48 - ANALYSIS OF THE WAIST-HEIGHT INDEX AND OF THE CENTRALIZED FAT MEASURED FOR ABSORPTIOMETRY X-RAY OF DUAL-ENERGY

Ana Patrícia Siqueira Tavares Falcão
Professora Assistente da Escola Superior de Educação Física ESEF/UPE, Recife PE, Brasil
Manoel da Cunha Costa
Professor adjunto da Escola Superior de Educação Física ESEF/UPE, Recife, PE, Brasil
Ana Maria de Carvalho Albuquerque Melo
Professora adjunta do Departamento de Nutrição UFPE, Recife, PE, Brasil
Moacyr Cunha Filho
Professor Adjunto da Universidade Federal Rural de Pernambuco, Recife, PE, Brasil
Florisbela de Arruda Câmara e Siqueira Campos
Professora adjunta do Departamento de Nutrição UFPE, Recife, PE, Brasil
apstfalcao@hotmail.com

Introduction

The study of the body composition and, especially, of the distribution of the body fat has great relevance as in the clinical practice as in the evaluation of the populations, being associated to several metabolic alterations (REZENDE et al., 2006), as well as the excess of body weight and of fat cause several chronic-degenerative dysfunctions and consequently increase the morbidity indexes and mortality, rebounding in a negative way as in the quality as in the expectation of the individuals' life (GUEDES and GUEDES, 1998; ARAÚJO et al., 2005).

Information with relationship to the distribution of body fat can be obtained through the calculation of indexes anthropometrics. Hsiem and Muto (2006) used the waist-height index demonstrating the effectiveness in studies related to the obesity and metabolic syndrome, also using it as one of the criterion to identify coronary risks (WHI 0,5).

The abdominal obesity or android are considered a risk factor for several morbidities, being related to cardiovascular diseases, diabetes, dislipidemies and metabolic syndrome (OLINTO et al., 2006), being of great relevance the development of studies of that nature in several segments of the society, besides in young adult men.

The anthropometric is a good option for the estimates associated to the amount of body fat (GUEDES, 2006), because it has low operational cost, non invasive measures, it presents simplicity of using and validity (Costa, 2001; Pires Neto, 2007) and it has relationships with several types of diseases and with the distribution of the body fat in adults (BERMUDEZ et al., 2001, ARONNE, 2002).

The absorptiometry x-ray of dual-energy (AXDE) it is a scanning technique that measures different attenuations of x-ray which pass through the body (PAIVA & BOTARRO, 2002), considered a new and promising technique (LOHMAN, 1996). According to Botarro et al (2000), AXDE is a technology that is being recognized recently as reference method in the analysis of the body composition.

To relate the waist-height index with the total fat and centralized measured starting from techniques more accurate, like AXDE, it also allows tracing one of the largest problems of the contemporary society that is the obesity.

Thus, the present study has for objective to analyze the waist-height index (WHI) and the total fat and centralized measured for AXDE, verifying the risk prevalence the health taking as reference WHI.

Methodology

The sample was constituted by forty five young adults evaluated in the Laboratory of Evaluation of Human Performance of the University of Pernambuco and in the Laboratory Albuquerque do Ó, Recife - PE, with age varying between 20 and 30 years. Everybody participated voluntarily and they signed the term of free and illustrious consent, authorizing the publication of the data. The study was approved by the Committee of Ethics in Research involving human beings of the Center of Sciences of the Health of the Federal University of Pernambuco (CEP/CCS/UFPE); register nº 328/07.

The inclusion criterions for the selection of the sample were: to be of the masculine gender, to have between 20 and 30 years and not to present any temporary or permanent physical problem that impeded the evaluation for the anthropometric or for AXDE.

The measured used anthropometrics was: the total body mass, measured in a mark scale Filizola accurately of 100 grams, the measured stature in a wood estadiometric and the circumference of the waist measured in centimeters using a non expandable measuring tape marks GRAFCO, with 150 cm and precision of 0,1 cm following the recommendations of Gordon et al. (1988) and Costa (2001).

In the evaluation of the body composition for AXDE, the exams understood a complete sweeping of the individual's body, supplying measure of the bony density, thin mass and fat mass, being made a series of traverse scanning to the longitudinal axis of the body, with medium duration of 20 minutes. The used machine was a Bone Densitometer Pencil-beam LUNAR DPX Radiation Madison, WI. It USES, using software 3.65.

For the certification of validity of the system (Quality), a calibration block was daily scanned for the morning and a Phanton it was weekly scanned in agreement with the standard protocol of Lunar DPX. All the exams were accomplished by the same technician in radiologic.

The statistical treatment was accomplished through the statistical program SPSS version 13.0. The normality of the data was tested using the test of Shapiro-Wilk. To analyze the behavior of the variables a descriptive analysis represented by the average, standard deviation, minimum and maximum values was accomplished. The lineal correlation of Pearson was used to identify the relationship between the anthropometric waist-height index and the percentage of the total fat ($\%G_{TOTAL}$) and the percentage of fat of the trunk ($\%G_{TRUNK}$) measured by AXDE. The simple lineal regression was applied to verify the degree of explanation of the anthropometric index (WHI) in the prediction of the percentage of total fat and of the trunk measured for AXDE. The test was used t of Student to verify the difference of averages among the values measured for AXDE and the estimated for the predictive equations.

Results

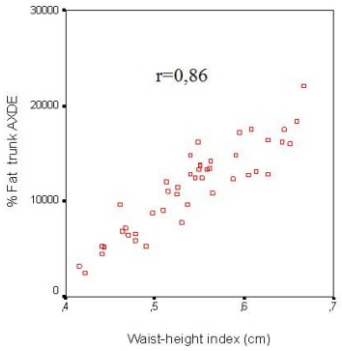
The test of Shapiro-Wilk was used to verify the normality of the distribution of the used variables, which verified that all the distributions presented normality for p> 0, 05.

The descriptive statistic is represented in the Table 1 by the average, deviation, minimum and maximum values. Considering the reference value of the WHI 0, 5 (HSIEH and MUTO, 2006), it was noticed that in spite of the average ot be a little below to the court point, 73, 33% (n=33) of the sample they presented values superior to the reference.

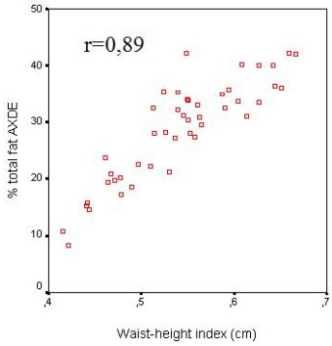
Table 1: Men's adult youth's characteristic anthropometrics of 20 to 30 years

Variables	$\overline{X} \pm S$	$Value_{minimum}$	$Value_{maximum}$
BM (kg)	83,890 ± 13,24	64,400	112
Stat (cm)	163 ± 5,29	175	185
CW (cm)	95 ± 11,64	74	120
$\%G_{TOTAL}$	28,59 ± 8,79	8,20	42,30
$\%G_{TRUNK}$	28,54 ± 8,21	8,40	41,30
WHI	0,54 ± 0,06	0,42	0,67

The correlations between $\%G_{TOTAL}$, $\%G_{TRUNK}$ and the waist-height index (WHI), considering a $p < 0,01$ meet in the graphs 1 and 2, strong correlation was verified among $\%G_{TOTAL}$, $\%G_{TRUNK}$ and WHI.



Graph 1: Correlation among the% G_{TRUNK} measured for AXDE and the waist-height index



Graph 1: Correlation between the% G_{TOTAL} measured by AXDE and the waist-height index

The equations predictive of simple lineal regression, using $\%G_{TOTAL}$ and $\%G_{TRUNK}$ as dependent variables and it WHI it with independent variable, they meet in the Table 3, accompanied of the value of the correlation of Pearson (r), of the test t of Student, of the deterministic index (R^2) and the constant error (CE).

Table 3: Analysis of regression of the anthropometrics indexes in relation to $\%G_{TOTAL}$ and $\%G_{TRUNK}$ in young adults among 20 to 30 years

Anthropometric Index	Region the AXDE	Equation of the Regression	r	t	R^2	EC
IC	$\%G_{TRUNK}$	E1: $\%G_{TRUNK}$ = - 28,103 + 104,641 . x	0,86*	0,945	0,73	- 0,04
	$\%G_{TOTAL}$	E2: $\%G_{TOTAL}$ = - 34,247 + 116,081 .x	0,89*	0,936	0,78	- 0,05

Significance level for the Correlation of Pearson and test t of Student ($p < 0,01$ *)

It was observed that besides the strong correlations (Table 3), there were no differences of averages among the values measured by AXDE and the estimated by the predictive equations developed. The values of R^2=0,73 (E1) and R^2=0,78 (E2) indicate that in the observed sample 73% and 78% of the variation of $\%G_{TRUNK}$ and of $\%G_{TOTAL}$, respectively, can be explained by a lineal relationship which involves WHI. Analyzing the values of CEs, it was verified that E1 and E2 presented a very small difference, - 0,04 and - 0,05.

Discussion

In the present study, took place the analysis among WHI and G_{TOTAL} and G_{TRUNK} measured by AXDE, verifying the risk prevalence to the health considering the court point for WHI 0,5 (HSIEM and MUTO, 2006).

To study the centralized fat is of extreme need tends in view that such accumulation is considered a risk factor for several morbidities, representing differentiated risk when compared with other forms of distribution of body fat (OLINTO, 2006).

The results evidenced a strong correlation between G_{TRUNK} (r=0, 86) and G_{TOTAL} (r=0, 89) with IAC. Hsiem and Muto (2006) objectifying to investigate the effectiveness of several anthropometrics indexes, besides WHI for evaluation of factors of coronary risk and as one of the metabolic syndrome approaches in the Japanese population, being 6141 men and 2137 women, they found so much for the men as for the women the percentage of obesity and risk factors in to metabolic syndrome more elevated for it WHI it, indicating to be WHI the more cash for the retreatment anthropometric in that population.

In other study developed by Hsiem and Muto (2004), objectifying to develop simple and effective methods for metabolic evaluation, it used some anthropometrics indexes as indicators of factors of coronary risk (hypertension, hyperglycemia, hypertrigliceridemia, hypercholesterolemia and lower HDL cholesterol) in men and women and found it narrows correlation among anthropometrics indexes, besides it WHI it and it ended that WHI it is more sensitive than the body mass index (BMI) and the circumference of the waist (CC) separately for aggregation of factors of coronary risk between individuals no-obese men and women.

Considering WHI, it was verified that 73,33% (n=33) of the sample they presented superior value to the of the reference, what is a preoccupying factor for being of young adult men with age varying among 20 to 30 years and as it mentions Hall (2002), it comes happening a great increase of the obesity prevalence among young with ages between 18 and 29 years of age, being the worst cardiovascular prognostic in the adult of the masculine gender (BRANDÃO et al., 2003), needing like this larger investigations in this population.

To strong correlation found among it WHI it and G_{TRUNK} and G_{TOTAL}, as well as the prevalence demonstrated for determination of the risk factors to the health when doing use of the it WHI, it evidences a considerable power of prediction of risk of this indicative anthropometric (WHI) for young adult men, what comes once again to confirm the one that Hsieh et al. (2006) he suggests when in one of its studies it evaluated the effectiveness of several indexes anthropometrics in 3000 men and 1000 women, indicating once again, ICA as indicative best in relation to BMI, CC separately or the relationship waist-hip (RWH).

When applying the simple lineal regression WHI demonstrated to be a good predictor of G_{TRUNK} and G_{TOTAL}, representing that 73% and 78% respectively, of the value of the percentage of fat (%G) measured by AXDE it can be explained by the one WHI, also not presenting difference between the measured and estimated when the test t of Student paired was applied.

Hsieh and Yooshinaga (2003) tell that the evidences point and suggest to use WHI as only index to identify metabolic risk as in people with normal weight, as in overweight or obese and it mentions some advantages in using WHI, as: to present larger correlations with metabolic risk, being inclusive in the overweight identification, it presents larger sensibility and specificity, approaches to the reason of 1 as for men as for women, it is more accurate in the tracking of the distribution of the body fat and accumulation by age and assists to the criterion simplicity.

Melo et al. (2006) objectifying to develop an equation predictive of the fat centralized in men with ages among 20 to 30 years, it presented the abdominal perimeter (Pab) as being a strong predictor of the abdominal fat using as technique " standard gold " AXDE, finding a r=0,94 and a R^2=0,88, suggesting like this, that other studies are accomplished investigating WHI and Pab using not only AXDE, but also other techniques as the magnetic resonance, that is an image technique used to measure the intra-abdominal fat tissue and the computerized tomography, that it comes demonstrating to be useful to measure the body fat, especially, the visceral fat (KAMEL et al., 2000).

Conclusion

In function of the established objectives, it can be inferred that: WHI presents strong correlation values and a good explanatory power of G_{TRUND} and G_{TOTAL} in adult men with age varying among 20 to 30 years, also as an effective variable on the identification of risks to the health associate to the excess of centralized fat.

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ANALYSIS OF THE WAIST-HEIGHT INDEX AND OF THE CENTRALIZED FAT MEASURED FOR ABSORPTIOMETRY X-RAY OF DUAL-ENERGY

ABSTRACT

This study had as objective to analyze the waist-height index (WHI) with the total fat and centralized measured by the absorptiometry x-ray of dual-energy (AXDE), and also identifying the prevalence of health risk associated with WHI. It is a study correlational descriptive and 45 young men with age between 20 and 30 years, participated in the study. The variables in study were total body mass (kg), stature (cm), circumference of the waist (CW), percentage of total fat ($\%G_{TOTAL}$) and percentage of fat of the trunk ($\%G_{TRUNK}$) measured by AXDE and WHI. To verify the relationship between the WHI and $\%G_{TOTAL}$ and $\%G_{TRUNK}$, the lineal correlation of Pearson (p>0, 01) was used as well as the analysis of simple lineal regression, being calculated later the test t of Student, the deterministic index (R^2) and the constant error (CE). The results demonstrated a strong correlation between WHI and $\%G_{TOTAL}$ (r=0, 89; p <0, 01) and between WHI and $\%G_{TRUNK}$ (r=0, 86; p <0, 01). In the analysis of prevalence of risk to the health, adopting the criterion the WHI 0, 5, it was observed that 73, 33% (n=33) of the sample presented superior value to the reference one. There were no differences of averages between the values measured by AXDE and the estimated by the predictive equations developed. The values of R^2=0,73 (E1) and R^2=0,78 (E2) indicate that in the sample observed 78% and 73%, respectively, of the variation of $\%G_{TRUNK}$ and $\%G_{TOTAL}$ can be explained by a lineal relationship which involves the WHI. Thus, it was concluded that WHI presents strong correlation values and a good explanatory power of G_{TRUNK} and G_{TOTAL} in adult men with age varying among 20 to 30 years, also coming as an effective variable identifying the risk to the health associate to the excess of centralized fat.

Keys word: Waist-height index, centralized fat, absorptiometry x-ray of dual-energy

ANALYSE DE L'INDICE CEINTURE-HAUTEUR ET DE LA GRAISSE CENTRALISÉE MESURÉE PAR L'ABSORPTIOMETRIE DE RAYONS X DE DOUBLE ÉNERGIE

RESUMÉ

Cette étude a comme objectif d'analyser l'indice ceinture-hauteur (ICA) e la graisse totale et centralisée, mesurée par l'absorptiométrie de rayons x de double énergie(AXDE), em verifiant la prévalence de risque pour la santé et em prenant comme référence L'ICA. Il s'agit d'une étude descriptive corrélationnelle ou ont été évalués 45 hommes jeunes, entre 20 et 30 ans. Lês variables étudiées ont éte la masse corporelle totale (kg), la stature (cm), la circonférence de la ceinture (CC), le pourcentage de graisse totale (%Gtotale) et le pourcentage de graisse du tronc (%Gtronc) mesurés par la AXDE et L'ICA. Pour vérifier la relation entre L'ICA et le % Gtotale et % Gtronc, on a utilisé la correlation linéaire de Pearson et l'analyse de régression linéaire simple, (p>0,01), en calculant poetérieurement le test t de Student, l'indice déterministique (R^2) et l'eurreur constante (EC). Les résultats montrent une forte corrélation entre l'ICA et le % Gtotale (r = 0,89; p<0,01). Dans l'analyse de prévalence de risque de santé, en adoptant le critère de l'ICA= 0,5, on observe que 73,33% (n = 33) de l'echantillon presente une valeur supérieure à celui de la référence. Il n'ya pas eu de différences de moyennes entre les valeurs mesurées para la DXA et celles estimées par les équations prévues développées. Les valeurs de R^2 = 0,78 (E1) et R^2 = 0,73 (E2) indiquent que dans l'échantillonnage observé, 78% et 73% respectivement, la variation du % Gtotale et Gtronc peut être expliquée par une relation linéaire qui englobe l'ICA. Ainsi, on en conclut que l'ICA présent de fortes valeurs de corrélation et um bon pouvoir explicatif de la Gtronc e de la Gtotale, chez des hommes adultes, d'um âge variant entre 20 et 30 ans, et se présent aussi comme une variable efficace dans l'indentification de risque de santé, associé à l'excès de graisse centralisée. **Mots clés:** índice ceinture-hauteur, graisse centralisée

ANÁLISES DEL ÍNDICE CINTURA-ALTURA Y LA GRASA CENTRALIZADA MENSURADA POR LA ABSORMETRIA DE RAYO-X DE DUAL-ENERGIA

RESUMEN

Este estudio tenía como objetivo para poner en análisis el índice cintura-altura (ICA) con la grasa total y la mensurada centralizada para la absortometria de rayo-x de energía dual (AXED), verificando el prevalencia de riesgo a la salud que toma como referencia el IAC. Es un estudio correlacional descriptivo, donde fueran avaluados 45 hombres jóvenes con edad entre 20 y 30 años. Las variables en estudio eran masa corpórea total (Kg), estatura (cm), circunferencia de la cintura (CC), percentil de grasa del total ($\%G_{TOTAL}$) y percentil de grasa del tronco ($\%G_{TRONCO}$) mensurados por la AXED e ICA. Para verificar la relación entre el ICA y el $\%G_{TOTAL}$ y $\%G_{TRONCO}$, se usó la correlación lineal de Pearson y el análisis de regresión lineal simple, (p>0,01), calculándose la prueba después t de Stundent, el índice determinantico (R^2) y el error constante (EC). Los resultados demostraran una correlación fuerte entre el ICA y el $\%G_{TOTAL}$ (r=0,89; p <0,01) y entre CAI y $\%G_{TRONCO}$ (r=0,86; p < 0,01). En el análisis de prevalencia de riesgo a la salud, adoptando el acercamiento ICA 0,5, fue observado que 73,33% (n=33) de la muestra presentaron valor superior al de la referencia. No había diferencias de promedios entre los valores medidos por AXED y el estimado por las ecuaciones predictivas desarrolladas. Los valores de R^2=0,73 (E1) y R^2=0,78 (E2) indican que en la muestra observada 73% y 78%, respectivamente, de la variación de $\%G_{TRONCO}$ y $\%G_{TOTAL}$ puede ser explicada por una relación lineal que lo involucra el ICA. Así, ha acabado que ICA presenta fuertes valores de correlación y uno bueno no poder explicativo de G_{TOTAL} y G_{TRONCO} en hombres adultos con edad que varía entre 20 a 30 años, presentándose también como una variable eficaz en la identificación de riesgo a la salud asociado al exceso de grasa centralizada.

Palabra llaves: índice cintura-altura, grasa centralizada, el absortometria de rayo-x de energía dual.

ANÁLISE DO ÍNDICE CINTURA-ALTURA E DA GORDURA CENTRALIZADA MENSURADA PELA ABSORTOMETRIA DE RAIO-X DE DUPLA ENERGIA

RESUMO

Este estudo teve como objetivo correlacionar o índice cintura-altura (ICA) com a gordura total e centralizada mensurada pela absortometria de raio-x de dupla energia (AXDE), verificando a prevalência de risco a saúde tomando como referência o ICA. Trata-se de um estudo descritivo correlacional, onde foram avaliados 45 homens jovens com idade entre 20 e 30 anos. As variáveis em estudo foram massa corporal total (kg), estatura (cm), circunferência da cintura (CC), percentual de gordura total ($\%G_{TOTAL}$) e percentual de gordura do tronco ($\%G_{TRONCO}$) mensurados pela AXDE e o ICA. Para verificar a relação entre o ICA e o $\%G_{TOTAL}$ e $\%G_{TRONCO}$, utilizou-se a correlação linear de Pearson e a análise de regressão linear simples, (p>0,01), calculando-se posteriormente o teste t de Student, o índice determinístico (R^2) e o erro constante (EC). Os resultados demonstraram uma forte correlação entre o ICA e o $\%G_{TOTAL}$ (r=0,89; p < 0,01) e entre o ICA e o $\%G_{TRONCO}$ (r=0,86; p < 0,01). Na análise de prevalência de risco à saúde, adotando o critério o ICA 0,5, observou-se que 73,33% (n=33) da amostra apresentaram valor superior ao da referência. Não houve diferenças de médias entre os valores medidos pela AXDE e os estimados pelas equações preditivas desenvolvidas. Os valores de R^2=0,73 (E1) e R^2=0,78 (E2) indicam que na amostra observada 73% e 78%, respectivamente, da variação do $\%G_{TRONCO}$ e $\%G_{TOTAL}$ pode ser explicada por uma relação linear que envolve o ICA. Assim, conclui-se que o ICA apresenta fortes valores de correlação e um bom poder explicativo da G_{TRONCO} e G_{TOTAL} em homens adultos com idade variando entre 20 a 30 anos, apresentando-se também como uma variável eficaz na identificação de risco à saúde associado ao excesso de gordura centralizada.

Palavra Chaves: Índice cintura-altura, gordura centralizada, absortometria de raio-x de dupla energia