130 - PERCENTAGE OF BODY FAT AND NUTRITIONAL STATUS: A STUDY OF PEOPLE IN VALE DO SINOS, SOUTHERN BRAZIL.

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INTRODUCTION

Nutritional status, which is closely associated with body weight, is often used to estimate current body energy reserves in a population. Body fat is also calculated for similar purposes. For men and women, energy reserves are determined according to different specific factors.

According to Duarte (2007), nutritional assessment is vitally important to detect fat as well as protein and calorie malnutrition. Fat, which can be determined using analytical methods, is classified as metabolically active mass or energy reserves. Calculations of surface area based on height, weight and skin folds may be used to estimate body composition in different age groups (OMCARDLE et al., 1996).

Adipose tissue is one of the major energy stores of the human body. According to Heyward and Stolarczyk (2000), studies about adipose tissue provide information to assess the risk associated with extremely high or extremely low total or intra-abdominal fat, the correlation with certain diseases, and the body changes according to age.

This study investigated the association of percentage body fat, calculated according to anthropometric measures, and nutritional status, according to body mass index, in a group of adults aged 20 to 80 years in Vale do Sinos, southern Brazil.

METHODS

This descriptive study enrolled a convenience sample of 1004 adults (323 men) aged 20 to 80 years living in the Vale do Sinos, southern Brazil. Participants were classified according to 5 age brackets: 20 to 29, 30 to 39, 40 to 49, 50 to 59, or older than 60 years of age. All participants signed an informed consent term, and data were collected from January 2005 to July 2007.

Body mass index (BMI) was used to assess nutritional status, and values were classified according to age and gender using the cut-off points recommended by the World Health Organization (WHO, 1998): BMI $\leq$ 18.4kg.m^{-2} = underweight; 18.5 to 24.9kg.m^{-2} = normal weight; 25.0 to 29.9kg.m^{-2} = overweight; and 30.0kg.m^{-2} = obesity. A balance beam scale (Welmy) was used to measure weight to the nearest 100 g, and a height rod (Welmy), to measure height to the nearest 0.1 cm.

To estimate percentage body fat (%BF), the method described by Jason and Pollock (1985) was used to measure seven skinfolds: subscapular, triceps, biceps, suprailiac, abdominal, thigh and leg. A skinfold caliper (Lange) was used to collect measures to the nearest 0.5 mm. The SPSS 15.0 software, ANOVA and the Tukey post-hoc test were used to analyze data, and the level of significance was set at p=0.01. Means and recommended values according to gender were compared using the Student *t* test at the same level of significance. **RESULTS AND**

DISCUSSION

Table 1 Sample distribution according to absolute and relative frequencies of gender and age (n=1004).

Age / Gender	20-29		30-39		40-49		50-59		e60		TOTAL
	n	%	n	%	n	%	n	%	n	%	n
Men	119	36.84	60	18.58	66	20.43	43	13.31	35	10.84	323
Women	179	26.29	129	18.94	151	22.17	124	18.21	98	14.39	681

Table 2 Distribution of relative differences between percentage body fat and nutritional status of study participants (n=536*).

Nutritional Status (I)	Nutritional Status (J)	%BF (I)	%BF (J)	(I - J)	p
Overweight (N=329)	Underweight	31.381	21.227	10.154	0.002**
	Normal		24.723	6.658	0.000**
	Obesity		39.165	-7.784	0.000**
Obesity (n=207)	Underweight	39.165	21.227	17.938	0.000**
	Normal		24.723	14.442	0.000**
	Overweight		31.381	7.784	0.000**

* "N" refers to data that were statistically different. (p=0.01).

Table 2 shows significant differences (p=0.01) in percentage body fat between all the nutritional statuses except "underweight" and "normal-weight", which suggests a pre-obesity status for men and women.

According to Wang et al. (2002), the prevalence of overweight and obesity has grown markedly in developed and developing countries in the last decades. Brazil is no exception as it follows this worldwide trend (WANG et. al., 2002; VEIGA et. al., 2004).

Table 3 Distribution of relative and absolute differences between percentage body fat according to age groups and percentage body fat recommended by the WHO for women (N=681).

Age group	Total (n)	total (%)	Overweight (n)	Overweight (%)	p
20 - 29	179	100	158	88.3	0.000**
30 - 39	129	100	118	91.5	0.000**
40 - 49	151	100	137	90.7	0.000**
50 - 59	124	100	105	84.7	0.000**
$\geq$ 60	98	100	92	93.9	0.000**

The analysis of women in the different age groups revealed significant differences between mean percentage body fat and referential percentages in all groups (WHO, 1998).

Table 4 Distribution of relative and absolute differences between percentage body fat according to age groups and percentage body fat recommended by the WHO for men (n=323).

Age group	total (n)	total (%)	Overweight (n)	Overweight (%)	p
20 - 29	119	100	56	47.1	0.825
30 - 39	60	100	42	70.0	0.000**
40 - 49	66	100	37	56.1	0.453
50 - 59	43	100	24	55.8	0.255
≥ 60	35	100	27	77.1	0.000**

The analysis of results in the group of men, however, showed significant differences only in the groups of participants aged 30 to 39 years or older than 60 years.

The current high prevalence of obesity seen in most countries, regardless of age or gender, may be responsible for several health problems. It may decrease functioning, increase susceptibility to other diseases, and trigger other health disorders.

The results of this study confirm these possibilities. We found that many of the study participants, both men and women, had pre-obesity characteristics.

Because of the growing numbers of overweight and obese people and of associated cardiovascular risk factors, interventions should focus on reducing body weight, particularly excessive body fat. Monteiro (2000) suggests that such interventions should prevent and control cardiovascular diseases in the population.

Rush et al. (1997) found that the prevalence of obesity may be assigned to environmental factors that, when interacting with genetic factors, may explain the accumulation of excessive body fat in large percentages of the world population.

Several techniques are used to determine body composition, and anthropometric measurements have been widely used for this purpose. These measurements have a low operational cost and are relatively simple, especially the calculation of body mass and height measurements (MONTEIRO, 1998).

Kamimura et al. (2003) suggested that body composition may be used to diagnose nutritional anomalies. Changes in body fat and lean mass indicate several metabolic disorders and detect health risks early on, when levels of body fat are high or low or when there is loss of muscle mass.

Although BMI does not directly measure percentage body fat and does not define its distribution, studies with large population samples found a high correlation between BMI and body fat and an increased risk of death associated with high BMI (WHO, 1998).

In addition, decreases in energy use, if not reversed or compensated for with reductions in calorie intake, may perpetuate this obesity epidemics and its consequences to health (MACDONALD et al., 2006).

CONCLUSION

Men and women have hormone differences that play an important role in body mass. Reference values do not mean that both genders should make efforts to achieve the body composition suggested by those models. They are useful as reference standards for statistical comparisons and data interpretation when analyzing studies with different groups, such as athletes, individuals taking part in physical training, and underweight or overweight people.

Regardless of gender or age, regular physical activity, either moderate or intense, produces measurable physiological improvement. It reduces obesity risks, which are constantly associated with the development of disorders and diseases, avoids high expenses with health, and, consequently, extends life expectancy.

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PERCENTAGE OF BODY FAT AND NUTRITIONAL STATUS: A STUDY OF PEOPLE IN VALE DO SINOS, SOUTHERN BRAZIL.

ABSTRACT

This study compared percentage body fat and nutritional status in a group of men and women 20 to 80 years of age living in Vale do Sinos, southern Brazil. This descriptive study enrolled a convenience sample of 1004 participants (323 men) divided into five age groups. Nutritional status was analyzed according to body mass index. Percentage body fat was measured using a skinfold caliper and the equations described by Jackson & Pollock and Williams. Other anthropometric measures were: total body mass and height, measured with a balance beam scale and a height rod. ANOVA and the Tukey test were used to analyze the differences between percentage body fat and nutritional status. The Student *t* test was used to compare actual and recommended means according to gender. The comparison of mean percentage body fat and nutritional status categories revealed statistical differences ($p<0.05$), which suggested that participants had pre-obesity characteristics. A significant difference ($p<0.05$) was found in the analysis of mean percentage body fat in all nutritional categories in the group of women, which indicated that percentage body fat in the group of women was above recommended normal values. Women in the “underweight” and “normal-weight” categories did not show any significant differences in percentage body fat, but a significant difference was found for men 30 to 39 years and over 60 years of age. These results are more concerning for women because of their greater prevalence of percentage body fat, but this type of fat distribution is associated with metabolic disorders and cardiovascular diseases in both men and women.

Key words: Human metabolism. Percentage body fat. Nutritional status.

POURCENTAGE DE GRAISSE ET ETAT NUTRITIONNEL : ETUDE MENEE AVEC DES INDIVIDUS DE LA REGION VALE DO SINOS, RIO GRANDE DO SUL, BRÉSIL.

RÉSUMÉ

La présente étude analyse la relation entre le pourcentage de graisse et l'état nutritionnel chez des individus des deux sexes, âgés de 20 à 80 ans et vivant dans la région Vale do Sinos (État du Rio Grande do Sul, Brésil). Il s'agit d'une étude descriptive, avec un échantillon de convenance de 1004 individus 321 hommes et 681 femmes, divisés en 5 catégories délimitées par une période de 9 ans. L'analyse de l'état nutritionnel s'est faite par l'Indice de Masse Corporelle ; le pourcentage de graisse a été obtenu avec les équations Jackson & Pollock et Williams, en utilisant le caliper ; pour les autres indicateurs anthropométriques, la masse corporelle totale a été mesurée avec la balance d'équilibre et la taille avec le stadiomètre. La différence entre les moyennes du pourcentage de graisse et les catégories de l'état nutritionnel a été analysée avec les tests statistiques ANOVA et Tukey. Les moyennes obtenues ont étés comparées aux moyennes recommandées selon le genre via le test de Student. Une différence significative ($p = 0,05$) a été observée dans le pourcentage moyen de graisse entre les catégories de l'état nutritionnel, caractérisant une pré-obésité parmi les genres. Pour le genre féminin, une différence significative ($p = 0,05$) est apparue au niveau du pourcentage moyen des 5 catégories ; autrement dit, la plupart des femmes avaient un poids supérieur au pourcentage normal de graisse recommandé. Le genre féminin n'a pas présenté de différence significative dans le pourcentage de graisse entre état nutritionnel « faible poids » et « eutrophie ». Les hommes ont présenté une différence dans les catégories entre 30 et 39 ans et au delà de 60 ans. En conclusion, les résultats sont plus alarmants pour les femmes, à cause de la plus grande prévalence de pourcentage de graisse corporelle ; toutefois, pour les deux genres, ce type de distribution de la graisse est lié aux maladies métaboliques et cardiovasculaires.

Mots-clés : Métabolisme humain. Pourcentage de graisse. État nutritionnel.

PORCENTAJE DE GORDURA Y ESTADO NUTRICIONAL: UN ESTUDIO ENTRE INDIVIDUOS DE LA REGIÓN DEL VALLE DE RIO DOS SINOS, RIO GRANDE DO SUL, BRASIL.

RESUMEN

El presente estudio buscó relacionar el porcentaje de gordura y el estado nutricional de individuos de ambos géneros, entre los 20 y los 80 años, residentes en la región del valle de Rio dos Sinos, Rio Grande do Sul, Brasil. Es un estudio descriptivo con 1004 individuos entre 20 y 80 años, 323 del género masculino y 681 del femenino, divididos en 5 categorías, delimitadas por franjas de 9 años, seleccionados por conveniencia. Mediante el Índice de Masa Corporal, se investigó el estado nutricional. El porcentaje de gordura se obtuvo mediante las ecuaciones Jackson & Pollock y Williams, con el uso del plicómetro. Para los demás indicadores antropométricos, masa corporal total y estatura, se utilizaron balanza de equilibrio y estadiómetro. La diferencia entre los promedios del porcentaje de gordura y las categorías del estado nutricional fue analizada mediante las pruebas estadísticas ANOVA y Tukey. El comparativo entre los promedios encontrados y recomendados por género fue evaluado por la prueba t-student. Se identificó significancia ($p=0,05$) en el porcentaje mediano de gordura entre categorías del estado nutricional, caracterizando preobesidad entre los géneros. Para el género femenino, se constató diferencia significativa ($p<0,05$) en el porcentaje mediano entre todas las categorías, o sea, la mayor parte de las mujeres evaluadas estaban por encima del porcentaje de gordura normal recomendado. El género femenino no presentó diferencia significativa en el porcentaje de gordura entre estado nutricional “bajo peso” y “eutrofia”. Los hombres tuvieron significancia en las categorías entre 30 y 39 y más de 60 años. Se concluyó que estos resultados son más alarmantes para las mujeres, por la mayor prevalencia de porcentaje de gordura corporal. Sin embargo, para ambos, ese tipo de distribución de gordura está relacionado a enfermedades metabólicas y cardiovasculares.

Palabras-clave: Metabolismo humano. Porcentaje de gordura. Estado nutricional.

PERCENTUAL DE GORDURA E ESTADO NUTRICIONAL: UM ESTUDO ENTRE INDIVÍDUOS DA REGIÃO DO VALE DO SINOS, RS, BRASIL.

ABSTRACT

O presente estudo buscou relacionar o percentual de gordura e o estado nutricional de indivíduos de ambos os gêneros, entre 20 e 80 anos, residentes na região do vale do Sinos, RS. Estudo descritivo com 1004 indivíduos, de 20 a 80 anos, 323 do gênero masculino e 681, do feminino, divididos em 5 categorias, delimitadas por um período de 9 anos, selecionados por conveniência. Através do Índice de Massa Corporal, investigou-se o estado nutricional. O percentual de gordura foi obtido através das equações Jackson & Pollock e Williams, utilizando o plicômetro, para os demais indicadores antropométricos: massa corporal total e estatura utilizaram-se balança de equilíbrio e estadiômetro. A diferença entre as médias do percentual de gordura e categorias do estado nutricional foi analisada através de testes estatísticos ANOVA e Tukey. O comparativo entre as médias encontradas e recomendadas por gênero foi avaliado pelo teste t-student. Identificou-se significância ($p<0,05$) no percentual médio de gordura entre categorias do estado nutricional, caracterizando pré-obesidade entre os gêneros. Para o gênero feminino se constatou diferença significativa ($p<0,05$) no percentual médio entre todas as 5 categorias, ou seja, a maior parte das mulheres avaliadas estavam acima do percentual de gordura normal recomendado. O gênero feminino não apresentou diferença significativa no percentual de gordura entre estado nutricional “baixo peso” e “eutrofia”. Os homens tiveram significância nas categorias entre 30 e 39 e acima de 60 anos. Concluiu-se que estes resultados são mais alarmantes para mulheres, pela maior prevalência de percentual de gordura corporal, porém, para ambos, esse tipo de distribuição de gordura está ligado a doenças metabólicas e cardiovasculares.

Palavras-chave: Metabolismo humano. Percentual de gordura. Estado nutricional.