131 - PHYSIOLOGICAL ALTERATIONS RELATED TO AGING

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INTRODUCTION

The Arterial Hypertension is a reflex of chronicle conditions of high levels of arterial pressure (AP) of a person. Because of this chronicle state the heart needs to work more intensively to be able to expel the blood against a higher resistance. By the time, this stress may compromise arteries and arterioles (WILLMORE & COSTILL, 2001).

The hypertension contributes to the development of the degenerative diseases of the circulatory system, and it is the main risk factor to develop cardiovascular diseases as arteriosclerosis, heart attack, and heart insufficiency and cerebral-vascular accidents (CVA).

Data from DATUSUS (1999) show that the squeamish and hemorrhagic CVA represents the main cause of death in the country:

Brazil's deaths	
Region	Deaths
Total	83.475
North	3.039
Northeast	16.510
Southeast	42.840
South	16.242
Center east	4.844
Deaths related to region – brain and heart diseases – 1999	

The hypertensive state presents high prevalence rates, being responsible for 20% of deaths of subjects ranging from 20 to 49 years old and 41% of the deaths of subjects over 50 years old.

Concerning to the new classification of adults blood pressure (JNC VII, 2003), the risk factors can be already seen in the pre-hypertension.

Adults blood pressure classification (JNC VII, 2003):

Blood pressure	Systolic	Diastolic
Normal	<120	<80
Pre - hypertension	120 a139	Between 80 e 89
Stage 1- Hypertension	140 a 159	Between 90 e 99
Stage 2 - Hypertension	≥160	≥100

The BMI has the intention of verifying the normality of body weight of a subject. It is an important predictor of risk factors to the development of degenerative joint disease, cardiovascular problems and dyslipidemies, being related to morbidity and mortality (PEETERS et al., 2003). The classification of these variables is described below:

Low weight	<18,5
Normal weight	18,6-24,9
Overweight	25,0-29,9
Obesity level I	30,0-34,9
Obesity level II	35,0-39,4
Obesity level III	>40,0

Researches show the normality of the increase in body weight and values of BMI with aging (ELIA, 2001). The proportion of intrabdominal fat, related to morbidity and mortality, also tends to increase through the years. At developed countries, a decrease of energetic consumption and quantity of caloric expenditure decrease 163kcal per decade in males through the years, and 103kcal per decade in females, as consequence of a decrease in the basal metabolic rate. The association of lower quantity of physical activity and lower metabolic expenditure will reflect in a progressive increase of overweight and/or obesity at higher age levels.

The distribution of adipose tissue may be involved in some pathologies and syndromes concerning to the percent of body fat (%). These values are classified by LOHMAN (1992):

	MEN	WOMEN
Low nutrition risk	<5%	<8%
Under mean	6-14%	9-22%
Mean	15%	23%
Over mean	16-24%	24-31%
Obesity risk	> 25%	>32%

The obesity is followed by some metabolic complications and has been known as a risk factor to many of others diseases and handicaps, including coronary disease and Non-Insulin Dependent Diabetes Mellitus. Usually, the risk of developing these complications is increased by the level of obesity (PEARSON, 1987; MAYO et al, 2003), presenting a high relation of morbidity and mortality.

Many of studies have associated the increase of fat mass and BMI with risk factors as: limitations of daily activities, diabetes and arrhythmias (LAUNER et al, 1994; VISSER et al., 1998; GALANOS et al., 1994).

Concerning to Votruba et al (2000), about 50% of American adult population is considered obese or overweight (BMI>30 kg/ m^2). This increase of the prevalence of obesity with aging brings preoccupations and costs (approximately $99 billions at 1995), once that is associated to the increase of the risk of diabetes, cardiovascular diseases, digestive problems, hypertension and joint disorders.

The increase of age is associated to complex changes in some factors as: increase of body weight, BMI, body composition differentiation and increase of the blood pressure. These variables are highly related. Once, that the quantity of body fat increases, the possibilities of an increase in BMI and blood pressure are higher. The quantity of intra-arterial fat may cause more complications as: heart diseases and metabolic dysfunctions.

OBJECTIVE

Verify and compare the level of arterial systolic and diastolic pressure, percent body fat and BMI of male and female related to age.

METHODS

307 subjects were evaluated, 146 males and 161 females, 15 to 60 years old, who were distributed among 5 age levels: (1) 15-19, (2) 20-29, (3) 30-39, (4) 40-49, (5) 50-59, to the comparisons.

The arterial pressure was measured while the subjects were at rest, sat down at least for 10 minutes, without using any kind of medicines or substances that could cause changes in the arterial pressure.

The equation to estimate the body fat was proposed by Guedes & Guedes (1998). The Body Mass Index (BMI) was calculated by using the data of body weight and height of the subjects.

The data were evaluated through the progamme STATISTICA 6.0; using ANOVA and Tukey post-hoc made the comparisons across age levels.

RESULTS

Some physiological changes can be seen easily in tables 1,2 and 3, showing some decreases of the morph-functional capacity related to the increase of age in both sexes.

Table 1- Comparative between blood pressure and age to both gender, mean (sd)

Age levels	MEN		WOMEN	
	SBP	DBP	SBP	DBP
15 a 19	112,94 (7,72)[a]	71,18 (4,85)	109,52 (9,21)	68,33 (7,64)[a]
20 a 29	117,10 (12,01)[a]	75,40 (8,91)	106,95 (10,64)[a]	68,37 (9,01)[a]
30 a 39	113,06 (10,09)[a]	73,19 (8,38)	106,32 (11,60)[a]	66,71 (13,42)[a]
40 a 49	121,67 (12,38)	79,90 (10,76)	115,00 (10,17)[b]	75,71 (8,51)[b]
50 a 59	124,00 (8,94)	80,00 (15,81)	118,06 (10,65)[b]	76,56 (958)[b]

Between different letters, significant difference to the same variable (p<0,01)

It is possible to notice through Table 1, the comparisons across the age levels to systolic and diastolic arterial pressure. In the female group, the comparisons were made until the age level from 50 to 59 years and presented mean values lower than the male group at all ages. In both genders the systolic and diastolic arterial pressure increased proportionally from 30 years old on, with the male group presenting mean values classified as pre-hyper tenses (see Figure 1).

The publication of JNC VII (2003), a new classification was adapted to arterial pressure, the pre-hypertension in which the subject has to improve his style of life in order to not present Arterial Hypertension.

Table 2- Comparative between BMI and age to both genders, mean (sd)

Age levels	BMI	
	MEN	WOMEN
15 a 19	23,09 (1,13)[a]	20,99 (0,57)[a]
20 a 29	24,84 (0,37)[a]	23,03 (0,36)[a]
30 a 39	25,80 (0,54)[a]	25,04 (0,73)[b]
40 a 49	27,37 (0,86)[b]	26,04 (0,84)[b]
50 a 59	25,38 (1,54)[a]	25,23 (1,00)[b]

Through Table 2 it is possible to observe that the comparisons of the female group values present significant differences across the age levels from 30 years old on, which overreach the normal values of BMI being classified as overweight. In the male group until 29 years old the classification of BMI stands normal, and from this age level on it turns to an overweight classification, with a peak value ranging from 40 to 49 years old.

Table 3- Comparative between fat (%) and age to both genders, values are expressed in mean (sd)

Age levels	Fat (%)	
	MEN	WOMEN
15 a 19	18,09 (1,76)[a]	24,82 (1,24)abc
20 a 29	18,95 (0,66)[a]	24,45 (0,52)b
30 a 39	22,71 (0,76)[b]	27,97 (0,92)c
40 a 49	25,49 (1,00)bc	31,59 (0,87)d
50 a 59	29,80 (1,95)c	34,02 (1,13)d

Between different letters, significant difference to the same variable (p<0,01)

It is possible to observe through Table 3 that the female values of body fat overreach the mean values at the lower category, being maintained until 30 years old, when there is a peak of body fat accumulation, which will be significantly different in higher categories ranging from 40 to 59 years old. In the male subjects these values were also above the mean of the first age level and continued increasing until the last category. Until 29 years old the classification of body fat (%) didn't change significantly, however, from this age level on it started increasing gradually until reaching a peak after 50 years old.

CONCLUSION

The results of the present study showed that the female subjects have lower mean values of systolic and diastolic arterial pressure than male and that arterial pressure suffers an increase from 30 years old favoring the happening of the Arterial Hypertension at advanced ages in both groups.

The BMI showed a tendency of increasing the overweight and body fat concentration with aging in both male and female groups. This increase was maintained from 30 years (as already reported in mean values of systolic and diastolic arterial pressure) in the female group, and the male group presented a significant increase in the age level ranging from 40 to 49 years old.

A proportional relation is noted across body fat (%) and age: the older the subject, the higher is his percent of body fat, for both groups; factor that predisposes subjects to higher risks of metabolic diseases and cardiovascular alterations. The peak of alterations usually presents significant differences in male and female after 30 years old.

In conclusion, three factors (AP, BMI and %F), present a relevant increase at the third age level ranging from 30 to 39 years old. The adoption of preventive actions is suggested in order to return to the dramatic state at lower ages as a prophylactic way of diseases that commit subjects especially at advanced ages, as hypertension, diabetes, dyslipidemies and cardiovascular problems.

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PHYSIOLOGICAL ALTERATIONS RELATED TO AGING

ABSTRACT

The increase of age is associated with complex changes in some factors as: increase of body weight, BMI and blood pressure; once that those are directly associated. The purpose of this study was to verify and compare the level of arterial systolic and diastolic pressure, percent body fat and BMI of male and female related to age. 307 subjects were evaluated, 146 males and 161 females, 15 to 60 years old, that were distributed among 5 age levels: (1) 15-19, (2) 20-29, (3) 30-39, (4) 40-49, (5) 50-59. The data were evaluated through the program STATISTICA 6.0; the comparisons across age levels were made using ANOVA and *post-hoc* of Tukey. Significant differences in the female group can be observed from 30 year-old age level on, which overreach the regular values of BMI and arterial pressure, being classified as overweight and pre-hypertensive; the values of female body fat overreach the mean values of the lower category, maintaining until 30 years old; when there is a peak of fat accumulation between 40 59 years old. Until 29 years old, the classification of the male BMI is considered normal, after this age level it presents values classified as overweight and hypertension, where the peak value is between 40 and 49 years old; the fat body values were also above the mean values at all age levels, showing a peak after 50 years old. These results permit to conclude that three factors (AP, IMC and %F), present relevant increases at the third age level from 30 to 39 years old, both to male and female; factors that predispose subjects to higher risks of metabolic diseases and cardiovascular changes.

CHANGEMENTS PHYSIOLOGIQUES DE RELATION DU VIEILLISSEMENT

Résumé:

L' augmen tation de l'âge est associé à un réseau complexe de facteurs que souffre changements: auqmentation du poids des corps, auqmentation du Index de Masse Corporelle (IMC) et auqmentation des neviaux de tension artérulli. L'objectif de l'étude a e'té de v'refur et de comparer les neviaux de tension actérulle systolique et dyastolique, percentuel de gras et IMC des homes et des femmes par rapport à l'âge. Il a étí évalué 307 sujects, 166 hommes et 161 femmes (15 à 60 ans) et partager sur 5 neviaux de l'âge: (1) 15-19, (2) 20-29, (3) 30-39, (4) 40-49, (5) 50-59. Les resultants ont étí analisé par le statistica 6.0 et anova. Pour conclure: les 3 facteurs (PA , IMC et %G) ont auqmenté dans le troisième neviau (30 a 39 ans) pour les femmes. As facteurs peuvent prédesposer à maladies du metabolisme et cardiaques.

ALTERACIONES FISILOGICAS EN RELACION AL ENVEJECIMIENTO.

Resumen

El aumento de edad está asociado a una compleja red de factores que sufren alteraciones como: aumento de peso corporal; elevación del IMC y aumento de niveles de presión; estando estas tres variables altamente relacionadas. El objeto de este estudio fue verificar y comparar los niveles de presión arterial sistólica y diastólica; porcentaje de gordura e IMC de hombres y mujeres en relación con la edad. Fueron evaluados 307 sujetos; 146 hombres y 161 mujeres, en un rango de 15 a 60 años, los que fueron divididos en 5 niveles por edades: (1) 15-19; (2) 20-29; (3) 30-39, (4) 40-49, (5) 50-59. Los datos fueron analizados a través de ESTADíSTICA 6.0 para la comparación de los distintos rangos; utilizamos el ANOVA como test *post-hoc* de Tukey. En el sexo femenino se observa que la comparación de los valores presenta diferencias significativas entre los rangos a partir del 30 año, donde sobrepasan los valores normales de IMC y presión arterial, siendo clasificados como sobrepeso y pre-hipertenso; ya que los valores de gordura corporal femeninos sobrepasan los valores de la media de la categoría más baja manteniéndose hasta los 30 años; cuando hay un pico de acumulación de gordura entre 40 y 59 años. En el sexo masculino hasta los 29 años su clasificación de IMC se mantiene dentro de la normalidad, a partir de ese rango pasa a presentar clasificación de sobrepeso e hipertenso, con valores pico entre 40 y 49 años; los valores de gordura corporal también se muestran por encima de la media en el primer rango de edad y así permanecerán en forma creciente hasta la última categoría, teniendo un pico después de los 50 años. Se concluye que los tres factores(PA, IMC y %G) presentan aumentos relevantes en el tercer nivel del rango de edad de los 30 a los 39 años tanto para hombres como para mujeres, factores que predisponen a individuos a mayores riesgos de alteraciones metabólicas y cardiovasculares. Palabras claves: Índice de Masa Corporal; Porcentaje de Gordura; Presión Arterial.

ALTERAÇõES FISIOLÓGICAS EM RELAÇÃO AO ENVELHECIMENTO

Resumo

O aumento da idade está associado a uma complexa rede de fatores que sofrem alterações, como: aumento do peso corporal, elevação do IMC, e elevação dos níveis pressóricos; sendo essas três variáveis altamente relacionadas. O objetivo desse estudo foi verificar e comparar os níveis de pressão arterial sistólica e diastólica, percentual de gordura e IMC de homens e mulheres em relação à idade. Foram avaliados 307 sujeitos, sendo 146 homens e 161 mulheres, na faixa etária de 15 a 60 anos, os quais foram divididos em 5 níveis de faixas etárias: (1)15-19, (2)20-29, (3)30-39, (4)40-49, (5)50-59. Os dados foram analisados através do STATISTICA 6.0, para as comparações entre as faixas etárias, utilizou-se a ANOVA com teste *post-hoc* de Tukey. No sexo feminino observa-se que as comparações dos valores apresentam diferenças significativas entre as faixas etárias a partir dos 30 anos, onde ultrapassam os valores normais de IMC e pressão arterial, sendo classificados como sobrepeso e pré-hipertenso; já os valores de gordura corporal feminino ultrapassam os valores da média já na categoria mais baixa, mantendo-se até os 30 anos; quando há um pico no acúmulo de gordura entre 40 a 59 anos. No sexo masculino até 29 anos a classificação do IMC manteve-se dentro da normalidade, a partir dessa faixa etária passou a apresentar classificação de sobrepeso e hipertensão, com valor de pico entre 40 e 49 anos; os valores de gordura corporal também se mostraram acima da média na primeira faixa etária e assim permaneceram de forma crescente até a última categoria, tendo um pico após os 50 anos. Conclui-se que os três fatores (PA, IMC e %G), apresentam aumentos relevantes no terceiro nível de faixa etária dos 30 aos 39 anos, tanto para homens e mulheres; fatores que predispõem indivíduos a maiores riscos de doenças metabólicas e alterações cardiovasculares.

Palavras chaves: Pressão arterial, IMC, gordura corporal e envelhecimento.