FREE THEMED ARTICLES

DOI: 10.12957/demetra.2015.15949

Anthropometric assessment of elderly patients receiving nutritional assistance at a reference healthcare center of the Universidade Federal Fluminense, Niterói-RJ, Brazil

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Abstract

Objective: To describe the body and anthropometric composition of the elderly assisted in the Nutrition Clinic of the Reference Healthcare Center for the Elderly, *Universidade Federal Fluminense*, Niteroi city, Brazil. *Methodology*: This is a cross-sectional study with 52 subjects aged 60 years or older treated at the nutrition clinic. Anthropometric measurements were performed according to the guidelines of the International Society for the Advancement of Kineanthropometry considering the following variables: body weight, height, biceps, triceps, subscapular, supra-iliac skinfold thicknesses, body fat percentage based on the sum of the four skinfolds, waist circumference and arm circumference. Statistical analyzes were performed using Graph Pad Instat® software, version 3.1, considering p <0.05 as significant value. *Results*: There was prevalence of overweight (43.5% of the sample), adequacy of the arm circumference, arm muscle circumference and triceps skinfold. Most women (67.6%) had high risk for cardiovascular disease according to waist circumference. There was high percentage of body fat in both sexes (89.2% and 66.7% in female and male, respectively). *Conclusion*: We observed the presence of inadequacies of the nutritional status of the population under study according to anthropometric parameters - body mass index, waist circumference, and percent of body fat based on the skinfold sum.

Key words: Aging. Anthropometry. Nutrition Assessment. Nutritional Status. Chronic Disease

Introduction

Aging is a universal process that characterizes a life stage permeated by social, psychic, environmental and biological changes that are part of normal and integral human development.[1] Among the Brazilian senior population, aging is a recent phenomenon and is closely linked to an improved quality of life, the trend of decrease in the population growth, better control of health disorders, and an intense urbanization of this age group.[2] In the city of Niterói, there are 83,536 elderly people, 51,024 females and 32,512 males, according to the data of the Brazilian Institute of Geography and Statistics (IBGE).[3]

According to Panziera et al.,[4] with aging occur physiological changes that affect the nutritional status and contributes for senior citizens being the most malnourished group.

The nutritional assessment of the elderly population should include detailed anamnesis of the physiological changes presented by the individual. Such assessment consists of various methods and techniques, among them anthropometry. This method allows assessing alterations in the body compartments caused by aging, such as height and free fat mass decrease, and a change in the redistribution of the body fat, occurring an increase of the central adipose tissue and a reduction of the peripheral adipose tissue.[5]

By using the nutritional data of elderly patients served by healthcare services or general population data, it is possible to outline the profile of the target population. The anthropometric profile of a population can be a warning factor for the decision making by healthcare authorities, public organs, as well as care institutions with a focus on the elderly, as well as the Reference Center for Healthcare of the Elderly (CRASI) in Niteroi, RJ, aiming to create medium- and long-term programs and preventive actions to minimize the typical trends and determinant factors of this age.[6]

This study aims to describe the anthropometrics and the body composition of elderly patients assisted by the CRASI's nutrition care services at the Federal Fluminense University (UFF) in Niterói, RJ.

Methodology

Sampling

Cross-sectional study with data collected from July to September 2013. Fifty-two elderly subjects aged 60 years or over, of both sexes, served by the nutrition clinical services of CRASI/UFF, were assessed. Exclusion criteria included the patients without physical conditions for a nutritional assessment.

After being informed on the methodology, risks and objectives of the work, the patients or the responsible persons signed the Free and Informed Consent Form.

The project of the study was submitted to the Research Ethics Committee of the School of Medicine of the Federal Fluminense University, and was approved under number 0084.0.258.000-0713343513.2.0000.5243, in 2013, for being in accordance with the Resolution nº. 466/2012 of the National Health Council.

Anthropometric assessment

The anthropometric measurements were performed according to the guidelines of the International Society for the Advancement of Kineanthropometry (ISAK).[7] The following anthropometric variables were determined: body mass, height, biceps, triceps, subscapular and supra-iliac skinfold thicknesses, percentage of body fat based on the sum of the four skinfolds, waist circumference and arm circumference. Trained personnel performed triplicate measurements, and the result consisted of the arithmetic mean of the measures.

The body mass was obtained using a Filizola® digital scale, with capacity of 150 kilograms (kg) and 100-gram (g) precision; height in meters (m), using a vertical stadiometer attached to the scale; the skinfold thickness was measured in triplicate at the right side of the individual, using a Cescorf® scientific adipometer with 1-millimeter (mm) precision, and the circumferences were measured with a Cescorf® 1-mm precision anthropometric tape.

The body mass index (BMI) was calculated by dividing the body weight (Kg) by the squared height (m). BMI (kg/m^2) was classified according to the cutoff points proposed by the World Health Organization (WHO).[8] The abdominal circumference (AbC) was classified according to the cutoff points established for the population, according to Alberti et al.[9]

Total estimated body fat was calculated by the bi-compartmental model, using the sum of the triceps, biceps, supra-iliac and subscapular skinfold thicknesses, in millimeters.[10] The result of the sum of thicknesses was used to estimate the percentage of the total body fat for the women and men according to age.[11]

Statistical analysis

The statistical analyses were conducted using the Graph Pad inStat® software, version 3.1. The arithmetic mean was used with its respective standard deviation (SD) to describe the continuous variables, and the absolute frequency (N) and percentage (%) for the categorical variables. To evaluate the association between sexes and the anthropometric variables, the Fisher's exact test was used, considering $p < 0.05$ as significant level.

Results

Fifty-two elderly individuals were interviewed and only 11.5% (n=6) were excluded from the sample, because they did not had physical conditions for a nutritional assessment. The sample consisted of 46 individuals, 80.4% (n=37) women 19.6% (n=9) men. The age ranged from 60-90 years, and the mean age ± standard deviation was 75.25±6.426, being 75.33±6.632 for women and 74.89±5.667 for men.

The percentage distribution of the elderlies in relation to the nutritional state, according to the BMI cutoff points for the age, as recommended by WHO,[8] is represented in Table 1. It was found prevalence of overweight (27.48±1.284 Kg/m^2), representing 43.5% (n=20) of the total sample. According to the statistical analysis, there was no significant difference between the sexes regarding overweight (p=1.0000). Among the women, the percentage of overweight was 43.2% (n=16) of the total sample, a mean of 27.58±1.212 Kg/m^2. Among the men, the percent overweight was 44.4% (n=4), mean of 27.05±1.689 Kg/m^2.

Table 1. Percentage distribution of elderly individuals according to gender, and mean ± standard deviation, according to the nutritional status based on the BMI (Kg/m^2) for adults, as recommended by WHO (1997). Niterói-RJ, 2013.

Nutritional Status	Total		Women		Men	
	%(N)	Mean ± SD	%(N)	Mean ± SD	%(N)	Mean ± SD
Underweight	6.5 (3)	17.12±1.020	5.4 (2)	17.40±1.280	11.1 (1)	16.58±0.000
Normal weight	26.1 (12)	22.74±1.394	29.7 (11)	22.82±1.437	11.1 (1)	21.93±0.000
Overweight	43.5 (20)	27.48±1.284	43.2 (16)	27.58±1.212	44.4 (4)	27.05±1.689
Obesity Grade I	17.4 (8)	33.01±1.313	13.6 (5)	33.46±1.175	33.3 (3)	32.41±1.466
Obesity Grade II	4.3 (2)	37.01±1.322	5.4 (2)	37.01±1.322	-	-
Obesity Grade III	2.2 (1)	40.58±0.000	2.7 (1)	40.58±0.000	-	

Source: WHO (1997).

With respect to the abdominal circumference, as shown in Table 2, we can highlight the prevalence of high risk for cardiovascular diseases among the female population, representing 67.6% (n=25), with mean value of 98.16±7.601. On the other hand, most of the men (n=5), corresponding to 55.6%, did not present risk (91.25±1.768). There was no statistical significance between the women and men who showed moderate risk (p=0.0090) and between the women and men who presented high risk (p=0.0115).

Table 2. Percentage distribution of the sample, divided by gender, results of abdominal circumference shown as mean ± standard deviation and reference risk values for cardiovascular diseases, according to the American Heart Association (2009). Niterói-RJ, 2013.

Risk for cardiovascular diseases	Women		Men	
	N (%)	Mean ± SD	N (%)	Mean ± SD
Normal Women: < 80 Men: < 94	3 (8.1)	69.67±6.807	5 (55.6)	91.25±1.768
Moderate risk Women: 80 – 88 Men: 94 – 102	9 (24.3)	83.83±1.837	-	-
High risk Women: > 88 Men: > 102	25 (67.6)	98.16±7.601	4 (44.4)	110.00±0.000

Source: American Heart Association (2009).

Regarding somatic protein store, based on the arm circumference (AC), it was found that, according to the percentage of adequacy, the women (n=37) were eutrophic, i.e., normal (96.21±16.790), as well as men (n=9), with mean percentage of adequacy of 96.21±16.790. The percentage of adequacy of the arm muscle circumference (AMC) among the women (102.30±18.110) and men (100.30±17.820) was within the normal parameters. With respect to the triceps skinfold thickness (TSFT), a marker of fat stores, both sexes were eutrophic, according to the percentage of adequacy (94.34±32.620 and 105.10±41.680 for the women and men, respectively). Table 3 shows the values and percentages of adequacy for AC, TSFT and AMC.

Table 3. Arm circumference, triceps skinfold thickness and arm muscle circumference expressed in mean ± standard deviation and respective percentage of adequacy per sex, according to the Blackburn & Thornton's classification (1979). Niterói-RJ, 2013.

	Total	Women	Men
	Mean ± SD	Mean ± SD	Mean ± SD
AC (cm)	29.28±5.030	29.35±5.152	29.00±4.770
Percentage of Adequacy	95.05±6.020	96.21±16.790	90.26±15.910
Classification	Eutrophic	Eutrophic	Eutrophic
TSFT (mm)	18.73±7.487	20.21±7.352	12.83±4.783
Percentage of Adequacy	96.50±34.370	94.34±32.620	105.10±41.680
Classification	Eutrophic	Eutrophic	Eutrophic
AMC (mm)	24.97±3.947	23.54±4.150	23.83±4.107
Percentage of Adequacy	91.95±14.600	102.30±18.110	100.30±17.820
Classification	Eutrophic	Eutrophic	Eutrophic

AC = Arm circumference. TSFT = Triceps skinfold thickness. AMC = Arm muscle circumference.

Table 4 shows the percentage distribution of AC, TSFT and AMC, according to the Blackburn & Thornton's classification.[12] Most of the elderly individuals were eutrophic and there was no significant difference between eutrophic and non-eutrophic women and men for the AC (p=0.4817), TSFT (p= 0.4069) and AMC (p=0.1573) variables.

Table 4. Percentage distribution of arm circumference, triceps skinfold thickness and arm muscle circumference, according to the Blackburn &Thornton's classification (1979). Niterói-RJ, 2013.

Classification	Women			Men		
	AC N (%)	TSFT N (%)	AMC N (%)	AC N (%)	TSFT N (%)	AMC N (%)
Obesity (> 120)	3 (8.1)	7 (18.9)	4 (10.8)	-	5 (55.6)	-
Overweight (120 – 110)	3 (8.1)	3 (8.1)	5 (13.5)	1 (11.1)	-	2 (22.2)
Normal weight (110 – 90)	21 (56.8)	11 (29.7)	22 (59.5)	4 (44.4)	1 (11.1)	3 (33.3)
Mild malnutrition (90 – 80)	6 (16.2)	2 (5.4)	5 (13.5)	2 (22.2)	-	3 (33.3)
Moderate malnutrition (80 – 70)	1 (2.7)	6 (16.2)	1 (2.7)	1 (11.1)	-	-
Severe malnutrition (< 70)	3 (8.1)	8 (21.6)	-	1 (11.1)	3 (33.3)	1 (11.1)

The percentage distribution of total body fat was higher among women (38.18±4.498; n=34) compared to men (27.98±3.585; n=6); however, both sexes are at risk of diseases associated with obesity, as described in Table 5. There was no significant statistical difference between women and men at risk of obesity-related diseases (p=0.0997). Estimation of the body fat percentage was not possible for 23.1% (n=12) of the total sampled elderly individuals, because the required measurements, according to methods described, could not be obtained.

Table 5. Percentage distribution of body fat expressed in mean ± standard deviation by sex, according to the Lohman's classification (1992). Niterói-RJ, 2013.

Percentage of body fat	Women		Men	
	Mean ± SD		Mean ± SD	
	38.18±4.498		27.98±3.585	
	N	%	N	%
Risk of malnutrition-related diseases	-	-	-	-
Below average	2	5.4	-	-
Average	-	-	-	-
Above average	2	5.4	3	33.3
Risk of obesity-related diseases	33	89.2	6	66.7

Discussion

This study describes the anthropometric profile of a sample of senior individuals assisted by the Nutrition Clinic of CRASI/UFF, in the city of Niterói-RJ, where the number of women was higher than men, comparable to the literature.[13-15] This is due to the different mortality rate between the sexes, higher among men, a fact that has lasted for many years in Brazil.[16,17]

The highest percentage of women is due, among other causes, to a less exposure to risk factors, such as smoking and drinking, and the difference in attitude between men and women with regard to the control and treatment of diseases, once women use more often the healthcare services.[18]

The age range in this study was high, and the highest age was 90 years. This is relevant, because the elderly who reach ages that are more advanced will often present a decrease of functional reserves, which increases vulnerability to many diseases and, consequently, a higher risk of death.[16]

Based on the BMI, the population under study showed prevalence of inadequacy of the nutritional status, especially overweight, as also found by Cintra et al.[19] and Ribeiro et al.[15] When grouped by gender, the women's BMI values are lower than those of men, which does not corroborate other studies on senior populations, once the men's weight peaks around the age of 65 years, and then declines, while in women weight peaks around 75 years.[14]

A lower percentage of the elderly individuals showed low weight, comparable to the national standard, which indicates that the prevalence of weight loss affects 4.1% of the women and 5.3% of men over 65 years, according to a nationwide survey.[19,20]

In more recent data, low weight was found in a small percentage of the elderly population. Therefore, the prevalence of overweight or underweight among the investigated population is according to the standard.[19] This result should be emphasized once it corroborates data of literature, which, despite the different classification criteria used in the studies, point to a nutritional depletion in the elderly population.[21]

The classification of the nutritional status of older people based on the BMI has been largely discussed in numerous studies and is controversial regarding the values used. [22] Considering the changes in the body composition with aging and the evidences available until now, according to Silveira et al.,[23] using the same BMI cutoff points to grade obesity in older people does not seem appropriate. However, WHO suggests the adoption of the same cutoff points used for adults, which are based on the US population.[24] In addition, this criterion was utilized in national inquiries, such as the National Survey on Health and Nutrition and the Household Budget Survey.[23]

Regarding the indicator of intra-abdominal fat, waist circumference, the results found in this study show a high percentage of moderate risk and high risk for cardiovascular diseases and metabolic disorders, for both sexes (67.4%), especially among the women, as also observed in the study by Ferreira et al.[25] Also in the study conducted by Cintra et al.[19] and Reis Filho et al.,[26] the waist circumference values of the elderly individuals who were assessed indicated a high rate of people with out-of-standard measures. National studies associating the abdominal circumference with chronic diseases among older people are recent.[20]

One of the hypotheses for the increase of the abdominal circumference, especially among women, would be some behavioral changes that are typical of this population, such as a decrease in physical activity and intake of unbalanced diets, which also contribute to an inadequate anthropometric profile.[27] This finding can be related to the tendency of higher abdominal fat among the older individuals. Therefore, the elderly's abdominal fat must be examined carefully, once the fat redistribution can mask malnutrition diagnosis, with an increase of thoracic-abdominal fat deposits and reduced subcutaneous fat on the arms and legs. Moreover, among older people, AC and BMI may have inverse associations with mortality.[20]

With regard to the arm circumference compared to the percentage of adequacy in both sexes, the prevalence was of eutrophic subjects (54.3%), similar to the results in the studies conducted by Cabreira et al.,[28] who found that 47% of the elderly population examined were eutrophic.

The results of this study corroborate current studies but differ from the literature regarding the elderly's nutritional status. The literature reports that with aging there is a decrease of lean mass and increase of body fat, and among the elderly subjects under study such change was not observed, prevailing the eutrophic state for such parameter.[28]

Regarding TSFT, the elderly individuals of both sexes were eutrophic; women, however, showed higher values (20.21±7.352) when compared to men (12.83±4.783), without a statistically significant difference. The TSFT values are in agreement with the information available on literature, which indicate a higher fat deposit in women, when compared to men.[14]

Studies show that men tend to have more deposits of lean mass than women: however, in the present study, both sexes showed similar AMC results (23.83±4.107 and 23.54±4.150 for male and females, respectively) and there was not significant statistical difference in the comparison of sexes and the percentage of adequacy (p=0.1573).[14]

Assessment of the elderly's body composition is vital, because changes in the body fat distribution can be associated with metabolic and cardiovascular disorders.[29]

According to Moreira et al.,[27] the sum of skinfold thicknesses is considered an excellent indicator of subcutaneous fat, because it was validated previously for the Brazilian population. The results of this study indicate more subcutaneous fat accumulation in women than in men, as found by Reis Filho and peers[26] and in other studies conducted in Brazil and worldwide.[29]

Conclusion

Based on the present study, conclusion is that there is an incidence of inadequacies of the nutritional status of the elderly population served by the Nutrition Clinic of the Reference Center for Healthcare of the Elderly (CRASI) at the Federal Fluminense University (UFF), Niterói-RJ, which indicated overweight, according to BMI, and increased abdominal fat, which indicate a higher susceptibility of this population to chronic diseases, influencing the increase of mortality rates.

The results of this study suggest special attention to the importance of intervening nutritionally in the habits of this population, so that dietary strategies may be defined to diminish the high anthropometric values and collaborate to a reduction of risks of diseases associated with inadequacies of the nutritional status.

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Received: April 04, 2015
Reviewed: April 10, 2015
Approved: Aprril 30, 2015