133 - ASSOCIATION BETWEEN ADIPOSITY AND AGE IN ELDERLY WOMEN

SERGIO GREGORIO DA SILVA, MARESSA PRISCILA KRAUSE,
COSME FRANKLIN BUZZACHERA, TATIANE HALLAGE.
Projeto Terceira Idade Independente Universidade Federal do Paraná
Curitiba, Paraná, Brazil.
sergiogregorio@ufpr.br

INTRODUCTION

The Body Mass Index (BMI) is considered one of the main indicators of body fatness adopted in epidemiological studies (PRENTICE and JEBB, 2001). Due to its simplicity to perform and low cost, the BMI has been an important tool among public health professionals, including becoming a fundamental item in the obesity classification system proposed by World Health Organization (WHO, 1998).

The utilization of BMI among older people has been questioned (PRENTICE and JEBB, 2001; ROSSNER, 2001). The human aging process is associated with various morphological changes, including a progressive increase in the ratio between fat and lean body mass, in addition to decreased height and body fluids (SHEPHARD, 1997; FORBES, 1999; HUGHES et al., 2004). These transitory processes in the body composition are verified even in individuals who maintain a constant value of BMI for many years (PRENTICE and JEBB, 2001).

Furthermore, the BMI may not adequately detect modifications in the distribution of body fat with aging. A progressive increase is observed on the amount of body fat in abdominal region (ROSSNER, 1991; HUGHES et al., 2004), contributing thus for the elevated risk of metabolic dysfunctions, such as diabetes type II, hypertension and coronary heart disease, primarily in postmenopausal women (KULLER et al., 1994). Hence, the utilization of other indicators of body fatness associated with BMI has been recommended, such as waist-to-hip ratio (WHR), waist circumference (WC) and hip circumference (HC) (RAJA et al, 2004).

The classification systems used to define excess of body weight among elderly people can demonstrate irregularities, because the cutoff points of BMI were inespecific for age (HEIAT et al., 2001).). Actually, the main classification system adopted in epidemiological studies is that proposed for World Health Organization (WHO, 1998), which ignores the age distinction in adults (ZAMBONI et al., 2005). Thus, the simple utilization of cutoff points for BMI as a marker of body adiposity in elderly people could not precisely diagnose the true impact of changes in body composition in this population. The adoption of other indicators of body fatness associated with BMI could be considered a more effective procedure to assess the elderly population in clinical settings.

Therefore, the purpose of this study was (a) to investigate the changes on indicators of body fatness in older women with aging and (b) to analyze the relationship between BMI and WC cutoff points as established by international institutions.

METHODS

Study Population

The present study was conducted between March and September of 2005, in the city of Curitiba Parana Brazil, being part of the Projeto Terceira Idade Independente Centro de Pesquisa em Exercício e Esporte Universidade Federal do Paraná. The subjects of this study are elderly people that participate in leisure activity groups in the city of Curitiba. Within the existent groups, participants were randomly selected from the data obtained by many institutions that promote leisure activities for the elders in the city of Curitiba, Paraná.

Sample

Participated of this study 902 female subjects, non institutionalized, all with age above 60 years old. For the data analyses, the sample was divided in five groups: AG 1 (6064 years; n = 286), AG 2 (6569 years; n = 293), AG 3 (7074 years; n = 206), AG 4 (7579 years; n = 120) and AG 5 (> years, n= 52).

After detailed clarifying about the purposes of this investigation, the procedures utilized, the benefits and possible risks, the subjects signed the consent term, defining this participation as voluntary. The study protocol was approved by the Committee of Ethics from the Biological Sciences Department of the Universidade Federal do Paraná, according to the norms established in the Resolution 196/96 of National Health Council about researches involving humans.

Procedures

With the objective to avoid the influence of circadian variations, all the assessments were done in the same period of the day, between 08:00 and 10:00 hours. Furthermore, the participants were instructed not to ingest any food two hours before the tests, as well as to avoid the any vigorous physical activity in the previous day of the tests. All assessments were realized on the Exercise Physiology Laboratory of the Centro de Pesquisa em Exercício e Esporte Universidade Federal do Paraná.

Anthropometric Variables

The anthropometric variables, Body Mass (BM, kg) and Height (H, cm), were obtained according to the procedures proposed by LOHMAN et al. (1988), using a digital scale TOLEDO, model 2096 PP (precision of 0,1 kg), while the height was obtained using a wall-mounted estadiometer SANNY, model STANDARD (precision of 0,1 cm). Body Mass Index (BMI, kg/m^2) was calculated as body weight (kg) divided by height (m) squared. According to the cutoff points of BMI established by World Health Organization (WHO, 1998), where values inferior to 18.5 kg/m^2 meant underweight, and between 18.5 kg/m^2 and 24.9 kg/m^2 normal, and superior to 24.9 kg/m^2 classified as overweight.

The measurement of waist circumference (WC) and hip circumference (HC) were determined according to procedures proposed by LOHMAN et al (1991). As the instrument of measurement it was used the non-stretchable anthropometric tape With the purpose of avoiding the variations inter-examiners, all the measures were obtained by a single trained examiner. According to the values proposed by the World Health Organization (WHO, 1998) for WC, the values inferior of 88 cm indicated normality for adult women. The Waist-to-Hip Ratio (WHR) was expressed as WC /HC.

Statistical Analyses

For the determination of the descriptive values, central tendency measures were applied (mean and standard deviation). The ANOVA one-way was used to verify the differences among investigated groups, and to identify the localization of these differences, it was utilized the *Tukey Post Hoc.*

The analysis of the present study was performed using *Statistical Package for the Social Sciences* (SPSS, version 13.0) *for Windows*.

RESULTS

The anthropometric characteristics of Body Mass (BM), Height (H), Body Mass Index (BMI), Waist-to-Hip Ratio (WHR), Waist Circumference (WC) and Hip Circumference (HC) of the participants are shown in Table 1. The mean values of all anthropometric variables decreased with aging. The ANOVA indicated that BM diminished between the two first age groups when compared to the last group. The H reduced from the first age group in relation to the last two groups.

Table 1. Anthropometric characteristics of the participants (n = 957), divided in five age groups.

	60 – 64 (n=286)	**65 – 69** (n=293)	**70 – 74** (n=206)	**75 – 79** (n=120)	**> 80** (n=52)
BM (kg)	70,1 ± 13,1	69,1 ± 12,3	67,4 ± 11,3	66,7 ± 11,3	63,5 ± 12,2[ab]
H (cm)	155,9 ± 6,2	154,9 ± 6,8	154,7 ± 5,5	153,9 ± 5,4[a]	152,4 ± 5,7[a]
BMI (kg/m^2)	28,8 ± 4,9	28,8 ± 4,8	28,1 ± 4,5	28,1 ± 4,6	27,2 ± 4,4
WHR	0,85 ± 0,06	0,86 ± 0,07	0,86 ± 0,06	0,86 ± 0,06	0,80 ± 0,06
WC (cm)	87,1 ± 10,8	87,0 ± 10,8	86,9 ± 10,0	86,9 ± 10,0	85,6 ± 10,8
HC (cm)	101,3 ± 9,5	101,1 ± 9,7	100,6 ± 9,5	100,9 ± 8,9	99,2 ± 9,5

The Position Stand of American College of Sport Medicine (ACSM, 2003) presents the classification system for risk factors for all-causes disease based in both BMI and WC. Thus, it was possible to analyze the percentage of the sample (Table 2).

Table 2. Relative values of incidence of risk for disease for all causes based in BMI and WC (n = 952), divided in five age groups.

	60 – 64 (n=286)	**65 – 69** (n=292)	**70 – 74** (n=206)	**75 – 79** (n=119)	**> 80** (n=52)
Normal	17,1%	23,3%	22,8%	24,4%	28,8%
Augmented	38,8%	27,7%	33,0%	27,7%	34,6%
High	16,4%	19,9%	15,5%	21,0%	13,4%
Very High	24,4%	28,0%	27,2%	25,2%	23,1%
Extremely High	3,1%	2,1%	1,5%	1,7%	0,0%

The elevated incidences of risk for disease were verified in the classification augmented and very high, in all age groups, exception on group > 80 years. The older women, above 80 years, showed more elevated values in normality when compared to others age groups. The group pertaining to classification extremely high decreased with aging, practically unexisting in latter age group.

DISCUSSION

The human aging process has been associated with a set of morphological modifications, including the reduction in body mass and height (SHEPHARD, 1997; HUGHES et al., 2004). According to the results showed in the table 1, this study confirmed those affirmations, due to alterations observed in BM and H with aging. The changes in H has been linked to compression of intervertebral disks, increase in the spine curvatures, and diminished plantar arch (SHEPHARD, 1997), while the changes in BM are primarily due to reductions in lean body mass (PRENTICE and JEBB, 2001).

The classification system for excess of body weight proposed by the World Health Organization (WHO, 1998) for adults with age above 18 years old, shows that the values superior to 25.0 kg/m^2 denote the overweight condition. According to table 1, in all age groups, the mean values of BMI were superior to that desired by the WHO to indicate normality. This fact demonstrate the need for practice of public politics which object the maintenance of normality status, and consequently, the prevention and/or attenuation of negative effects of these undesired condition of excess of body weight in elderly people.

Changes in distribution of body fat have been observed with aging, with a tendency of elevated accumulation on abdominal region in women, primarily in postmenopausal phase (KULLER et al, 1994). According to lack of accuracy of BMI to detect the modifications in these distributions of body fat with the aging, the utilization of others indicators of body fatness associated with BMI has been proposed. As stated by the American College of Sports and Medicine (ACSM, 2003), the utilization of WC, is recognized as an important indicator of abdominal fat, associated with BMI that has been utilized for prediction of risk factors for all-causes disease in adults. The table 2 demonstrated that the major part of elderly women was classified normal with 17,1-28,8%; augmented 27,7- 38,8%; high 13,4-21%; very high 23,1-28% and extremely high 0.0-3,1%.

The large part of this elderly women population, above of 50%, independently of age, has been classified as elevated risks factors for all-causes disease. This indicates that the quality of life of this population is negatively affected, due to the fact that people with acquired diseases present increased level of disability, elevating the susceptibility for dependency in daily life activities (FRIES, 1980).

CONCLUSIONS

The results of the present study demonstrated alterations only on body mass and height with aging. Furthermore, independently of age, the association among indicators of body fatness, BMI and WC, to classify the risk factors for all-causes disease revealed elevated incidence in the augmented and in the very high categories. It is advised that programs of public health should have the purpose to interfere in these morphological modifications in elderly women.

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Maressa P. Krause F.:41. 3360-4331 Coordenadora do Projeto Terceira Idade Independente
Endereço: Rua José Rodrigues Pinheiro, 949 - Capão Raso 81.130-200 - Curitiba, Paraná, Brasil.

ASSOCIATION BETWEEN ADIPOSITY AND AGE IN ELDERLY WOMEN

Abstract

The human aging process is associated with a number of morphological and structural modifications. The increase on the amount and abdominal concentration of body fatness as a consequence of the aging is linked to many metabolic diseases, which can affect the elderly quality of life (KULLER et al., 1994). According to that, the utilization of body fatness indicators that can precisely detect the morphological alterations become indispensable in the clinical field. However, entities like the World Health Organization indicates the utilization of simple body fatness indicators, but with easy applicability and low operational cost like the Body Mass Index (BMI) and Waist Circumference (WC) (WHO, 1998), as being also considered all-cause disease predictors (ACSM, 2003). The objective of the present study was (a) to investigate the changes on indicators of body fatness in older women with aging and (b) to analyze the relationship between BMI and WC cutoff points established by international institutions concerning its influence on risk factors. The anthropometric variables, body mass, height, body mass index, waist circumference and waist to hip ratio were obtained according to the procedures proposed by LOHMAN et al. (1988). The classification of risk factors for disease based in both BMI and WC following the classification proposed by the ACSM (2003). The results showed percentage alterations only for body mass 9.5% and height 2.3%, from the first age group to the last. The risk variability for disease in the normal classification was 17.1-28.8%; for the augmented classification was 27.738.8%, for high was 13.421.0%; for very high was 23.128.0% and for the extremely high classification was 0.0-3.1%. In conclusion, public health programs that can interfere with those morphological modification that occur in elderly women are advised

ÉTUDE DES ALTÉRATIONS DANS LES INDICATEURS D´ADIPOSITÉ CORPORELLE DANS DES FEMMES ÂGÉES NON-INSTITUTIONNALISÉES

RÉSUMÉ

Le processus de vieillissement humain est associé à un ensemble de modifications morphologiques et structurelles. L´élévation de la quantité et la régionalisation abdominal de la graisse corporelle est lié aux innombrables maladies métaboliques, qui peuvent affecter la qualité de vie du sujet âgé.(KULLER et al., 1994). De cette manière, l´utilisation d´indicateurs d´adiposité corporelle qui puisse détecter avec précision les altérations morphologiques est indispensable dans le moyen clinique. Néanmoins, entités comme l´Organisation Mondiale de la Santé indiquent l´utilisation d´ indicateurs d´adiposité corporelle simple, mais de facile application et la basse coût opérationnel - comme l´Indice de Masse Corporelle (IMC) et la Circonférence de la taille (CC) (WHO, 1998), en étant de même considéré prédits de maladies par toutes les causes (ACSM,2003). Donc, l´objectif du présent étude ce a été (a)enquêter les modifications dans des indicateurs d´adiposité corporelle dans des femmes âgées avec l´avance de l´âge et (b)analyser la relation entre les indicateurs IMC et CC comme les points de coupe établis par des institutions internacionales. Les variables anthropométriques masse corporelle, stature, IMC, circonférence de la taille e de hanche, et raison taille-hanche, ce ont été évaluées, comme normalisation proposée par LOHMAN et al. (1988). Le classement de risque pour maladies par toutes les causes en utilisant les indicateurs IMC et CC associés ont suivi le classement proposée par l´ACMS(2003). Les résultats du présent étude ont démontré des altérations de pourcentages seulement dans la masse corporelle 9,5%, et dans la stature 2,3%, de la première bande étaire pour la dernière.La variabilité du risque pour maladies dans le classement normal ce a été de 17,1-28,5%; classement augmentée 27,7-38,8%; classement haut 13,4-21,0%, classement très haut. 23,1-28,0% et extrêmement haut. 0,0-3,1%. De cette manière, s´il conseille des programmes de santé publique qui peuvent intervenir dans ces modifications morphologiques dans des femmes âgées.

Mots-clés: vieillissement , adiposité corporelle , risque pour maladies chroniques.

ESTUDIO DE LAS ALTERACIONES EN LOS INCIDADORES DE ADIPOSIDAD CORPORAL EN MUJERES ANCIANAS NON-INSTITUCIONALIZADAS

Resumen

El proceso de envejecimiento humano está asociado a un cunjunto de modificaciones morfológicas y estructurales. La elevación en la cantidad y regionalización abdominal de la grasa corporal en decurso al avance de la edad está vinculada a las innumerables enfermedades metabólicas, donde pueden afectar la calidad de vida del sujeto anciano (KULLER et al., 1994). De esa manera, la utilización de los indicadores de adiposidad corporal que podrán detectar con precisión las alteraciones morfológicas tornándose indispensable en el medio clínico. Sin embargo, las entidades como la Organización Mundial de la Salud indican la utilización de indicadores de adiposidad corporal simple, pero de fácil aplicación y bajos costo operacional como el Índice de Masa Corporal (IMC) y la Circunferéncia de Cintura (CC) (WHO, 1998), siendo incluso considerados los predictores de enfermedades por todas las causas (ACMS, 2003). Portanto, el objetivo del presente estudio fue (a) investigar los indicadores de adiposidad corporal en mujeres ancianas con el decurso de la edad y (b) analisar la relación entre los indicadores IMC y CC conforme los puntos de corte establecidos por instituiciones internacionais. Las variables antropométricas masa corporal, estatura, IMC, circunferéncia de cintura y cuadril, y la razón cintura-cuadril fueron evaluadas conforme la padronización proposta por LOHMAN et al. (1988). La clasificación de riesgoo para las enfermedades

por todas las causas utilizando los indicadores IMC y CC asociados siguen la clasificación propuesta pelo ACMS (2003). Los resultados del presente estudio demuestran alteraciones percentuales solamente en la masa corporal 9,5% y en la estatura 2,3%, en la primera tira etaria para la última. La variabilidad de riesgo para las enfermedades en la clasificación normal fue de 17,1-28,8%; clasificación aumentado 27,7-38,8%, clasifición alto 13,4-21,0%, clasificación muy alto 23,1-28,0% y extremamente alto 0,0-3,1%. Desa manera, se aconseja programas de salud estatal que podrán interferir en estas modificaciones morfológicas em mujeres ancianas.

Palabras-clave: envejecimiento, adiposidad corporal, riesgo paral las enfermedades crónicas.

ESTUDO DAS ALTERAÇÕES NOS INDICADORES DE ADIPOSIDADE CORPORAL EM MULHERES IDOSAS NÃO-INSTITUCIONALIZADAS

Resumo

O processo de envelhecimento humano está associado a um conjunto de modificações morfológicas e estruturais. A elevação na quantidade e regionalização abdominal da gordura corporal decorrente do avanço da idade está ligada a inúmeras doenças metabólicas, as quais podem afetar a qualidade de vida do sujeito idoso (KULLER et al., 1994). Dessa maneira, a utilização de indicadores de adiposidade corporal que possam detectar com precisão as alterações morfológicas torna-se indispensável no meio clínico. Entretanto, entidades como a Organização Mundial da Saúde indicam a utilização de indicadores de adiposidade corporal simples, porém de fácil aplicação e o baixo custo operacional - como o Índice de Massa Corporal (IMC) e a Circunferência de Cintura (CC) (WHO, 1998), sendo inclusive considerados preditores de doenças por todas as causas (ACSM, 2003). Portanto, o objetivo do presente estudo foi (a) investigar as alterações em indicadores de adiposidade corporal em mulheres idosas com o avanço da idade e (b) analisar a relação entre os indicadores IMC e CC conforme os pontos de corte estabelecidos por instituições internacionais. As variáveis antropométricas massa corporal, estatura, IMC, circunferência de cintura e quadril, e razão cintura-quadril foram avaliadas, conforme padronização proposta por LOHMAN et al. (1988). A classificação de risco para doenças por todas as causas utilizando os indicadores IMC e CC associados seguiram a classificação proposta pelo ACSM (2003). Os resultados do presente estudo demonstraram alterações percentuais somente na massa corporal 9,5%, e na estatura 2,3%, da primeira faixa etária para a última. A variabilidade do risco para doenças na classificação normal foi de 17,128,8%; classificação aumentado 27,738,8%; classificação alto 13,421,0%; classificação muito alto 23,128,0% e extremamente alto 0,03,1%. Dessa maneira, aconselha-se programas de saúde pública que possam interferir nessas modificações morfológicas em mulheres idosas.

Palavras-chave: envelhecimento, adiposidade corporal, risco para doenças crônicas.