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ORIGINAL ARTICLE

BODY COMPOSITION AND ANTHROPOMETRIC EVALUATION OF ADULTS COMPOSIÇÃO CORPORAL E AVALIAÇÃO ANTROPOMÉTRICA DE ADULTOS COMPOSICIÓN CORPORAL Y EVALUACIÓN ANTROPOMÉTRICA DE ADULTOS

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ABSTRACT

Objective: to evaluate the nutritional status and body composition of adults. **Method:** it is a cross-sectional, descriptive and quantitative study, performed at a school clinic with 80 individuals of both genders. The nutritional status was assessed by body mass index and waist circumference. Body composition was determined by bioimpedance. Data were analyzed using the chi-square test and Pearson's correlation. The study was approved by the Research Ethics Committee, CAAE Number 19987213.2.0000.5210. **Results:** it was found that 51.25% of the participants had overweight, 45% showed that their waist circumference was increased or very increased, and 74.68% had increased fat percentage. **Conclusion:** the proportion of adults with overweight and obesity was high in this group. This shows the necessity of actions for food education and to encourage physical activity as health promotion measures. **Descriptors:** Nutritional Status; Body composition; Anthropometry.

RESUMO

Objetivo: avaliar o estado nutricional e composição corporal de adultos. **Método:** estudo transversal, descritivo, quantitativo, realizado em uma clínica escola, com 80 indivíduos de ambos os sexos. O estado nutricional foi avaliado por meio do índice de massa corporal e da circunferência da cintura. A composição corporal foi determinada por bioimpedância. Os dados foram analisados por meio do teste qui-quadrado e correlação de Pearson. A pesquisa foi aprovada pelo Comitê de ética em Pesquisa, CAAE nº 19987213.2.0000.5210. **Resultados:** observou-se que 51,25% dos participantes possuíam excesso de peso, que 45% apresentaram circunferência da cintura aumentada ou muito aumentada, e 74,68% tinham percentual de gordura aumentado. **Conclusão:** a proporção de adultos com excesso de peso e adiposidade foi elevada no grupo estudado. Isso mostra a necessidade ações de educação alimentar e de incentivo à prática de atividades físicas como medidas de promoção de saúde. **Descritores:** Estado Nutricional; Composição Corporal; Antropometria.

RESUMEN

Objetivo: evaluar el estado nutricional y composición corporal de adultos. **Método:** estudio transversal, descriptivo, cuantitativo, realizado en una clínica escuela, con 80 individuos de ambos sexos. El estado nutricional fue evaluado por medio del índice de masa corporal y de la circunferencia de la cintura. La composición corporal fue determinada por bioimpedancia. Los datos fueron analizados por medio del test chi-cuadrado y correlación de Pearson. La investigación fue aprobada por el Comité de ética en Investigación, CAAE nº 19987213.2.0000.5210. **Resultados:** se observó que 51,25% de los participantes poseían exceso de peso, que 45% presentaron circunferencia de la cintura aumentada o muy aumentada, y 74,68% tenían porcentaje de gordura aumentada. **Conclusión:** la proporción de adultos con exceso de peso y adiposidad fue elevada en el grupo estudiado. Eso muestra la necesidad acciones de educación alimentar y de incentivo a la práctica de actividades físicas como medidas de promoción de salud. **Palabras clave:** Estado Nutricional; Composición Corporal; Antropometria.

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INTRODUCTION

Obesity is considered a major public health problem worldwide, affecting men and women of all social classes, ages, and cultures. It constitutes a risk factor for cardiovascular, musculoskeletal and neoplastic diseases.¹

The prevalence of obesity has increased among adults in developed and developing countries. From 2008 to 2009 obesity has reached in Brazil at least 10% of the population. Projections based on national surveys conducted in recent decades estimate that obesity reaches in 2025, 40% of the population in the United States, 30% in England and 20% in Brazil.²

Anthropometry is the most common method for diagnosing obesity in population studies to be the most inexpensive, non-invasive, universally applicable and well accepted by the population. Among the most used anthropometric indicators, there are the Body Mass Index (BMI) and Waist Circumference (WC).³

The electrical bioimpedance (BIA) is a method for assessing body composition and widely used nutritional status. It is characterized by being a non-invasive, practical method and can be done at the bedside, being used in healthy and sick individuals.⁴

The assessment of body composition has been highlighted due to the role of body components on human health. Excess body fat mass and its centralized distribution are highlighted by the influence in the onset of chronic diseases, especially cardiovascular diseases.⁵

Considering the increasing prevalence of related obesity with changes in lifestyle, it becomes evident the seriousness of this problem in the population as a whole, justifying this study in order to evaluate the nutritional status and body composition of adults seen at a school clinic, through the classification of BMI, waist circumference and body fat percentage measured by BIA.

METHOD

Article elaborated from the dissertation << Excess weight and food intake in adults >> presented to the Professional Master's Program in Health University Center of family UNINOVAFAP. Teresina-Pi, Brazil. 2014.

It is a cross-sectional, descriptive study with a quantitative approach, performed in an Integrated Health Service of a Higher Education Institution located in the city of Teresina - Piauí. The choice of location was

because the service provides care for people in all life cycles, as well as the receptivity to conduct this type of study and projects involving the health of the general population.

The sample was composed of adults of both genders, aged 20-59 years old, without any other nutritional appointment before, attending the service from August to December 2013. To estimate the sample size, a survey of care provided in the months before the study was carried out, where the average monthly of adults were 20 people, totaling 80 subjects in a semester.

The following criteria for selection were considered: age from 20 to 59 years old, having sought the Nutrition Service voluntarily and not presenting any physical limitations that would prevent the performance of anthropometric measurements or BIA.

The data collection instrument consists of a form for recording the anthropometric and BIA measures. Body weight measurements were taken (kg), height (m) and waist circumference (cm). Later, the body mass index (kg/m^2) was calculated and classified according to the cutoff points for the diagnosis of overweight and obesity, established by the Food and Nutrition Surveillance System (SISVAN).⁶

The anthropometric measurements were performed in a standardized manner. To weight checking, a Filizola scale with a capacity of 150 kg and 100 g division was used. For height, the stadiometer coupled to the scale was used. Weight and height were obtained calculating BMI (Body Mass Index) by its formula: $\text{BMI} = P/A^2$, where P =current weight (kg) and A =height (m).

Waist circumference was measured with an inextensible and inelastic measuring tape, with 0.5 cm scale, at the midpoint between the last rib and the iliac crest, and the tape placed in a horizontal plane. The waist circumference was classified according to cutoff points defined in action levels, using the cutoff points established by the World Health Organization (WHO)⁷, both in clinical as in health programs, as shown below. Level 1 of action or increased risk for morbidities associated with obesity (WC between 80 and 88 cm for women and between 94 and 102 cm for men), in which the individual should be advised to stop gaining weight and adopt a healthy lifestyle; and Level 2 or very increased risk (≥ 88 for women and ≥ 102 for men), in which the individual should seek health professional help for weight loss and search for other risk factors.

The assessment of body fat was performed by BIA, using four-pole apparatus of Biodynamics, model 310 (BIAT). For more accurate results, instructions were given that should be taken by participants before the test. The electrodes obeyed the following guidelines: on the right foot, a distal electrode in the base of the middle finger and the proximal between the medial and lateral malleolus; and on the right hand, distal electrode in the middle finger base and the proximal electrode coinciding with the styloid process. For the determination of adiposity index, body fat levels were classified according to the cutoff points suggested by Lohman.⁸

Through the results of BIA, the basal metabolic rate (BMR) was estimated and compared these results with the value obtained by Basal Metabolic Rate prediction equation established by FAO/WHO/ONU.⁹ To calculate the BMR, gender, age and ideal weight were considered according to each patient.

The results of the phase angle obtained from the BIA were also analyzed. For comparison purposes, the reference values were used for research conducted in American healthy adults¹⁰ establishing a cutoff variation of five degrees for both genders. These values

were used as a reference by the lack published data of the population.

The study met the guidelines and norms of Resolution 466/2012 of the National Health Council/Ministry of Health, which deals with the ethical aspects of research involving human beings and was approved by the Ethics Committee in Research UNINOVAFAP, with CAE number 19987213.2.0000.5210. After the clarification of the aims and methods of the research, the participants signed an informed consent form (TCLE).

Data were analyzed using the Statistical Package for Social Sciences software (SPSS) version 12.0. Associations were tested by applying the chi-square test and the relationship between the variables using Pearson's correlation test. The level of significance was set at $p < 0.05$.

RESULTS

Study participants were 80 individuals aged 20 to 59 years old with a mean age of 28.1 years old and most were female (83.55%). When evaluating the distribution of the population to the overall nutritional status (Table 1), it was observed that more than half (51.25%) had excess weight, obesity and overweight proportions of 28.75% and 22 5%, respectively.

Table 1. Distribution of adults assisted in a school clinic in Teresina-Pi according to global nutritional status classified by BMI, 2013.

Nutritional status	Gender		Total n (%)	p value χ^2
	Male n (%)	Female n (%)		
Low weight	0 (0.00)	5 (7.46)	5 (6.22)	$p = 0.051^*$ $\chi^2 = 6.953$
Eutrofic	2 (15.38)	32 (47.76)	34 (42.50)	
Overweight	5 (38.43)	18 (28.86)	23 (28.75)	
Obesity	6 (46.15)	12 (17.92)	18 (22.50)	

p- marginal value.

Regarding the Waist Circumference, 37.77% had increased circumference indicating increased risk for morbidities associated with obesity for men and 19.40% for women, and 39.15% of men and 19.40% of women had

increased circumference or very increased risk (Table 2). As for the fat percentage (Table 3), 74.68% of the population showed high values, of which 37.97% had a high risk of obesity.

Table 2. Distribution of adults assisted in a school clinic in Teresina-Pi according to the classification of waist circumference, Brazil, 2013.

Classification of waist circumference	Gender		Total n (%)	p value χ^2
	Male n (%)	Female n (%)		
Normal	3 (23.08)	41 (61.20)	44 (55.00)	$p = 0.026$ $\chi^2 = 0.732$
Increased	4 (37.77)	13 (19.40)	17 (21.25)	
Very increased	6 (39.15)	12 (19.40)	18 (23.75)	

Table 3. Distribution of adults assisted in a School Clinic in Teresina-Pi according to the percentage of body fat and gender, Brazil, 2013.

Percentage of Body Fat	Gender		Total n (%)	p value χ^2
	Male n (%)	Female n (%)		
Low (Malnutrition)	0 (0.00)	1 (1.52)	1 (1.27)	p=0.933 $\chi^2=0.680$
Low than the average	1 (7.69)	5 (7.58)	6 (7.59)	
Average	2 (15.38)	12 (18.18)	14(17.72)	
Above the average	6 (46.15)	23 (34.85)	29 (36.71)	
High risk (obesity)	4 (30.77)	26 (39.39)	30 (37.97)	

There was a weak correlation between the variables related to nutritional status and age of the study participants. BMI showed a strong correlation between WC (r=0.936) and the % of Body Fat was variable that most correlated to other markers, showing a moderate relationship with age (r=0.406), BMI (r=0.591) and WC (r=0.507) (Table 4).

Table 4. The relationship between the variables related to nutritional status used for assessing the adults assisted in a School Clinic in Teresina-Pi, Brasil, 2013.

Variables	AGE r	BMI r	WC r	% BF r
Age	1	0.300	0.340	0.406
BMI	0.300	1	0.936	0.591
WC	0.340	0.936	1	0.507
%BF	0.406	0.591	0.507	1

* R value obtained through the Pearson correlation test. $r < 0.3$ indicates low correlation; $r \geq 0.3$ and < 0.7 indicate moderate correlation; and $r \geq 0.7$ indicates strong correlation.

Table 5 shows the distribution of adults studied based on some of the indicators that complement the BIA test. It was observed that 16.2% of participants in this study had a basal metabolic rate deemed optimum, according to the equation FAO/WHO/UNU (1985), and 51.3% of the sample were at levels below with

BMR the recommended values. In the phase angle, the significant difference found should not be considered as an association between this variable and gender, since the phase angle of the entire sample presented a value above five degrees.

Table 5. Basal metabolic rate and phase angle of adults assisted in a School Clinic in Teresina-Pi Clinic according to gender, Brazil, 2013.

Parameter evaluated	Gender		Total	p value
	Male	Female		
	n (%)	n (%)		
Basal metabolic rate				
Ideal	02 (15.4)	11 (16.4)	13 (16.2)	p = 0.880
Above the recommendation	05 (38.5)	21 (31.3)	26 (32.5)	$\chi^2 = 0.256$
Below the recommendation	06 (46.1)	35 (52.3)	41(51.3)	
Phase angle (degrees)				
< 5	0	0	0	p = < 0.001
> 5	13(16.2)	67 (84.8)	80 (100.0)	$\chi^2=72.9$

DISCUSSION

The predominance of female participants in this study is justified by the fact that women prove more concerned about their health and also with aesthetics. These results corroborate other studies. Thus, this result is consistent with a study of adults attending a University Center of Minas Gerais,¹¹ as well as a study carried out with adults living in Ribeirão Preto.¹²

More than half of the participants were overweight, with obesity frequency corresponding to 22.5% of the respondents. These findings are similar to those found in adults assisted in the Family Health Strategy.¹³ On the other hand, lower values were found in a population-based study of

adults living in the city of Teresina, where was also performed this work, in which the prevalence of excess weight was equal to 37.7%, and obesity was 7.7%.³ Factors that have been associated with the high prevalence of overweight and obesity are the changes in people’s lifestyle seen with the process of urbanization and industrialization that mainly occurred in the last thirty years. One possible explanation for the higher frequencies of overweight and obesity among adults attending the school clinic when compared to those of the adult population of the capital of Piauí is the fact this research have addressed only a group of adults who sought nutritional care in a medical school, with the main objective to weight loss.

A waist circumference of the measure constitutes an important tool to identify the degree of central adiposity in individual and collective assessments.¹⁴ An association between increased and very increased waist circumference was found in the male. Similar results were found in a study conducted with 30 employees of a University in São Paulo.¹⁵ This result could be explained by considering that most of the study participants were women, which seems to represent more concerned with their image. However, a survey of workers in a hotel on the Bahian coast showed similar frequencies of increased waist circumference between the gender.¹⁶

The BIA consists of a method of assessing body composition of great application in clinical practice to provide an estimate of lean mass and body fat compartments. In this study, evaluation using the BIA showed that most of the adults surveyed with an elevated risk of obesity, especially in the group of women compared to men. Such evidence can be justified through a survey of 852 individuals of both genders, showing that there is a greater maintenance of fat mass in men while in women fat mass increases progressively with age; thus concluding that women have a greater increase in body fat with age compared to men.¹⁷

As for the correlation study, a survey of 98 men aged between 20 and 58 years old showed a strong correlation between BMI and waist circumference and found correlations between anthropometric variables (BMI, WC, RCQ) and body fat percentage.¹⁸ These results are similar to those found in this study, in which the percentage of fat mass showed a weak to moderate correlation with the anthropometric variables evaluated.

The existence of a strong correlation between BMI and waist circumference can be regarded as expected since, as the BMI increases the waist circumference increases. This finding combined with the high frequency of increased or very increased waist circumference in adult participants of this study is worrisome because central adiposity is a major risk factor for cardiovascular and metabolic diseases.¹⁹

This analysis reinforces the importance of using anthropometric indicators as an alternative on the evaluation and exercise prescription in large scale groups. The practicality and low cost in evaluating allow a greater range of the population's nutritional status monitoring of scope, supporting interventions the epidemiological level programs.²⁰

In the assessing of the basal metabolic rate of this study, it was observed that half of the population has energy expenditure below the reference values considered. This result can be partially explained by the fact that more than half of participants had overweight. In this regard, a study to compare basal metabolic rate and body composition before and after an exercise program showed that the basal metabolic rate decreases with increasing body weight and concomitant increase in fat mass.²¹

Corroborating the findings of this study, a research of 60 volunteers living in the city of Porto Alegre - RS, under standardized conditions of fasting, rest and environment, showed that the absolute average basal metabolic rate was higher in eutrophic group compared to the group had obesity or overweight.²² In absolute numbers, obese people usually have more decreased BMR values since they have more fat mass and is metabolically less active, causing the basal metabolic rate reducing it.²³

It is important to highlight that due to women having presented percentage values of higher fat, they exhibited lower values of basal metabolic rate when compared to males. One possible explanation for these results is the differences in body composition found in both genders, while men have more muscle mass and bone mass, women tend to have a higher accumulation of fat and a bad general distribution of adipose tissue.

The analysis of the Phase Angle (PA), its biological significance has not been fully elucidated. However, this variable can be interpreted as an indicator of the integrity and function of cell membranes and also related to the ratio between extra and intracellular water. Thus, low PA are related to cell death or reduced integrity of cell membranes, lean mass reduction and increased morbidity and mortality.¹⁰

In this study, women have higher phase angle values when compared to those found for men. This result can be explained because of the possible change in the degree of hydration related to compliance with the guidance given to the examination, such as hydration, physical activity, nutrition and menstrual cycle.

As for whether the population studied showed higher values of five degrees, it is believed that this fact may be related to the high frequency of high BMI in the adult study group, considering that there is a strong relationship between BMI and the phase angle values. In this context, the results

demonstrating higher phase angle in individuals with BMI, possibly because of the phase angle is dependent on the integrity of tissues and cell capacitance. 24

Another factor that may help explain the results is the frequency of low birth weight found in the sample studied by using BMI in the overall nutritional status classification because the phase angle values are reduced with the worsening malnutrition. In a study of 1967 healthy American individuals to verify the reference values for the phase angle, it was considered in their sample than those patients who presented phase angle values lower than five degrees were considered malnourished.¹⁰

However, there is a concern in taking on the reference values of international studies, considering the demographic and anthropometric differences among the populations of these studies and those of a mixed population as it is the Brazilian population⁵. Although the PA is highlighted as an important morbidity marker and mortality some diseases (and thus a potential indicator of nutritional status), it is necessary to study it in greater depth since it is still a parameter not so used and there are controversies about its relation to nutritional status markers.²⁴

FINAL CONSIDERATIONS

In the group of adults studied, there were high proportions of overweight and adiposity based on nutritional status assessment methods used. These findings demonstrate the need to mobilize the authorities to set health policies, including food education activities combined with encouraging physical activity as promotion policies and prevention of health and control chronic diseases.

The anthropometric assessment constitutes a method of easy execution and good application in detecting diseases related to being overweight and adiposity, for use in groups of healthy or sick people.

Regarding the anthropometric markers, it can be seen that the anthropometric measures appear to be sensitive indicators of health, aimed at early detection of diseases related to obesity and cardiovascular risk for these patients.

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