Nutrición Hospitalaria

Nutr Hosp. 2015;31(1):363-370
ISSN 0212-1611 • CODEN NUHOEQ
S.V.R. 318

Original/*Ancianos*

Nutritional status, muscle mass and strength of elderly in Southern Brazil

Maria Helena Klee Oehlschlaeger[1,2], Carla Alberici Pastore[1,3], Adriana Schüler Cavalli[2,4] and Maria Cristina Gonzalez[1]

[1]Post-Graduation Program on Health and Behavior – Catholic University of Pelotas. [2]Physical Education College – Federal University of Pelotas. [3]Nutrition College – Federal University of Pelotas. [4]Post-Graduation Program on Physical Education – Federal University of Pelotas. Brazil.

Abstract

Aims: **to assess and compare nutritional status and functional capacity of elderly goers of groups for guided physical activity or for guided recreational activities.**

Methods: **Cross-sectional study with 210 elderly (60 years old or more) of coexistence groups (for physical or recreational activities). Nutritional status was assessed by the Mini Nutritional Assessment and Body Mass Index. Muscle mass was estimated by calf circumference (cut point of 31cm for both genders) and strength was evaluated by hydraulic dynamometer, which measures the opponent's finger maximal strength. The study was approved by Research Ethics Committee.**

Results: **Were enrolled 106 elderly in recreational group and 104 in physical activity group. Most of the sample (86.7%) were female. The mean age was 69.3 years old. Body Mass Index showed 82.9% of seniors with excessive weight (87.7% in recreational and 77.9% in physical activity group, p=0.04). When assessed by Mini Nutritional Assessment, 22.9% was classified as malnourished or at risk of malnutrition, with no difference between groups. The mean calf circumference was 37.3 ± 4.1 cm, decreasing significantly with aging (p=0.05) and being higher in elderly with higher BMI (p=0.001). Calf circumference was also greater in physical activity group. Muscle strength's mean was 6.77 (IQR: 5.83, 7.90) kg, with significantly higher values among men. There was no significant variation between age, nutritional status or between groups.**

Conclusions: **This study presented as its main findings that most seniors showed no nutritional risk, with high prevalence of overweight. The practice of physical activities was associated with greater CP and greater functionality of the opposing finger muscles, which indicates the importance of maintaining physical activity in the aging process, in order to prevent frailty and disability.**

(*Nutr Hosp*. 2015;31:363-370)

DOI:10.3305/nh.2015.31.1.7264

Key Words: *Aging. Physical capacity. Frailty. Calf circumference. Dynamometry.*

Correspondence: Carla Alberici Pastore.
Rua Taquari, 617, Laranjal. CEP: 96090-770, Pelotas - RS - Brazil.
E-mail: pastorecarla@yahoo.com.br

Recibido: 8-I-2014.
1.ª Revisión: 5-III-2014.
Aceptado: 16-IX-2014.

ESTADIO NUTRICIONAL, MASA MUSCULAR Y FUERZA DE ANCIANOS EN EL SUR DE BRASIL

Resumen

Objetivos: **evaluar y comparar el estado nutricional y la capacidad funcional de ancianos frecuentadores de grupos de actividad física o de actividad recreacional.**

Métodos: **estudio transversal con 210 ancianos (edad igual o superior a 60 años) de grupos de convivencia (de actividad física o recreacional). El estado nutricional fue evaluado por la Mini Evaluación Nutricional y por el Índice de Masa Corporal. La masa muscular fue estimada por la circunferencia de la pantorrilla (punto de corte 31cm para ambos géneros) y la fuerza fue evaluada por dinamómetro hidráulico, que mide la fuerza máxima de pinza de la mano. Este proyecto fue aprobado por Comité Ético de Investigación.**

Resultados: **Participaron 106 ancianos del grupo recreacional y 104 del grupo de actividad física. La mayoría eran mujeres (86.7%). La edad promedio fue 69.3 años. El Índice de Masa Corporal presentó 82.9% de los ancianos con peso excesivo (87.7% en el grupo recreacional y 77.9% en el grupo actividad física, p=0.04). Cuando evaluado por la Mini Evaluación Nutricional, 22.9% de los ancianos presentaron desnutrición o riesgo para desnutrir. La circunferencia de la pantorrilla fue de 37.3 ±4.1cm, decreciente con el envejecimiento (p=0.05) y siendo mayor en ancianos con IMC más alto (p=0.001). La pantorrilla también fue mayor en el grupo de actividad física. La fuerza muscular tuvo promedio de 6.77Kg, con valores significantemente mayores entre los hombres. No hubo diferencias significativas entre distintas edades, estado nutricional o entre los grupos.**

Conclusiones: **este estudio tiene como principales contribuciones que la mayoría de los ancianos que frecuentan grupos de convivencia no presentaron riesgo nutricional, con alta prevalencia de exceso de peso. La práctica física fue asociada con mayor masa muscular y funcionalidad, lo que indica la importancia de mantener la práctica física en el proceso de envejecimiento para prevenir fragilidad y disfunción.**

(*Nutr Hosp*. 2015;31:363-370)

DOI:10.3305/nh.2015.31.1.7264

Palabras Clave: *Envejecimiento. Capacidad física. Fragilidad. Circunferencia de la pantorrilla. Dinamometria.*

Abbreviations

BMI: Body Mass Index.
CC: Calf Circumference.
GSOT: Grip Strength of the Opposable Thumb.
IQR: Inter Quartile Range .
MNA: Mini Nutritional Assessment.
PAG: Physical Activity Group.
RG: Recreational Group.
WHO: World Health Organization.

Introduction

Currently many discussions focus on the implications of global aging on public health. Demographics show that the world's population aged 60 or older will triple in 50 years, from 600 million in 2000 to over two billion by 2050, with two-thirds of seniors currently living in the developed world[1]. This global aging will have a major impact on the health system due to increased morbidity and increased need for hospitalization and / or institutionalization of individuals, as age advances[2].

Good health is essential for older people to remain independent and to continue to participate actively in the life of family and community. Health promotion is the guarantee of preventing or delaying the onset of chronic diseases such as cardiovascular diseases, cancer and diabetes[2].

The relationship between physical activity, health and aging has been increasingly discussed and studied in scientific circles. During the aging process, body changes occur, among which the decrease in lean body mass with loss in muscle strength, affecting the functional capacity[3, 4].

Several instruments have been developed to assess nutritional status in the elderly, including the Mini Nutritional Assessment (MNA). This is a validated instrument and considered the golden standard for this population for being practical, non-invasive, with simple measurements and quick questions[5-7]

The Body Mass Index (BMI) is also an indicator of nutritional status often used due to the ease of its application, the existence of reference patterns that allow comparisons between populations, it not being invasive and also not an expensive process[8]. However, there are constraints to their use in the elderly, as it fails to identify the exchange that takes place between body compartments (lean mass and fat) during the aging process.

Another widely used parameter, considered a very important anthropometric measurement of muscle mass in elderly, is the calf circumference (CC). The CC provides an estimate of protein reserve and can be used in nutritional assessment programs, assisting in the detection of risks to ensure appropriate interventions, improving the quality of life of elderly[9]. According to the World Health Organization, the CC provides the most sensitive measure of muscle mass in the elderly. Works interested in anthropometric measurements suggest the CC as an important measure for evaluating the loss of muscle mass. This measure would indicate changes in lean mass that occur with age and the decrease in physical activity[5, 10, 11].

Currently, another simple method that has been used to monitor the nutritional status is the handgrip dynamometry, which can be taken by different equipment. The tools that feature the highest coefficient of validity and reliability are used to measure handgrip strength and the clamping forces of the opposing thumb, respectively. Handgrip dynamometry is widely used for a specific measure of hand strength[12]. The assessment of hand function and, specifically, of clamping forces, allows us to identify seniors who may be unable to perform simple activities of daily living and provides us important information to measure the effectiveness of treatment[13, 14]. This evaluation provides us simple information, such as force levels and their relationship to healthy or not populations, of different genders and different age groups. It also identifies the manual function deterioration that occurs as a result of the normal aging and diseases often found in older people, such as osteoporosis, osteoarthritis and rheumatoid arthritis[12]. The Pinch Gauge (finger hydraulic dynamometer) is a tool to assess the grip strength of the opposable thumb (GSOT), and was chosen for this study because there are few references on its use and it presents itself as more user-friendly for the elderly, as these can often be affected by diseases that impair hand mobility.

Therefore, this study aims to assess the nutritional status and functional capacity of elderly seen in groups of coexistence. In this context, this work aims to compare elderly groups who meet to practice guided physical activity with those who gather for guided recreational activities.

Methods

Population and sample

We conducted a cross-sectional study with a convenience sample consisting of 210 elderly (60 years or more, according to the Ministry of Health of Brazil) linked to coexistence groups in the city of Pelotas, RS, Brazil. Of this total, 104 individuals attending a group whose goal was the practice of regular, supervised physical activities, according to WHO recommendations (Physical Activity Group - PAG), and 106 attended a group that met for social and recreational activities (Recreational Group - RG).

Instruments and data collection

The elderly were invited to participate in the study after being properly informed about their goals and

procedures, and those who agreed to participate signed a consent form. Subjects were then weighed (Tanita™ electronic scale HS301) and measured (Cardiomed WCS™ portable stadiometer) according to standard techniques, barefoot and wearing light clothing.

Then seniors answered a standardized and pre-coded questionnaire with questions regarding gender, age and education. For socioeconomic status, we used the questionnaire of the Brazilian Association of Research Companies, which uses information about education of household head and ownership of certain goods, such as television, refrigerator, radio and automobile, and the presence of domestic workers at home. From the scores achieved, individuals are classified into classes A (wealthiest), B, C, or E (less favored).

Nutritional status was assessed using the Mini Nutritional Assessment tool (MNA)[7]. The MNA assesses food intake, recent weight loss, mobility, and recent history of psychological stress or acute disease, as well as the existence of neurological problems. It also features the Body Mass Index (BMI = weight [kg] divided by height [m] ^{2}) or, in its absence, the calf circumference (CC). Through scores generated based on questions, the MNA classifies individuals as with "normal nutritional status", "at risk of malnutrition" or "undernourished".

Still in order to classify nutritional status, we used the BMI that classifies individuals into categories: malnutrition (BMI <18.5 kg / m^2), normal weight (BMI 18.5 to 24.9 kg / m^2), overweight (BMI 25 0 and 29.9 Kg / m^2) or obese (BMI ≥ 30 kg / m^2)[15].

In order to evaluate the muscular mass, we used the CC obtained at the point of greatest circumference of the leg. We considered 31 cm to be the universal cut-off point for CC in the elderly as the lower limit of adequate muscle mass for both genders[7].

The GSOT was tested through the hydraulic finger dynamometer (Pinch Gauge™), which quantitatively measures the opponent's finger maximal isometric muscle strength in kilograms, the average value of three successive measurements of the dominant hand being used as a final result.

Ethical Aspects

The Statement of Free and Informed Consent from all study participants was obtained. The research project was approved by the Research Ethics Committee of the Catholic University of Pelotas (Number 172 514).

Data Processing and Statistical Analysis

The data was processed with double entry and consistency analysis with the Epi Info 6.04d™ software. Statistical analyzes were performed using Stata™ 11.1 software. For comparison of prevalences it was used the chi-square test. In order to comparison of averages we used Student t test and for the comparison of medians, when data showed non-parametric distribution, the Mann-Whitney and Kruskal-Wallis tests were applied. It was considered the level of significance of 5% for all tests.

Results

The sample consisted of 210 seniors, 106 of the RG and 104 of the PAG. Most seniors were female (86.7%) and the average age was 69.3 ± 5.9 years old, with a minimum of 60 and maximum of 89.4 years. The elderly in the RG presented considerable higher age than those in the PAG (70.5 ± 6.4 versus 68.2 ± 5.1, respectively, p = 0.02). While in the PAG only 28% had age over 70 years, 47% of RG were 70 years or older. Over half of the sample belonged to socioeconomic class "C" and most had schooling up to complete primary education (Table I).

Regarding nutritional status assessed by BMI, 82.9% of seniors had with excessive weight (overweight and obesity), with a higher prevalence in the elderly from RG (87.7% versus 77.9% in the PAG, p = 0.04). However, when assessed by MNA, 22.9% of the sample was classified as malnourished or at risk of malnutrition, with no difference between groups (Table I).

In Table II, we present the concordance between nutritional diagnosis made by the BMI and the MNA. The only senior who had a BMI <18.5 kg/m^2 was classified by the MNA as at nutritional risk. However, 17.1% of elderly people with normal BMI were identified by MNA as at nutritional risk. Among seniors with a BMI above 25 kg/m^2, 23.6% were identified as at risk or malnourished by the MNA.

The CC presented an average value of 37.3 ± 4.1 cm, in the overall sample. The CC decreases significantly with age (p = 0.05) and was significantly higher in elderly patients with higher BMI (p = 0.001), as can be seen in Table III. The CC was also different between RG and PAG, being greater in the latter group (36.5 ± 3.9 and 38.2 ± 4.1 cm, respectively, p = 0.002). No significant differences were found between genders in CC and nutritional status as assessed by MNA.

Only six individuals (2.9% of total) showed a decrease in muscle mass (CC <31 cm), five in RG and one in PAG (p = 0.2). There was no significant association between lower muscle mass and sex (CC <31cm: 3.6% among men and 2.8% among women, p = 0.6). There was also no association between lower muscle mass and age of the elderly in decades (p = 0.3). A significant association (p = 0.03) between the decrease in muscle mass and BMI was found: the elderly with BMI <18.5 kg/m^2, as would be expected, showed CC <31 cm, but 2.9% of the elderly who are overweight

Table I
Sample's description of elderly goers of Recreational and Physical activities groups in Pelotas/RS/Brazil, 2013

Characteristics	*General Sample (n= 210)*	*Recreational Group (n= 106)*	*Physical Activity Group (n= 104)*	*p valuea*
Age				0.01[b]
60 - 69 years old	131 (62.4%)	56 (52.8%)	75 (72.1%)	
70 - 79 years old	67 (31.9%)	41 (38.7%)	26 (25.0%)	
80 - 89 years old	12 (5.7%)	9 (8.5%)	3 (2.9%)	
Gender				0.6
Male	28 (13.3%)	14 (13.2%)	14 (13.5%)	
Female	182 (86.7%)	92 (86.8%)	90 (86.5%)	
Economic Situation				0.001[b]
A	2 (0.9%)	0 (0.0%)	2 (1.9%)	
B	81 (38.6%)	30 (27.4%)	52 (50.0%)	
C	109 (51.9%)	67 (63.2%)	42 (40.4%)	
D	18 (8.6%)	10 (9.4%)	8 (7.7%)	
Schooling				0.2
Illiterate	26 (12.4%)	15 (14.1%)	11 (10.6%)	
Incomplete basic education	60 (28.6%)	33 (31.1%)	27 (25.9%)	
Basic Education	60 (28.6%)	34 (32.1%)	26 (25.0%)	
High School	41 (19.5%)	16 (15.1%)	25 (24.1%)	
Higher Education	23 (10.9%)	8 (7.6%)	15 (14.4%)	
BMI				0.1[b]
Under nutrition	1 (0.5%)	1 (1.0%)	0 (0.0%)	
Eutrophic	35 (16.7%)	12 (11.3%)	23 (22.1%)	
Overweight	85 (40.5%)	44 (41.5%)	41 (39.4%)	
Obesity	89 (42.4%)	49 (46.2%)	40 (38.5%)	
MNA				0.8[b]
Malnutrition	5 (2.4%)	3 (2.8%)	2 (1.9%)	
Risk for malnutrition	43 (20.5%)	23 (21.7%)	20 (19.2%)	
Normal nutritional status	162 (77.1%)	80 (75.5%)	82 (78.9%)	
Total	**210 (100%)**	**106 (100%)**	**104 (100%)**	

[a]χ^2 test; [b]Fisher's Exact test,

Table II
Agreement of nutritional diagnosis by Body Mass Index (BMI) and Mini Nutritional Assessment (MNA) in 210 elderly subjects

BMI	*MNA*		
	Malnutrition n (%)	*Nutritional Risk n (%)*	*Normal n (%)*
< 18.5 kg/m^2	0	1 (100)	0
18.5 a 24.9 kg/m^2	0	6 (17.1)	29 (82.9)
≥ 25 kg/m^2	5 (2.9)	36 (20.7)	133 (76.4)

also had CC <31 cm. Regarding nutritional status as assessed by the MNA, a linear trend between lower muscle mass and malnourishment has been found. We observed CC <31 cm in only 1.9% of normal elderly by MNA in contrast to the 20% observed in those classified as malnourished (p = 0.03).

To check whether the type of activity would be significantly determinant of CC, even after adjusting for the possibly confounding remaining variables (age and BMI), a multivariate analysis (linear regression) was performed. The results can be seen in Figure 1: the increase of age and BMI <18.5 kg/m^2 significantly

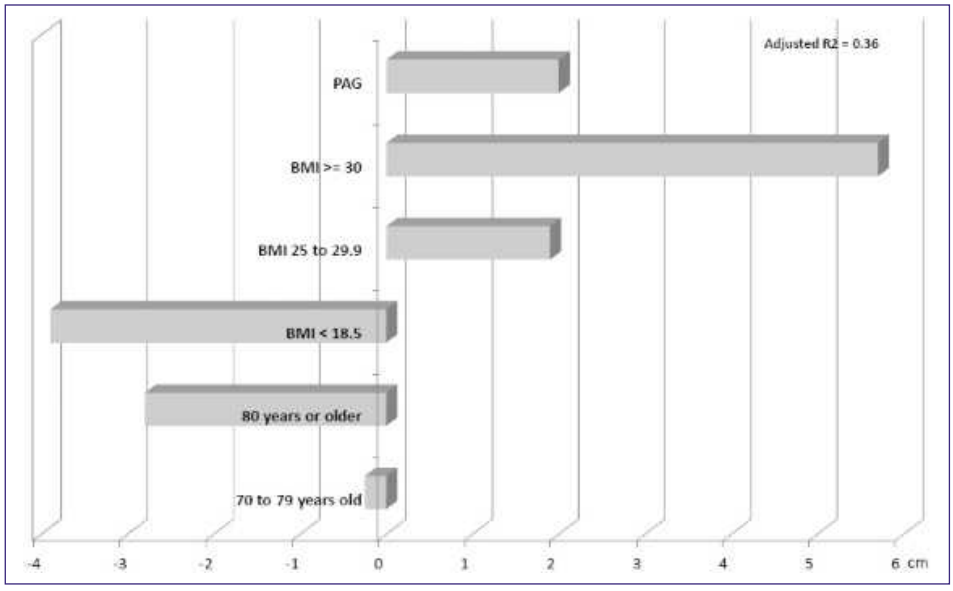

Fig. 1.—Type of activity and calf circumference (multivariate analysys – linear regression).

decrease the CC whereas a BMI greater than 25 kg/m^2 significantly increases the CC. The elderly from the PAG had the highest CC 2.0 cm, compared with the RG, even after controlling for age and BMI.

Muscle strength of the overall sample, measured by GSOT reached an average of 6.77 kg (IQR: 5.83, 7.90), with significantly higher values among men (Table III). There was no significant variation between

Table III
Calf Circumference (CC) and pinch strength distribution among sample's characteristics.

Characteristics	*N*	*CC (cm) Mean*	*p value*	*Pinch (kg) Median (IQR)*	*p value*
Gender					
Female	182	37.3 ± 4.2	0.9[a]	6.5 (5.7;7.6)	<0.001[d]
Male	28	37.4 ± 3.1		9.8 (8.4;11.1)	
Age			0.05[b]		0.9[c]
60 – 69 years old	131	37.6 ± 4.0		6.8 (5.8;8.1)	
70 – 79 years old	67	37.3 ± 3.9		6.7 (5.8;7.8)	
80 years old or more	12	34.6 ± 5.1		6.6 (6.1;7.7)	
BMI			0.001[c]		0.1[c]
< 18.5 kg/m^2	1	29.5		10.7	
18.5 a 24.9 kg/m^2	35	34.5 (33;36)		6.3 (5.7;7.2)	
≥ 25 kg/m^2	174	37.5 (35.5;40)		6.9 (5.8;8.1)	
MNA			0.7[b]		0.3[c]
Malnutrition	5	36 (34;40)		5.8 (5.6;7.0)	
Nutritional Risk	43	37 (35;41.5)		6.5 (5.7;8.2)	
Well nourished	162	37 (34.5;40)		6.9 (5.9;7.9)	
Group			0.002[a]		0.5[d]
Physical Activity	104	38.2 ± 4.1		6.8 (6.0;8.2)	
Recreational Activity	106	36.5 ± 3.9		6.7 (5.8;7.8)	

[a] T test; [b] ANOVA; [c] Kruskal-Wallis test; [d] Mann-Whitney test.

Table IV
Pinch strength distribution among sample's characteristics between gender

Characteristic	*N*	*Female*	*p value*	*n*	*Male*	*p value*
Age			0.8[a]			0.4[a]
60 – 69 years old	113	6.7 (5.7;7.7)		18	10.0 (7.8;11.3)	
70 – 79 years old	59	6.4 (5.7;7.3)		8	10.4 (9.4;11.0)	
80 years old or more	10	6.5 (5.9;7.0)		2	8.2 (7.7;8.8)	
BMI			0.06[a]			0.8[a]
< 18.5 kg/m^2	0	---		1	10.7	
18.5 – 24.9 kg/m^2	30	6.2 (5.7;6.8)		5	11.0 (8.2;11.2)	
≥ 25 kg/m^2	152	6.7 (5.8;7.7)		22	9.5 (8.7;11.0)	
MNA			0.5[a]			0.3[a]
Malnutrition	5	5.8 (5.6;7.0)		0	---	
Nutritional Risk	39	6.3 (5.7;7.6)		24	10.7 (10.1;11.1)	
Well nourished	138	6.6 (5.8;7.6)		4	9.4 (8.0;11.1)	
Group			0.6[b]			0.04[b]
Physical Activity	90	6.5 (5.9;7.4)		14	10.8 (9.3;11.6)	
Recreational Activity	92	6.5 (5.7;7.6)		14	8.8 (7.7;10.6)	

[a]Kruskal-Wallis test; [b]Mann-Whitney test.

age groups, nutritional status classified by the MNA or the BMI, or between groups of elderly people in PAG and RG.

As a significant difference between the values of GSOT between men and women was found, associations between the values of GSOT and remaining variables (age, BMI, nutritional status and activity group) were tested according to gender (Table IV). There was a tendency that women with higher BMI showed higher values GSOT (p = 0.06). Among men, those in the PAG presented more strength than those in the RG. No other associations with the remaining variables were found.

Discussion

The present study aimed to evaluate the nutritional status, the reservation of lean mass and muscle strength in elderly belonging to different groups of activities.

Studies subjects showed high prevalence of overweight (83%), according to BMI (BMI ≥ 25 kg/m^2). In RG, 87.7% were overweight while 78% in PAG. Other studies conducted in elderly in Brazil found lower prevalences of overweight, as Campos et al (2006) found 43.6% of overweight among 1519 elderly studied in the Northeast and Southeast regions of the country[16]. Barbosa et al (2007), in São Paulo (southeastern Brazil), found 40.5% of women and 21.6% of men with BMI greater than or equal to 28 kg/m^2 [17]. In Viçosa, MG, also in the country's southeast, Gonçalves et al (2012) found 50.5% of overweight among seniors who were regulars in a city program for the third age[18]. Fares et al (2012), in a comparative study amidst seniors in Bahia (Northeast) and Santa Catarina (southern Brazil), found a higher prevalence of overweight in individuals who lived in the southern region (52.8% versus 28 2%), yet lower than in this study[19]. In a study from Leite-Cavalcanti et al (2009) conducted in Joao Pessoa, PB (north east), 100% of the elderly were overweight, and 53.9% of them obese[20]. This study, however, got a sample of seniors who sought treatment in an outpatient health care facility, which may have biased their sample. The south of Brazil, especially Rio Grande do Sul, has a high prevalence of obesity in the general population when compared to other regions/states[21], which may have contributed to the findings of this study.

In studies conducted in other countries, the prevalence of overweight among elderly range from 64.5% in Turkey[22], through 62.3% in Mexico[23] and 29 6% in Havana, Cuba[24].

When the nutritional status of the elderly was assessed by MNA, the present study found only one malnourished individual and 20% at risk of malnourishment. Findings by Kucukerdonmez et al (2005), studying seniors in Turkey, pointed to much higher prevalences (7.8% malnourished and 76% at nutritional risk)[22]. Similarly, a study conducted in Spain found a high prevalence of malnourishment (12.5%) and risk of malnutrition (57%); it should be emphasized that the average age of this sample is more than 10 years

higher than the one in the present study (80.7 versus 69.3 years, respectively) and that the increase of age is implicated in worsening of the nutritional status [25]. On the other hand, Tsai et al (2010), in a study conducted with elderly people in Taiwan, has found prevalences more similar to those of the present study (0.7% of malnutrition and 16.6% risk of malnourishment)[26].

It is worth emphasizing that among the seniors classified by BMI as overweight, over 20% were considered at nutritional risk according to the MNA, since this specific tool for use in the elderly conducts a comprehensive evaluation of the health of the aged and the conditions that may impact their food habits. Thus, the MNA is able to anticipate negative changes in nutritional status, classifying the risk of malnourishment. BMI, in its turn, is limited to assessing the immediate anthropometric conditions of individuals[7].

The CC, assessed as a reserve of appendicular skeletal muscle mass among elderly[27], reached an average of 37.3 cm in the present sample, decreasing significantly with age. And proportionally increasing BMI. We observed also that, in the present study, the PAG showed higher average of CC than RG, identifying physical activity as an important factor in maintaining the reserve of lean mass among elderly. The difference remained even after a logistic regression controlling for age and BMI, which means that physical activity may have been an important factor in the preservation of muscle mass in the PAG group.

Using the cutoff point suggested by the literature, less than 3% of the sample had less than 31 cm CC, also with no difference between gender and age. Similar results were found in a study conducted in Spain with more than 22,000 seniors of both genders, in which 16.6% of men and 23.5% of women had CC lower than 31cm, this being associated with lower BMI, higher scores on the MNA and higher prevalence of malnourishment[28]. It is worth mentioning that this Spanish had a study sample with an average age higher than the one in the present study (75.2 years). Tsai et al (2013), while evaluating seniors in Taiwan, found 2.8% with CC less than desirable, quite similar result to the one in this study. Still as a similarity with the present study, 56% of the Taiwanese sample practiced physical activities three or more times per week, with a minimum of 30 minutes moderate to intense exercise. The authors, however, used cutoff points different from the ones in this study, fit for the Taiwanese population (<28cm for men and <25 cm for women)[29]. We observed that the sample showed seniors who are overweight according to the BMI, which showed reduced CC, suggesting that the combination of two simple methods can trace sarcopenic obesity, a condition with important prognostic implications involved in the pathogenesis of frailty in seniors[30].

The study indicated that GSOT seems to decrease with increasing age, in agreement with the study by Rahman et al, which considers ordinary the hand's loss of functionality with senescence[31]. Men had higher strength than women in all age groups except over 80 years old, in agreement with Jansen et al, stating that the difference decreases with advancing age because men lose strength more abruptly than women[13]. Su et al (1995) found that in a sample of seniors in Taiwan the strength of the handgrip decreased with age and, furthermore, has demonstrated that the decline was deeper after 70 years, in accordance with this study[32].

There was no significant difference in GSOT between PAG and RG. There may have been a confounding aspect, because among the recreational activities performed by RG there was an activity with handling of percussion instruments, which may have contributed positively with the tropism of hand muscles.

Men were significantly stronger than women, with women showing values of 6.47 kg and men showing 9.83 kg . Other studies have found similar results, such as the one by Gunther (2008), who obtained similar findings in a sample of 769 adults aged 20 to 95 years, where the strength was also lower in women, 6.6 kg in the right hand and 6.1 kg in the left hand and right and 10.4 kg in the right hand and 9.7 kg in the left hand for men[33]. Hanten et al (1999) demonstrated that age can affect men and women differently. In a cross-sectional study of 1182 volunteers aged 20 to 64 years there has been a decline in grip strength for men starting from 55 years for men and 60 years for women[34].

The present study provides important information about the nutritional and functional status of healthy and non-institutionalized elderly. However, it presents some limitations regarding the size and sample selection (sample of convenience).

Conclusions

This study presented as its main findings that most seniors showed no nutritional risk, with high prevalence of overweight. The practice of physical activities was associated with greater CP and greater functionality of the opposing finger muscles, which indicates the importance of maintaining physical activity in the aging process, in order to prevent frailty and disability.

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