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Impact of Cardiovascular Risk in Elderly Physical Activity Program Participants

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Abstract

Introduction: The wear of the human organism by old age reduces the functions of some organs causing greater burden to the sedentary elderly population.

Objective: The incidence of cardiovascular risk in the elderly has become the objective of this work with individuals who practice physical activities. This study aims to verify the relationship between waist circumference, hip and abdomen in relation to the identification of cardiovascular disease and risk of premature death.

Methodology: We evaluated 112 individuals participants of Physical Activity Programs at Faculty Assis Gurgacz, on the city of Cascavel and Exercise Programs of the Department of Sports and Recreation of the city of Quatro Pontes, sorted by location, gender and age. The variables assessed were age, body mass, body mass index, height, waist circumference, waist circumference and hip circumference in cm, waist/hip ratio and cardiovascular risk based on the W/H. Descriptive statistics were used for each variable by checking the normal distribution of errors in the sample data directly using the Shapiro-Wilk test.

Results: There is a direct relationship between the highest values of waist circumference and the largest numbers of cardiovascular risk, and individuals with higher age tend to have higher risk of cardiovascular disease.

Conclusions: Regular physical activity has demonstrated efficacy for the prevention of cardiovascular disease in the elderly population, besides providing healthy aging.

Keywords: Aging; Cardiovascular disease; Physical activity; Sedentary

Introduction

In our country, aging is a recent phenomenon, but no return on the decline in the fertility rate and mortality recorded in recent decades. It is estimated that the Brazilian elderly population will reach the range of 30 million by 2025. The population aging process has been seen in developed and developing countries, given the positive results found in the medical field and social advances [1].

In 2003, according to the PNAD data, the population aged 60 or more were about 17 million people, accounting for about 10% of the country's total population. In 2006 it was indicated that the elderly were already about 19 million people, demonstrating the increasing aging of the Brazilian society [2].

The first jump in life expectancy in Brazil was seen between 1999 and 2003. Life expectancy after age 60 increased in all age groups calculated during those years, for both sexes, being the life expectancy for women higher. In 2006, the country as a whole, life expectancy of 60 year olds was 19.3 years for men and 22.4 years for women. Among seniors 80 years or more, the expectation of life of women exceeds also that of men: 9.8 years and 8.9 years, respectively [2].

In Brazil, the increase in the number of elderly in recent decades has generated great interest in terms of physiological changes that affect the physical conditions and the reduction of the functions of some organs and systems as advanced in age [1].

In this study statistics will be raised related to health which are the ratio of waist and hip to waist circumference and hip. These measures are used to indirectly indicate the amount of visceral fat, the fat that surrounds the intra-abdominal organs. In the elderly, this fat volume and the distribution of it in the body is correlated with certain diseases such as cardiovascular, hypertension, increases the risk of premature death and morbidity-mortality diseases, atherosclerosis and the consequences of it and even cancer [3].

Given the above study aims to verify the relationship between waist circumference, hip and abdomen in relation to the identification of cardiovascular disease and risk of premature death.

Methods

The article includes ethical research procedures complying with the "Guidelines and Norms Regulating Research Involving Human Subjects" (466/12) issued by the National Health Commission, getting the opinion of the Ethics Committee in Research with Human beings of School Assis Gurgacz, opinion number 089/2013.

The study population included practitioners of elderly exercise projects from School Assis Gurgacz, located at the Municipality of Cascavel and the participants of the exercise program from the Department of Sport and Leisure Four Bridges municipality in the state of Paraná.

A sample was collected from 112 subjects who were classified by location, sex and age. Eight groups were formed by combining two site classes (Four Bridges and FAG), two classes on gender (male and female) and two age classes in years (up to 65 and >65). Individuals sampled on FAG, was obtained a total of 12 female subjects aged up to 65 and 17 women aged over 65 years. A total of eleven men were sampled, three aged 8 to 65 years and over 65 years of age. For sampling related to the city of Quatro Pontes, they were gathered 19 and 41 female subjects, for the categories up to 65 and over 65 years respectively. For men, three were included in the category of minimum age, and nine made up the category with over 65 years [4].

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The evaluated variables were: age (years), body mass (BM) in kg, body mass index (BMI), height (HT), waist circumference (WC), abdominal circumference (AC) and hip circumference (HC) in cm, waist/hip ratio (W/H) and cardiovascular risk based on the W/H.

The elderly were evaluated individually, on the place were they normaly meet for the group activities, during normal frequency schedule in the days combined with the principals and teachers of the establishment, without prejudice to the activities.

Weight measurements were checked, height, BMI and waist circumference and hip circumference and their relationship and abdomen.

For weight measurement was used a scale with a capacity of 200 kg and accuracy of 100 grams was placed standing in front of the balance scale, with lateral clearance of the feet, erect and stare straight ahead. For the measure of height a stadiometer fixed to the wall and an anthropometric square was used. The stadiometer was graduated in centimeters and tenths of centimeters. The participants were instructed to be barefoot while it was evaluated the hight on a standing position with feet together, looking for contact measuring instrument the rear surfaces of the heel, pelvic waist, scapular waist and occipital region. The measurement was performed with the individual in inspiratory apnea and with head oriented in the Frankfurt plane, parallel to the ground. The move was made with the cursor at an angle of 90 degrees will scale. Body mass index was calculated from the formula: BMI=weight kg/Height^{2}m. As BMI reference was used the nutritional status of elderly people who corresponds to the recommendation proposed by the North American Dietetic Association (ADA, 2003) Analysis of anthropometric data in corresponding elderly population in the publication "Food and Nutrition Surveillance-SISVAN". Cohort points of reference BMI <22 kg/m^2=Low weight ≥22 and <27 kg/m^2=Normal weight; ≥27 kg/m^2=Overweight.

For the circumference of waist and hip measurements: We used a flexible metal tape measure with accuracy of 1 millimeter. The waist circumference was measured considering two standards cited by Heyward and Stolarczyk (1996): the narrowest part of the trunk or, if it can not be visualized by considering the recommendations of the World Health Organization (1988) to measure the midpoint between bottom edge of the last rib and the iliac crest [5]. To perform the measure, was assessed with underwear or if you do not have an isolated location may lift the shirt in the height of the lower edge of the breasts.

The hip circumference was measured considering the bulk of the buttocks being evaluated in the right lateral position relative to the evaluator and the pants or shorts below your buttocks. The measure is eventually held on underwear. The waist/hip ratio (W/H) is strongly associated with visceral fat and seems to be an acceptable rate of intra-abdominal fat, although some authors consider that waist circumference seems to be the best visceral fat deposit predictor than the ratio W/H. Moreover, hip circumference is influenced only by the subcutaneous fat deposit and the ratio W/H can change depending on the pattern of menopausal woman (Heyward and Stolarczyk, 1996). The waist/hip ratio (W/H) is calculated by dividing the waist circumference (in centimeters) by the value of (hip circumference in centimeters), like this: W/H=Waist circumference (cm)/circumference hip (cm).

For abdominal circumference the evaluator remained ahead of the evaluated. The assessed remains standing with arms at your sides and feet together. The procedures are the same as those to be followed for waist circumference, except that the tape measure is placed around the assessed at the level of most previous abdominal distension in a horizontal plane. This level is usually, but not always at the navel. The tape is held snugly against the skin without compressing tissue with the tip of the scratch on the noted value. The measurement is collected at the end of a normal expiration to the nearest millimeter (0.1 feet) closest. The isolated measurement of waist circumference have been shown to be sufficient to establish risks, the normal range being considered the circumference <95 cm for men and <80 cm for women. The risk must be at least a classical factor of coronary risk increases substantially when measured in men exceeds 104 cm in women exceeds 88 cm. The waist circumference limit in several studies ranging from 95 to 105 cm, although there is no data available for the Brazilian population.

Descriptive statistics were used which initially was observed for each variable the normal distribution of errors in the sample data directly, using the Shapiro-Wilk test. The following was preceded visual analysis of disparate data through charts in box (box plots), in which are used the descriptive statistics of the five numbers, expressed by the minimum and maximum value, the first (Q1) and the third quartile (Q3), and the median of the observed data. Observations with greater value greater than + Q3 1,5IQR or lower lower Q1-1,5IQR were considered outliers, where IQR the interquartile range (Q 3-Q 1), which contains 50% of the data analysis variance (ANOVA). Except for the binary variable "risk", the simple effects location, gender and age, the effects of double interaction between location and gender, location and age, and gender and age, and the triple interaction effect between location, gender and age have been checked by the F test, considering the ANOVA for unbalanced data with sum of squares of the type III.

The average associated with significant effects location, gender and age were compared by F test in ANOVA for unbalanced data and presented through graphs in columns.

In the absence of statistical significance in ANOVA for all interaction effects, we opted for the presentation, by means of tables, the average data relating to combinations of factors associated with the interaction of the highest degree.

The local effects, sex, age and interactions on the binary data of the variable "danger" were verified by analysis of the deviance (ANODE), using the theory of generalized linear models, which set the binomial distribution with logit link function (log (μ/μ-1). The verification of the significance of the statistical model factors was performed by the deviances difference between two test models which roughly follows the distribution $\chi^2_{n\text{-}p(\alpha)}$ [5] and corresponds to the analysis of type I [6]. The presentation of the risk ratios associated with significant factor in class ANODE was performed by means of graphs in columns.

The quality adjustment models to the observed data was evaluated by comparing the ratio of value between residual deviance and residual degrees of freedom to the percentiles of the distribution $\chi^2_{n\text{-}p(\alpha)}$ [7], whose value should be approximately one.

The degree of association between the dependent variables, including age (years), was evaluated by Pearson correlation analysis. The 5% level of significance was adopted in all hypothesis testing. The analyzes were performed using the R Development Core Team (2013) [8].

Results

In the visual assessment of disparate data through graphical analysis, there was the presence of an outlier to body mass, BMI and hip circumference. Three outliers were displayed for the variable abdominal circumference. For the other variables, it was not observed the presence of outliers. It was proceeded the removal of outliers variables of the database. Although differing in general the values assumed by outliers were considered real, which reflected the variation found in the features.

We opted for the use of models with the normal distribution of variable data, given the adherence to the normal probability distribution ($p>0.05$) for all dependent variables evaluated, except for the binary variable "risk". The significance probability values of the Shapiro-Wilk test applied to the raw data were: BM=0.1929, HT=0.7065, BMI=0.5969, WC=0.3575, HC=0.0699, W/H=0.1816, 0.2402 and AC=AGE=0.6821 [9,10].

For the raw age data, the acceptance of the null hypothesis for the normal distribution indicated that the Pearson correlation analysis should be adopted to assess the degree of association between age and the other variables.

Before the data normality results, it can be seen that there were no restrictions on the use of analysis of variance as a procedure to detect the effects of the factors included in the statistical model on the variables body mass, height, BMI, waist circumference, circumference Hip, waist/hip ratio and waist circumference.

As Tables 1 and 2 shows the average measures of age, body mass, height, body mass index, waist circumference, hip circumference, waist/hip ratio, waist circumference, Cardiovascular Risk seniors of physical activity program in Cascavel and four bridges.

There was no effect ($p>0.05$) location on the body mass, height, BMI, waist/hip and waist circumference. Otherwise, there was a significant effect ($p<0.05$) location on the circumference of waist, hip circumference and cardiovascular risk.

The average values observed for waist circumference, hip circumference and cardiovascular risk, obtained on the subjects from Four Bridges were 97.6 cm, 106.4 cm and (0.82%), respectively. These values were higher ($p<0.05$) to their average waist circumference (88.1 cm), hip circumference (100.4 cm) and risk (0.55%), found in individuals from FAG. Thus we can see that individuals Four Bridges municipality which has largest circumference than individuals from FAG where we could identify cardiovascular risks.

There were no differences ($p>0.05$) between male and female individuals in mean body mass, BMI, hip circumference and abdominal circumference. There was a significant effect ($p<0.05$) sex in stature, waist circumference, waist/hip ratio and cardiovascular risk, indicating that gender factor acted independently of other factors.

Features	Fem ≤65	Fem >65	Male ≤65	Male >65	CV (%)
Age	61,26	74,54	63,67	74,44	10,97
Body Mass	75,32	72,42	79,10	83,73	18,42
Height	163,03	161,10	167,87	168,89	4,84
BMI	28,06	27,84	27,96	29,50	15,93
WC	95,93	96,32	100,40	106,36	13,22
HC	107,42	106,20	105,23	105,64	9,41
WC/HC	0,89	0,91	0,95	1,01	9,66
AC	101,96	104,18	103,90	110,00	11,93
Cardiovascular risk	0,84	0,93	0	0,56	62,14

Table 1: Average data of the variables evaluated in individuals of Four Bridges municipality, by combination of sex and age classes.

Features	Fem ≤65	Fem >65	Male ≤65	Male >65	CV (%)
Age	61,33	71,65	59,00	73,88	10,97
Body Mass	72,84	74,22	83,40	76,06	18,42
Height	160,45	162,32	169,33	168,16	4,84
BMI	28,40	27,87	29.09	26,82	15,93
WC	86,67	86,59	95,00	90,62	13,22
HC	102,25	101,94	97,67	95,12	9,41
WC/HC	0,85	0,85	0,97	0,95	9,66
AC	99,00	104,18	97,67	95,12	11,93
Cardiovascular risk	0,67	0,65	0,33	0,25	62,14

Table 2: Average data of the variables evaluated in individuals at FAG, by combination of sex and age classes.

Features	Mean	DP	Min	Max	CV (%)
Age	61,30	4,01	51,00	65,00	6,55
Body Mass	75,48	12,70	50,99	97,61	16,83
Height	163,61	7,33	143,00	178,50	4,48
BMI	28,25	4,75	17,96	38,61	16,80
WC	93,21	12,58	62,50	115,50	13,50
HC	104,78	10,44	90,00	133,50	9,96
WC/HC	0,89	0,08	0,69	1,02	9,39
AC	100,78	12,46	68,00	127,00	12,37
Cardiovascular risks	0,68	0,47	0	1,00	70,24
CV: Variation Coefficient; n=37.					

Table 3: Means observed variables assessed in individuals aged up to 65 years, regardless of location and gender.

Features	Mean	DP	Min	Max	CV (%)
Age	73,80	5,24	66,00	90,00	7,09
Body Mass	74,57	14,37	48,00	122,00	19,27
Height	163,07	8,20	148,20	181,00	5,03
BMI	27,94	4,35	18,45	40.76	15,58
WC	94,71	12,44	65,00	118,50	13,14
HC	103,99	9,54	80,00	126,00	9,17
WC/HC	0,91	0,09	0,68	1,13	9,74
AC	103,91	12,13	77,00	137,00	11,67
Cardiovascular Risk	0,75	0,44	0	1,00	58,64
CV: Variation Coefficient; n=75.					

Table 4: Means observed variables assessed in individuals aged superior to 65 years, regardless of location and gender.

Age	NS	NS	NS	NS	NS	NS	NS	NS
-0,06	**BM**	***	***	***	***	***	NS	***
-0,04	0,48	**HT**	NS	*	NS	**	NS	NS
-0,04	0,84	-0,04	**BMI**	***	***	***	*	***
0,06	0,80	0,21	0,79	**WC**	***	***	***	***
0,07	0,70	0,07	0,76	0,71	**HC**	NS	NS	***
0,07	0,44	0,26	0,36	0,70	0,06	**WC/HC**	***	***
0,005	0,16	-0,06	0,21	0,38	0,16	0,32	**CR**	**
0,12	0,79	0,12	0,83	0,85	0,81	0,39	0,29	**AC**
Significance Codes: *p ≤ 0,05; **p ≤ 0,01; ***p ≤ 0,001; NS p>0,05								

Table 5: Estimates of Pearson correlation coefficients (lower diagonal) between pairs of variables and their significance levels (upper diagonal).

Men had higher mean values ($p\leq0.05$) of stature, waist circumference and waist/hip ratio than their average values of women. Mean values for Height were 168.6 cm (men) and 161.9 cm (women). For the circumference of waist, men had a mean value of 98.6 cm, while women obtained 93.1 cm. The ratio waist/hip average was 0.98 (men) and 0.89 (women).

Opposite behavior was observed for sex effect on cardiovascular risk, with higher average value ($p=0.05$) for women (0.82%) compared to men who had an average risk (0.35%).

There was no significant effect of age categories for all variables. The average values of variables according to age groups (≤65 and >65 years), as shown on Tables 3 and 4 by age group.

Regarding to the Pearson correlation analysis (Table 5), it was observed that most of the estimatives showed a direct relationship. These

results indicated that such pairs of variables are directly associated, or to a larger values correspond to larger values of the other.

The degrees of magnitude greater association occurred between waist circumference and abdominal circumference (r=0.85), body mass with BMI (r=0.84), which were significant (p≤0,001), indicating that such estimates were valid to estimate their population correlation coefficients.

In Brazil, (Tavares and Anjos) analyed the data of elderly aged 60 or more in all regions of the country reported an overall prevalence of 5.2% and 18.2% among men and women respectively. When analyzed only the elderly of the south, obesity was found in 9.2% of men and 23.3% women, coinciding with the data obtained in this study. Taddei et al., 1997 realised a multicenter study in ambulatory elderly, found that 36% of women had IMC³ 27.3 and 22% of men with IMC³ 27.8.

The inverse association of greater magnitude occurred between age and body mass, stature and risk, both with estimated r=-0.06 and not significant at the 5% probability. These results show that the estimates do not serve as reliable estimator for the population correlation coefficient, ie, it can be considered that there was no association between pairs of the aforementioned characteristics. In general, the degrees of association inverse presented with low magnitude, approaching zero, with no important information for discussion.

Santos and Sichieri, evaluated elderly participants of survey conducted in 1996 in the city of Rio de Janeiro, where they found that about 50% of the elderly were overweight, a result similar to that found in the present study where the overweight rate was 66, 67%.

In Brazil, (Tavares and Anjos) analyzing the data of elderly aged 60 or more in all regions of the country reported an overall prevalence of overweight of 5.2% among men and 18.2% among women. When analyzed only the elderly in the southern region, overweight found was 9.2% in men and 23.3% in women, coinciding with the data obtained in this study, the prevalence was also among women.

For every 112 data pairs, regardless of location, age and sex, the relationship between the waist/hip and cardiovascular risk presented directly and low to medium magnitude (r=0.32, p≤0,001). Such information is important in this research, as it showed that individuals with higher relationship waist/hip are in the risk category for cardiovascular disease.

Discussion of Results

Knowing that obesity is a cardiovascular risk factor in the population shows that this concept is poorly studied. We can see that in relation to data collected most of the sample was female for both, Four Bridges and FAG. Another aspect to which we can point out is that there was no difference between the interaction between location and gender, location and age, gender and age, and location, gender and age on the variables evaluated. Consequently, the average daily levels of body mass, height, BMI, waist circumference, hip circumference, ratio waist/hip, abdomen circumference and cardiovascular risk individuals did not differ in comparisons of effects between hierarchical location, gender and age showing independence between the factors.

To the study of statistics observed that the minimum age between the two sites studied was 61 years and maximum 74 years for females, for males the youngest was 59 and the oldest 74, the average body weight for females was 72 kg to 75 kg, while for males the average was 79 kg to 83 kg, an important bridge we have to emphasize in this study is the issue of height where it was observed that the smaller 65 for the largest obtained an average of 164 cm to 161 cm this proves - if they were short people for so this also indicates the high BMI index, because they are heavy and low. As waist circumference in Four Bridges of individuals obtained for females between the upper and lower age than 65 years were 95 cm, 93 cm to 96.32 cm while for males got 100.40 cm to 106.36 cm, individuals FAG average was 86.67 cm to 86.59 cm for women and 95.00 cm for men 90.62 cm based on references that indicate that waist circumference classification where the ideal medium for females is 88 cm and males 102 cm and women of Four Bridges as long as they are above the reference to the age, as individuals FAG are near the ideal average. As the circumference of the abdomen was found that they had observed an average for women younger than 65 years.

In the study we found that there is a direct position to cardiovascular risk with waist circumference, the largest waist circumference values correspond to higher risk values and is not a strong relationship, same with waist-hip ratio, the same results have data positive, but the height is negative, the individual over the age tend to have higher risk.

Conclusions

The active lifestyle with physical activity, again, is fundamental for the elderly as it reduces the effects of aging. Physical inactivity present in the lives of most elderly can be tackled by involving them in physical activities and exercise programs. Besides, have beneficial effects on the psychological, social and cognitive the elderly.

The Paraná occupied the 6th place in relation to the human development index (HDI) between the states of Brazil, with an estimated average life of 77.9 years for women and 71.6 years for men. The municipality of Four Bridges, located in the western region of Paraná, presented a total of 3,803 inhabitants and met in 3rd place in the HDI aspect, among the other municipalities of the state of Paraná, is considered a city with a high longevity index [2].

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