12 - RELATION AMONG ADIPOSITY PREDICTORS IN MAN

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INTRODUCTION

Skinfolds measurements provide a better estimate of fatness and they are more difficult than other anthropometric methods that use circumferences, height and weight (ACSM, 2003).

The body mass index has been used in epidemiologic studies to detect and to observe the evolution of the percentage of overweight (= 25 Kg/m^2) and obese (= 30 Kg/m^2) people (ACSM, 2001) and this index is easy to apply and only demand the standardization of the body height and weight (LOHMAN, 1992).

The waist circumference can be used as a health risk index because circumference classify people with risk for the development of pathologies as type 2 diabetes, hypertension and cardiovascular disease (ACSM, 2003).

The prevalence of obesity and overweight is associated with a higher risk for the mortality and morbidity (WHO, 2003). The diseases associated with obesity are the development of cardiac coronary disease, hypertension, dyslipidemia, diabetes (WHO, 2002), cancer, hyperlipidemia and hyperinsulinemia (ACSM, 2001).

The objective of this study was to examine the relation between adiposity indexes in adult men that were visitors of the coast of the Parana state.

METHODOLOGIC PROCEDURES

Population and sample

The sample was composed by 440 men aged between 30 and 38 years old and they were visitors of the coast of the Parana State.

Procedures

The research instruments used were sphygmomanometer with scale of 2 mmHg and stethoscope appropriated; balance, scale of 100 grams to the body weight; stadiometer, centimeters scale to the height; anthropometric tape to the circumference, millimeters and CESCORF caliper, to measure thickness to the skinfolds, 1/10 milimeters.

The procedures of ACSM (2003) were used to collect the resting blood pressure. For the anthropometric variables were used the following protocols: body weight (MC), body height (EST) and perimeter HEYWARD e STOLARCZYK (1996) and skinfolds, JACKSON e POLLOCK (1985).

BMI was classified by the recomendations of WHO (1997); BMI normal when the values were between 18.5 and 24.9 Kg/m^2, BMI overweight between 25.00 and 29.9 Kg/m^2 and BMI obesity equivalent or higher than 30.00 Kg/m^2.

Body density (D) was calculated by the predictive equation of JACKSON and POLLOCK (1985) that uses three skinfolds. The skinfolds (DC) used were chest (PT), triceps (TR) and subscapula (SE) and the equation was D = 1.1125025 - (0.0013125 x DCPT+DCTR+DCSE) + (0.0000055 x (DCPT+DCTR+DCSE)^2) - (0.0002440 x AGE). The skinfolds were in millimeters and age in years.

Fat percentage was calculated by the equation of SIRI (1961) and this equation was indicated and utilized by JACKSON and POLLOCK (1985). The fat mass and the lean body mass were calculated by the procedures suggested by DE ROSE, PIGATTO and DE ROSE (1984).

Dates treatment

For the statistics treatments were used:

1) descriptive statistics (mean and standard deviation) for the physiology, anthropometric and of body composition variables;

2) *One-Way* Anova and the *post-hoc* of Tukey, (p = 0.05), having as factor the body mass index and independent list the age, resting heart rate, resting systolic and diastolic blood pressure, body mass, body height, waist perimeter, fat percentage, sum of skinfolds, fat mass and lean body mass p = 0.05. The classification of BMI with the values equivalent or taller than 18.49 was not used because there were little people in this classification.

3) Pearson bivariate *two-tailed* correlation, where the variables analysed were body mass index, fat percentage, waist perimeter, lean body mass and age, p < 0.05.

4) multiple regression, where the dependent variable was body mass index and independents variables were age, fat percentage, waist circumference and lean body mass.

RESULTS

The higher is the mean value of the BMI higher were the mean values of the resting heart rate and blood pressure, body weight, waist perimeter, sum of skinfolds, fat percentage, fat mass and lean body mass, Table 1.

TABLE 1 Physiological, anthropometric and body composition characteristics by the BMI classifications in men aged between 30 and 38 years

DEPENDENTS VARIABLES	NORMAL	OVERWEIGHT	OBESITY
n	168	209	63
Age (years)	34.2±2.6	34.2±2.6	34.4±2.8
F.C.R. (bpm)	77.3±12.9	76.5±11.1	79.6±11.2
PA Systolic (mmHg)	115.9±10.2 [b, c]	119.7±11.6 [a, c]	123.8±13.8 [a, b]
PA Diastolic (mmHg)	73.3±7.6 [b, c]	77.1±9.6 [a, c]	80.6±10.1 [a, b]
Body mass (Kg)	68.8±7.5 [b, c]	80.6±7.1 [a, c]	98.9±12.7 [a, b]
Body height (cm)	172.3±7.0	171.8±6.4	172.0±7.1
Waist perimeter (cm)	82.7±6.1 [b, c]	92.1±5.7 [a, c]	105.3±15.7 [a, b]
? of skinfolds TR, SE and PT	36.2±12.0 [b, c]	52.1±13.7 [a, c]	75.2±22.5 [a, b]
Fat percentage	15.0±4.6 [b, c]	20.7±4.4 [a, c]	26.3±4.5 [a, b]
Fat mass (Kg)	10.4±3.7 [b, c]	16.7±4.2 [a, c]	26.3±6.8 [a, b]
Lean body mass (Kg)	58.4±6.2 [b, c]	63.8±5.5 [a, c]	72.6±8.3 [a, b]

[a] different of BMI normal (p ? 0.05)
[b] different of BMI overweight (p ? 0.05)
[c] different of BMI obese (p ? 0.05)
F.C.R. = resting heart rate
PA = blood pressure
TR = triceps skinfold
SE = subscapular skinfold
PT = chest skinfold

The BMI groups normal and overweight were classified in normal by the resting systolic and diastolic blood pressure, but, the group of BMI obese was classified in prehypertension by the resting systolic and diastolic blood pressure (CHOBANIAN et al, 2003).

The waist perimeter classified the normal BMI group in risk very low for the emerging of cardiovascular disease and the overweight and obese BMI group in risk low (BRAY, 2004).

The normal BMI group was classified in average by the fat percentage, the overweight BMI group above the average and the obese BMI group at risk for the development of disease associated with obesity (LOHMAN, 1992).

There were significant correlations, (Table 2), among BMI with fat percentage (% FAT), waist perimeter (PWAIST) and lean body mass (LBM); fat percentage with waist perimeter and lean body mass; waist perimeter with lean body mass, ($p<0.05$). There were not significant correlations among age with BMI, fat percentage, waist perimeter and lean body mass. Hence, there were significant correlations among the overweight and obesity indexes (BMI, fat percentage and waist perimeter) in the population studied.

TABLE 2 Pearson bivariate correlations among overweight and obesity indexes in men aged between 30 and 38 years

VARIABLES	% FAT	PWAIST	LBM	AGE
BMI	0.73*	0.81*	0.67*	0.03
% FAT		0.72*	0.25*	0.03
PWAIST			0.58*	0.01
LBM				- 0.00

* $p < 0.05$

The variance of the dependent variable BMI was 81.5% when the dependents variables were fat percentage, waist perimeter and lean body mass. The variance and standard error of estimative were the same when the age was added how the dependent variable together with the others cited, table 3.

TABLE 3 Analyses of multiple regression for the dependent variable BMI in men aged between 30 and 38 years

VARIABLES	EQUATIONS
LBM, % FAT e PWAIST	- 0.171 + (0.290 x % G) + (0.089 x PWAIST) + (0.207 x LBM); SEE= 1.68.
AGE, LBM, % FAT e PWAIST	- 0.859 + (0.290 x %G) + (0.089 x PWAIST) + (0.207 x LBM) + (0.020 x AGE); SEE= 1.68.

DISCUSSION

The BMI obesity group had the risk indexes for the emerging of cardiovascular disease higher than the BMI overweight group and this higher than the BMI normal group. The blood pressure, fat percentage and waist circumference were significantly differentiated among the three groups of the BMI, ($p = 0.05$).

There were significant correlations among the overweight and obesity indexes (BMI, fat percentage, waist circumference) and of these indexes with the lean body mass. The correlation of hydrostatic weighing and anthropometry is between 0.50 and 0.80 (NORTON e OLDS, 1996). The skinfold method had correlations between 0.70 and 0.90 with hydrostatic weighing (ACSM, 2003). The correlation between densitometry and hydrostatic weighing had the value of 0.70 in men aged between 18 and 32 years old (SMALLEY, KNERR, KENDRICK, COLLIVER e OWEN, 1990).

The BMI is easy to be applied, utilized in clinic and epidemiologic studies and this method needs only of the standardization of the body height (Kg) and weight (m^2), but, in specific populations can be limited to predict the body fat percentage because the body mass is influenced by muscle mass, bone mass and fat (LOHMAN, 1992). In this study, the variance was significant in the predict variable BMI because of the predictors fat percentage, waist perimeter and lean body mass, more than 0.80. With these results is possible to affirm that the BMI is not limited to predict the fat percentage of the population studied, despite, of the BMI reflect the relative mass of the fat and lean tissue (GARN, LEONARD e HAWTHORNE, 1986). The variance and standard error of estimative were the same when the age was added how the dependent variable with the other cited. Other methods should be used to predict body fat if the standard error of estimative of the percent fat from BMI to be of ± 5%. The higher standard error of estimative of the fat percentage by the BMI in this study was not upper than 1.68% and because of this the BMI is not limited to predict the fat percentage.

CONCLUSÃO

The BMI in the studied population was sensitive to detect significant variations among the comportments of the risk factors for the development of the cardiovascular disease studied, significant variance and correlations with the overweight and obesity indexes and the standard error of estimative of the fat percentage by the BMI was not elevated.

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RELATION AMONG ADIPOSITY PREDICTORS IN MAN

ABSTRACT

The purpose of this study was to examine the relation between adiposity indexes in a male population. The sample was composed by 440 males aged between 30-38 years old and they were visitors of the coast of the Parana state. The WHO (1997) reference was used to classify BMI. Body density was calculated by the predictive equation of JACKSON & POLLOCK (1978) with three skinfolds and the fat percentage (% G) by the equation of SIRI (1961). The BMI obesity group had the risk indexes for the development of cardiovascular disease higher than the BMI overweight group and this higher than the BMI normal group. Blood pressure, fat percentage and waist circumference were different among the three groups of the BMI, (p = 0.05). There were significant correlations among the overweight and obesity indexes (BMI, fat percentage, waist circumference) and of these indexes with the lean body mass. Hence, the BMI in the studied population was sensitive to detect significant variations among the comportments of the risk factors for the development of the cardiovascular disease studied, significant variance and correlations with the overweight and obesity indexes and the standard error of estimative of the fat percentage by the BMI was not elevated.

Key-words: overweight, obesity, males.

RAPPORT ENTRE LAS CAUSES D'ADYPOSITÉ CHEZ LES HOMMES

RÉSUMÉ

Le but de cette étude a été d' analyser les relations entre les indicateurs antropométriques de surpoids et l'obésité. La population étudiée a été composée de 440 hommes âgés de 30 à 38 ans fréquentant la cote du Paraná. Pour le classement de BMI a été employé lê referentiel de WHO (1997). La densité corporelle a été calculée par l'équacion généralisée de JACKSON et POLLOC (1985), qui emploient 3 pliures cutanées et pourcentage de graisse a été calcule par l'équation de SIRI (1961). Le groupe de IMC, obése a presenté les indicateurs de risque pour la naissance des troubles cardiovasculaires plus élevés que ceux du groupe d'IMC, em surpoids et celui-ci du groupe d'IMC normal. Parmi les facteurs de risque differencés statistiquement (p = 0,05) entre les 3 grupes d'IMC on peut dégager la tension arterielle, le pourcentage de graisse et le périmètre de la ceinture. On a trouvé une corrélation significative (p = 0,05) entre les indicateurs antropométriques de surpoids et d'obesité (IMC, pourcentage de graisse, périmètre de la ceinture) et ceux-là avec la masse corporelle maigre. Donc, l'IMC dans la population étudiée a servi à détecter des variations significatives dans les comportements des facteurs de risque pour la naissance des troubles cardiovasculaires étudiés, correlation et variation significatives avec les indicateurs de surpoids et d'obesité et, aussi, la faute patron d'estimative de percentage de graisse à partir du IMC n'a pás été élevé.

MOTS-CLÉ: Surpoids, Obésité, Hommes**.**

RELACION ENTRE LOS CAUSADORES DE LA ADIPOSIDADEN LOS HOMBRES

RESUMEN

El objetivo de este estudio ha sido el de analizar las relaciones existentes entre los indicadores antropométricos de sobrepeso y de obesidad. La población estudiada ha sido compuesta por 440 hombres entre los 30 y los 38 años frecuentadores de la costa de Paraná. Para la classificación del BMI ha sido empleado el referencial de WHO (1997). La densidad corpórea ha sido calculada por la ecuación generalizada de JCKSON y POLLACK (1985) que emplea 3 pliegues cutáneos y el porcentaje de grasa ha sido clculado por la equación de SIRI (1961). El grupo de IMC obeso presentó los indicadores de riesgo el surgimento de distuurbios cardiovasculares más elevados que el del grupo de IMC normal. Entre los factores de riesgo diferenciados estadísticamente (p = 0,05) entre los três grupos de IMC se sobresalen la presión arterial, el porcentaje de grasa y el perímetro de la cintura. Se ha encontrado uma correlación significativa (p = 0,05) entre los indicadores antropométicos de sobrepeso y de obesidad (IMC, porcentaje de grasa, perímetro de la cintura) y de aquellos con la massa corpórea delgada. Luego, el IMC en la población estudiada ha servido para detectar variaciones significativas em los compartamientos de los fatores de riesgo para el surgimiento de disturbios cardiovasculares estudiados, correlación y variación cardiovasculares estudiados, correlación e variación significativas con los indicadores de sobrepeso y de obesidad y también el error patrón de estimativa de porcentaje de grasa a partir del IMC na ha sido elevado.

PALABRAS-CHAVE: Sobrepeso, obesidad, hombres.

RELAÇÃO ENTRE PREDITORES DE ADIPOSIDADE EM HOMENS

RESUMO

O objetivo desse estudo foi o de analisar as relações existentes entre os indicadores antropométricos de sobrepeso e obesidade. A população estudada foi composta por 440 homens na faixa etária entre 30 a 38 e freqüentadores da região litorânea do estado do Paraná. Para a classificação do BMI foi utilizado o referencial da WHO (1997). A densidade corporal foi calculada pela equação generalizada de JACKSON e POLLOCK (1985), que utilizam 3 dobras cutâneas e o percentual de gordura foi calculado pela equação de SIRI (1961). O grupo de IMC obeso apresentou os indicadores de risco para o surgimento de distúrbios cardiovasculares mais elevados do que o grupo de IMC em sobrepeso e esse do que o grupo de IMC normal. Dentre os fatores de risco diferenciados estatisticamente (p = 0,05) entre os três grupos de IMC destacam-se a pressão arterial, o percentual de gordura e o perímetro da cintura. Encontrou-se correlação significativa (p = 0,05) entre os indicadores antropométricos de sobrepeso e obesidade (IMC, percentual de gordura, perímetro da cintura) e dos mesmos com a massa corporal magra. Portanto, o IMC na população estudada demonstrou ser sensível para detectar variações significativas nos comportamentos dos fatores de risco para o surgimento de distúrbios cardiovasculares estudados, correlação e variância significativa com os indicadores de sobrepeso e obesidade e, também, o erro padrão de estimativa do percentual de gordura a partir do IMC não foi elevado.

Palavras chaves: sobrepeso, obesidade, homens.