly and these diseases were significant associated with BMI and WC, thereby supporting the results described previously by other authors³¹. Zindah *et al.*³² found that obesity was significantly associated with diabetes, high blood pressure and high cholesterol. According to these authors, compared with adults of normal weight, obese adults had OR of 3.27 (95% CI, 1.58–6.76) for diabetes and OR of 3.69 (95% CI, 2.13–6.39) for high blood pressure. Grievink *et al.*²⁴ found that WC was strongest associated with a higher prevalence of hypertension and diabetes mellitus. This tendency was verified in this study in which most (56.5%) of the subjects with a substantially increased WC were hypertensive. Moreover, obesity was also higher among those with hypertension (Table 1) highlighting the increased risk for multiple health problems such as the ones related to cardiovascular diseases.

Both the development of obesity and the increased risk of chronic diseases are related with physical inactivity and sedentary behaviors^{3,14,32,33}. Martýnez *et al.*³⁴ observed that a low participation in sport activities and a lack of interest in being involved in physical activity were all significant predictors of obesity. Our results are consistent with this concept, but only the abdominal adiposity was found to be related to physical activity with the majority of the physical inactive elderly showing a substantially increased WC. In relation to physical activities, it is important to mention that there are different method-

ologies applied to measure this variable with makes it difficult to establish valid comparisons between studies.

Finally, it was found a significant association between cigarette smoking and the prevalence of overweight and obesity. It was observed that the prevalence was higher among nonsmokers corroborating the findings from already published data which found that smoking is negatively associated to obesity^{11,34,35}. Bovet *et al.*¹⁸ found that overweight and obesity were directly associated with past smoking and inversely with current smoking. According to the literature^{34, 35}, smokers tend to be thinner than they would otherwise because it reduces appetite and stimulate the body's metabolic rate¹¹.

There are many ways of measuring the overweight and obesity, though most of them require the use of high technology and expensive instruments making the development of epidemiological surveys a difficulty strategy, particularly when it comes to assessing the nutritional status in developing countries where financial resources for researches are still scarce. Thus, the BMI and WC measurement remains a useful, simple, noninvasive and low cost toll^{36,37}. The results from this study are in agreement with the existing evidence, indicating that overweight and obesity are associated to a number of SES and behavioral variables. However, it is important to highlight the fact that that this study was limited by its cross-sectional design, which lacks sufficient power to establish a cause-effect relationship, thereby demonstrating the need to carry out longitudinal studies.

Based on the observations described herein it was concluded that the prevalence of overweight and obesity was high among elderly and it was associated with the socioeconomic status, presence of diabetes and/or hypertension and also with cigarette smoking. In a view of this, it is important to point out that obesity should be tackled as a major public health problem, highlighting the need for more researches, particularly in developing countries, in order provide new approaches in the direction of health promotion, including health eating and physical activities, not only for the elderly population but for all ages groups to give them a chance of a healthy aging, because the health status of our today's elderly is as a reflex of the care received throughout life. Furthermore, it is worthwhile to mention that the well being of this fast growing segment of the population also represents a political e economical issue and should not be overlooked.

Collaboration

FB Andrade, AF Caldas Junior, PM Kitoko worked on the elaboration of the research project, data collection and analysis and on the conception and writing of this paper. TB Andrade worked on the data collection and on the conception and writing of this paper. JEM Batista worked on the data analysis/interpretation and on the conception of this paper.

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