Prevalence of Abdominal Obesity in Hypertensive Patients Registered in a Family Health Unit

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Abstract

Background: Abdominal obesity is an important cardiovascular risk factor and, along with dyslipidemia, impaired glucose tolerance and hypertension, it makes up the metabolic syndrome.

Objective: To investigate the prevalence of abdominal obesity and associated factors in hypertensive patients.

Methods: Cross-sectional study with hypertensive patients aged 20 to 79 registered in a Family Health Unit in the city of Londrina, Paraná. Abdominal obesity was found through waist-hip ratio (WHR) and waist circumference (WC) according to the cutoff points recommended by the World Health Organization (WHR ≥ 1.0 and ≥ WC 102 cm for men and WHR ≥ WC 0.85 and ≥ 88 cm for women).

Results: Among 378 respondents, the prevalence of abdominal obesity determined by WHR was 65.3% in adults and 68.1% in the elderly, and 87.9% in females and 30.2% in males (p <0.001). In women, WHR was associated with reports of high cholesterol, failure to perform regular physical activity, lack of paid work and low education. There was no association of WHR with any variables in males. High waist circumference was present in 66.8% of adults and 64.3% of elderly patients, also with differences between sexes (p <0.001). High waist circumference was associated, in women, to diabetes and to nonsmoking, and in men, to diabetes and to physical inactivity.

Conclusion: These results show a high prevalence of abdominal obesity, especially among women, reinforcing the need for strategies to reduce abdominal obesity among hypertensive patients. (Arq Bras Cardiol. 2010; [online]. ahead print, PP.0-0)

Key words: Obesity, abdominal; prevalence; hypertension; health centers.

Introduction

Hypertension is a major risk factor for cardiovascular disease (CVD)[1-3]. It is the main cause of admission of a large number of patients in emergency rooms of hospital services[1,4]. Hypertensive patients require special attention in the control of some comorbidities[5] and in early detection of other cardiovascular risk factors[6], such as diabetes, sedentary lifestyle, smoking and obesity[7].

In this context, abdominal obesity stands apart, as it is considered harmful to health because it is more associated with cardiovascular morbidity and mortality[8]. Some authors have recently demonstrated the importance of abdominal obesity as a cardiovascular risk factor, especially when associated with dyslipidemia, glucose intolerance and hypertension, making up the metabolic syndrome[9,10].

This type of obesity can be determined by anthropometric measurements, abdominal ultrasound and nuclear magnetic resonance[11]. Although ultrasound and tomography are measures with greater accuracy in the determination of abdominal fat[12], anthropometric measurements allow a greater applicability[13,14] because they are inexpensive and easy to execute[15,16]. Moreover, they correlated well with imaging methods, making possible its use in outpatient care units[15,17].

Faced with the need for studies to investigate the prevalence of abdominal obesity in people who already have a risk factor for metabolic syndrome, i.e., hypertension, and the importance of determining factors associated with this condition for the purposes of prevention, this study seeks to investigate the prevalence of abdominal obesity and associated factors in hypertensive patients.

Methods

This is a cross-sectional study conducted between January and June 2007, with hypertensive patients registered in a Family Health Unit (FHU) in the city of Londrina, Paraná, southern Brazil. The city population estimated for 2008 was 505,184 million inhabitants[18], and in the FHU area, about 6,000 inhabitants[19].

We studied hypertensive patients aged 20 to 79, registered in at least one of the Family Health Unit's sources of information: Database and Monitoring of Hypertensive

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and Diabetic Patients (Hiperdia), Basic Attention Information System (SIAB), or appointment sheets used in the service for monitoring and scheduling of return of hypertensive patients. From the intersection of these sources of information, we obtained a number of 695 hypertensive patients. Considering an error of 3.5%, confidence level of 95% and 50% prevalence, we determined a sample of 442 individuals (including estimated losses or exclusions of 20%).

The sampling was systematic and random, with pre-sorting by sex and age, to ensure proportionality. Out of the total sample, 52 were excluded due to change of address to another Family Health Unit area (33), death (6), for being outside the defined age range (1) and for not having any hypertension history (12).

Data were collected through interviews from the homes of patients selected in up to five visits to obtain demographic and economic data, lifestyles, current diseases and anthropometric measurements (waist and hip). Data collection was conducted by interviewers trained and evaluated in theory and practice sessions. Waist and hip measurements were obtained with an inextensible measuring tape with a width of 1.0 cm and minimum unit of 0.1 cm. A prior pilot study was performed to adapt the data collection document to respondents' reality. A re-interview with 10% of the final sample was performed to assess data reliability.

In order to take waist and hip measures, the individual remained standing upright, with as little clothing as possible. Waist measure or waist circumference was obtained by positioning the measuring tape on an imaginary median line between the iliac crest and the last rib at the level of the umbilicus and was taken at the end of the expiratory movement. Hip circumference was measured at the largest extension of the buttocks. In both measures, the tape was positioned in a horizontal position without pressing the soft tissues[20].

The dependent variables analyzed were waist-hip ratio (WHR) and high waist circumference (WC). WHR was calculated from the waist circumference divided by the hip circumference. Individuals with abdominal obesity were those with WHR $\geq$ 1.0 for men and $\geq$ 0.85 for women. For the waist circumference, cutoff points of $\geq$ 102 cm for men and $\geq$ 88 cm for women[15] were used.

The independent variables were:

• *Age group* - divided into two, 20 to 59 (adults) and 60 to 79 (elderly).

• *Education* - up to 3rd grade (elementary school or low education) and 4th grade or more.

• *Paid work* - considered positive if the person received any type of earnings (either from registered work or not); otherwise, it is considered negative.

• *Economic class* - as proposed by the Brazilian Association of Research Companies (ABEP) through the Brazilian Economic class Criteria (CCEB), which takes into account the purchasing power of individuals and households and the education of breadwinners[21]. Respondents were classified into classes A, B or C (best economic conditions) and D or E (worst economic conditions).

• *Smoking* - currently smoking (currently smokes or had quit smoking 12 months or less before the interview) and have never smoked or former smoker (no history of smoking or had quit smoking more than 12 months before the interview).

• *Intake of alcoholic beverages* - categorized into: Regular consumption - (intake at least three days a week) and irregular consumption or non-intake (other cases). The daily amount consumed was not evaluated.

• *Physical activity* - regular physical activity was considered the performance of dynamic exercises (walking, running, cycling, dancing, swimming) at least three times a week for at least 30 minutes per session, as recommended by the V Brazilian Hypertension Guidelines[6].

• *Comorbidities (self-reported)* - diabetes, high cholesterol and cardiovascular disease (history of myocardial infarction and/or stroke) were considered if respondents answered affirmatively.

The study was approved by the Ethics Committee of the *Universidade Estadual de Londrina* (UEL), under opinion 286/06. Interviewees were asked about the objectives of the study and after reading, understanding and signing the informed consent, they answered the questions listed in the data collection document and had their measures checked.

All forms were coded, double entered into a database created in Epi Data 3.1 for Windows, and compared in the same program to correct typographical errors. Tabulation of data was performed using Epi Info version 3.3.2, initially with the distribution of frequencies of variables and measures of central tendency and variability, followed by checking of associations between qualitative variables using chi-square or Fisher exact test when recommended.

Results

From 390 eligible hypertensive patients, four could not be found, one refused to participate, and seven could not perform waist and hip measurements. In the end, we studied 378 individuals (96.9%) and 139 (36.8%) men and 239 women (63.2%), with mean age of 58.7 for both sexes. Adults (193) had mean age of 49.2 $\pm$ 8.1, and the elderly (185), 68.6 $\pm$ 5.5.

Concerning marital status, 63.3% were married, 49.5% had up to three years of study, and 45.8% belonged to economic class D or E. The distribution of socioeconomic, demographic, lifestyle and self-reported comorbidity variables, by sex, is presented in Table 1. This table shows low frequency of regular physical activity among those hypertensive patients under study (20.1%) but higher among men (26.6%) than among women (16.3%) - $p < 0.05$.

The average waist-hip ratio was 0.96 $\pm$ 0.07 for men and 0.94 $\pm$ 0.08 for women. Waist circumference averaged 98.4 cm $\pm$ 11.3 and 99.5 cm $\pm$ 12.9 for men and women, respectively.

The prevalence of abdominal obesity determined by WHR and WC was higher in females (87.9% and 82.8% respectively; $p < 0.001$) than in males (30.2% and 36.0% respectively). Comparing the age groups, the prevalence of high WC and WHR did not differ: 65.3% and 68.1% (WHR) and 66.8% and 64.3% (WC) for adults and the elderly, respectively, considering both sexes.

The prevalences of high WHR and WC by gender and age are shown in Figure 1. There are similarities between the prevalence of abdominal obesity for both measures in women and elderly men, but in male adult individuals, we perceived a difference between the prevalence rates determined by WHR and WC: 24.6% and 40.0%, respectively.

Table 2 shows the prevalence of abdominal obesity measured by WHR and WC in males. We perceive that there was no significant difference in the prevalence of abdominal obesity measured by WHR for the variables analyzed. Concerning waist circumference, men with diabetes had a greater prevalence of high WC, while those who practice regular physical activity had a lower prevalence (16.0%).

In females, there was a higher prevalence of abdominal obesity (measured by WHR) in women with high cholesterol (94.7%) and in those who attended school up to the 3rd grade (94.6%). Women who perform regular physical activity and have paid work had lower prevalence of high WHR. With regard to abdominal obesity as measured by WC, women with diabetes (92.6%) and those who had never smoked (70.3%) had a higher prevalence of high WC (Table 3).

Discussion

This study found high prevalence of abdominal obesity in this population of hypertensive patients measured both by WHR and by WC.

Such results were obtained in hypertensive patients registered in a Family Health Unit, and their selection was based on the analysis of three sources of information (Hiperdia, Siab and appointment sheets), ensuring greater representation of the hypertensive population in the area. In addition, the study population consists mostly of low income and low education individuals, which is similar to a large portion of the Brazilian society, especially in peripheral regions[22].

Characteristics of the population include irregular performance of physical activities (20.1%). Considering that this population has hypertension, regular physical activity helps control blood pressure levels[23] and obesity[6]. However, several studies report sedentary lifestyle as highly prevalent in our society, both in non-hypertensive and hypertensive individuals[3,6,24,25].

Importantly, the mean waist circumference and waist-hip ratio found were high. Mean WC (98.4 and 99.5 cm for men and women, respectively) are above the values found in other studies[26-29]. As for mean WHR (0.96 for men and 0.94 for women), a study with hypertensive patients aged over 45 found similar value for males (0.97), but not for females (0.84)[30]. In other studies[27-29], the mean WHR among both men and women were lower than those found in this study.

Interestingly, Picon et al[31] found mean WHR of 0.93 and 0.98 for women and men, respectively, and mean WC of 96.9 cm for women and 99.4 cm for men. These findings are closer to this study. Such similarities may relate to the fact that both studies looked at individuals already with a risk factor for the metabolic syndrome: this one, hypertension; that one, diabetes.

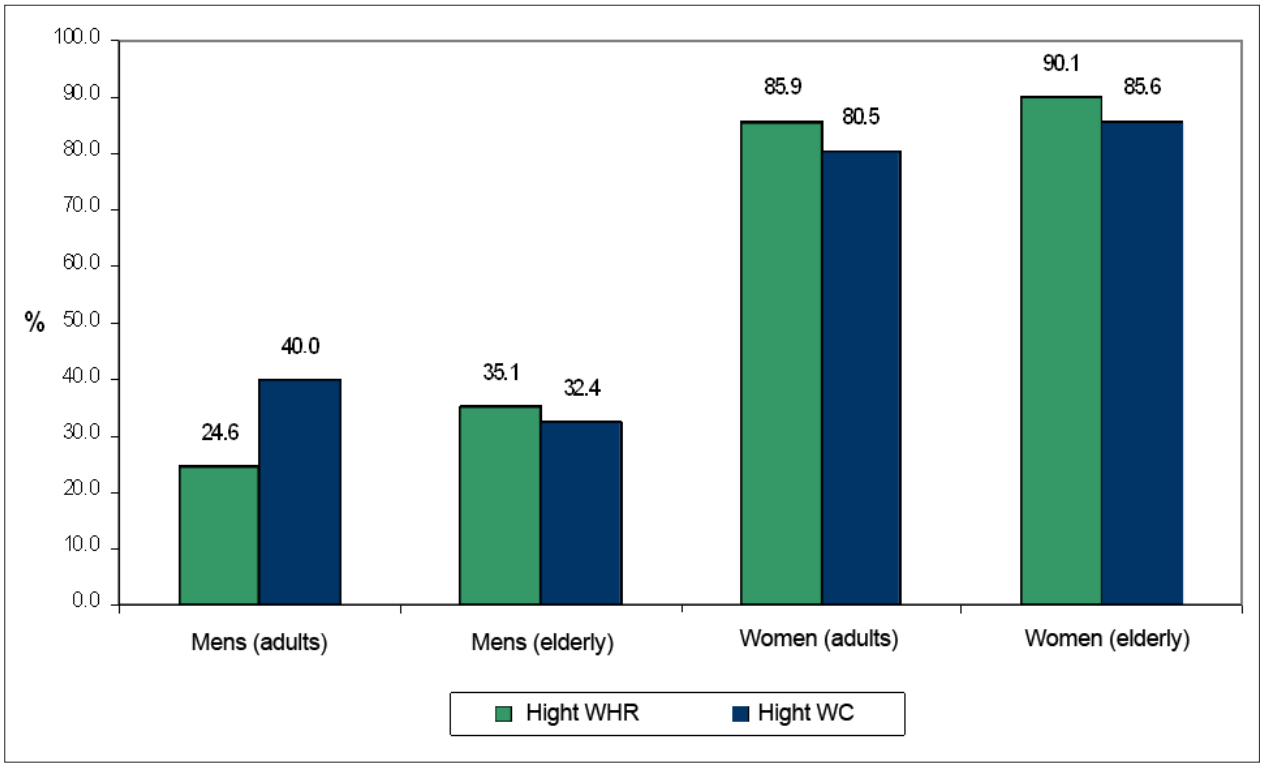

Figure 1 - Prevalence of abdominal obesity measured by waist-hip ratio (WHR) and waist circumference (WC) according to age and sex among hypertensive patients within the area of a USF, Londrina, PR, 2007.

Table 1 – Socioeconomic and demographic characteristics and comorbidities of hypertensive patients in the area of a USF, by sex, Londrina, PR, 2007

Variables	Sex				Total		p value
	Male		Female				
	n	%	n	%	n	%	
Age group							
20 to 59	65	46.8	128	53.6	193	51.1	0.20
60 and over	74	53.2	111	46.4	185	48.9	
Marital status							
Married	111	79.9	128	53.6	239	63.2	<0.001
Unmarried	28	20.1	111	46.4	139	36.8	
Race/color							
White	74	53.2	106	44.4	180	47.6	0.10
Nonwhite	65	46.8	133	55.6	198	52.4	
Education level							
Up to 3rd grade	57	41.0	130	54.4	187	49.5	<0.05
4th grade or more	82	59.0	109	45.6	191	50.5	
Economic class							
A-B-C	92	66.2	113	47.3	205	54.2	<0.001
D-E	47	33.8	126	52.7	173	45.8	
Paid work							
Yes	78	56.1	83	34.7	161	42.6	<0.001
No	61	43.9	156	65.3	217	57.4	
Diabetes							
Yes	33	23.7	54	22.6	87	23.0	0.80
No	106	76.3	185	77.4	291	77.0	
High cholesterol							
Yes	34	24.5	75	31.4	109	28.8	0.15
No	105	75.5	164	68.6	269	71.2	
Cardiovascular disease							
Yes	26	18.7	31	13.0	57	15.1	0.13
No	113	81.3	208	87.0	321	84.9	
Regular physical activity							
Yes	37	26.6	39	16.3	76	20.1	<0.05
No	102	73.4	200	83.7	302	79.9	
Smoking							
Current	26	18.7	37	15.5	63	16.7	0.42
Never or former smoker	113	81.3	202	84.5	315	83.3	
Alcohol drinking							
Yes	18	12.9	2	0.8	20	5.3	<0.001
No	121	87.1	237	99.2	358	94.7	

Furthermore, the prevalence of abdominal obesity, determined both by WHR and WC, was higher in females. This higher prevalence among women was also reported in the study conducted with employees of a company in Jaraguá do Sul (state of Santa Catarina), in which high waist circumference was found in 33% of the population, of which 49% were women and 26% were men[8]. Other studies also found higher prevalence of obesity among women[27,30,32]. However, in this study, the prevalence of abdominal obesity in women was much higher than that observed in the studies

cited, suggesting that this population is more exposed to cardiovascular risks.

In this study, both males and females had high WC associated with diabetes, which was also reported by Cabrera and Jacob Filho[33] in patients aged 60 or more.

Among men, the association of high WC with lack of regular physical activity was also detected, which is similar to the findings by Olinto et al[32]. A study with patients aged 20 to 69 found a higher mean WC among those who did not exercise or who did it three or more times a week, while those who exercised less than three times a week had a lower mean WC[26], which may reflect the reverse causality, which is an inherent limitation of cross-sectional studies[26].

Worthy of note is that women who perform physical activity had a lower prevalence of high WHR. A study conducted with women aged 55 to 69 showed that the waist-hip ratio was inversely associated with physical activity[34]. Changes in lifestyle such as high physical activity, leading to the adoption of a healthier lifestyle, should be encouraged by all health care professionals, both to prevent hypertension[29] and to control obesity.

The association of abdominal obesity determined by WHR with self-reported high cholesterol in women agrees with the study by Cabrera and Jacob Filho[33], although this study has been done only with the elderly. Research conducted with volunteers in the city of Viçosa (state of Minas Gerais) found higher proportions of women with high WC among those with high cholesterol levels[35].

In summary, among women, high WHR was more often associated with other cardiovascular risk factors or

Table 2 – Prevalence of abdominal obesity measured by waist-hip ratio (WHR) and waist circumference (WC) among hypertensive men, according to variables analyzed, Londrina, PR, 2007

Variables	WHR ≥ 1.0			WC ≥ 102		
	n = 42	%	p	n = 50	%	p
Diabetes						
Yes	14	42.4	ns	17	51.5	*
No	28	26.4		33	31.1	
High cholesterol						
Yes	14	41.2	ns	16	47.1	ns
No	28	26.7		34	32.4	
Smoking						
Current or former smoker	6	32.5	ns	9	36.3	ns
Never smoked	36	27.4		41	34.6	
Regular physical activity						
Yes	10	27.0	ns	8	21.6	*
No	32	31.4		42	41.2	
Low socioeconomic class						
Yes	16	34.0	ns	35	31.9	ns
No	26	28.3		15	38.0	
Cardiovascular disease						
Yes	8	30.8	ns	8	30.8	ns
No	34	30.1		42	37.2	
Alcohol drinking						
Yes	7	38.9	ns	9	41.5	ns
No	35	28.9		41	33.7	
Education level						
Up to 3rd grade	19	33.3	ns	19	33.3	ns
4th grade or more	23	28.0		31	37.8	
Paid work						
Yes	21	26.9	ns	32	41.0	ns
No	21	34.4		18	29.5	

*ns: not significant (p ≥ 0.05), * p <0.05.*

Table 3 – Prevalence of abdominal obesity measured by waist-hip ratio (WHR) and waist circumference (WC) among hypertensive women, according to variables analyzed, Londrina, PR, 2007

Variables	WHR ≥ 0.85			WC ≥ 88		
	n = 210	%	p	n = 198	%	p
Diabetes						
Yes	51	94.4	ns	50	92.6	*
No	159	85.9		148	80.0	
High cholesterol						
Yes	71	94.7	*	66	88.0	ns
No	139	84.8		132	80.5	
Smoking						
Current or former smoker	31	83.8	ns	26	70.3	*
Never smoked	179	88.6		172	85.1	
Regular physical activity						
Yes	30	76.9	*	29	74.4	ns
No	180	90.0		169	84.5	
Low socioeconomic class						
Yes	110	87.3	ns	94	82.5	ns
No	100	88.5		104	83.2	
Cardiovascular disease						
Yes	27	87.1	ns	22	71.0	ns
No	183	88.0		176	84.6	
Alcohol drinking						
Yes	2	100.0	ns	2	73.3	ns
No	208	87.8		196	83.5	
Education level						
Up to 3rd grade	123	94.6	†	112	86.2	ns
4th grade or more	87	79.8		86	78.9	
Paid work						
Yes	67	80.7	*	67	80.7	ns
No	143	91.7		131	84.0	

*ns: not significant (p ≥ 0.05), * p <0.05, † p <0.001.*

socioeconomic factors (high cholesterol, physical inactivity, low education and paid employment) compared to high WC (association only with diabetes and smoking). Among men, WHR was not associated with any of the factors studied, while high WC was sensitive to identify the simultaneous presence of diabetes and physical inactivity. These results may suggest that there are differences between these two anthropometric measurements for men and women in the investigation of other health risks, particularly in older populations, due to aging changes in body composition and differences in accumulation of abdominal fat between the sexes[36,37]. Fuchs et al[38] emphasize that although the abdominal circumference measurement has the advantage of being simpler, adjusting it for height or hip circumference increases the predictive power of detecting hypertension, which may also occur with other morbid conditions and other health risks.

Although many Brazilian studies still use cutoff points for WHR and WC recommended by the World Health Organization (WHO), as in this study, there are still doubts about using it for the Brazilian population[16,39], especially in women over 45[40]. A recent paper[41] reporting results from a study conducted in Porto Alegre, identified WC cutoff points of 87 cm and 80 cm for men and women, respectively, as the most suitable ones to predict hypertension, at an average follow-up time of 5.5 years. However, this research worked with individuals who had a mean age lower than that shown by hypertensive patients studied in this work.

Anthropometric parameters of abdominal fat probably differ in relation to age. It is known that with aging, there is an expected increase of abdominal fat tissue aging.

Thus, the high prevalence of abdominal obesity identified in this study could be partially justified by the high age of individuals sampled (mean age = 58.7). However, we cannot overlook the high prevalence of this type of obesity, especially among women.

It should be noted that this study performed only one waist and hip measurement, and other information collected were self-reported and may underestimate or overestimate the prevalence of certain situations[42]. In order to reduce potential biases, interviewers were extensively trained and pilot testing was made prior to completion of the study and re-interview of 10% of the sample and double data entry.

Abdominal obesity is associated with atherosclerotic disease[10], which may result in complications such as acute coronary events and cerebral aneurysm. Therefore, high levels of abdominal obesity identified in patients with hypertension and, consequently, with a risk factor for metabolic syndrome already installed, justify the use of strategies targeted at providing greater attention to these patients as well as the adoption of activities to promote health in this population group.

Conclusion

The results of this study show a high prevalence of abdominal obesity, especially among women, underscoring the need for strategies to reduce abdominal obesity among hypertensive patients. For this purpose, the identification of abdominal obesity, through these simple and low cost measures, should be part of the routine tasks of primary health care to hypertensive patients.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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References

1. Sanchez CG, Pierin AMG, Mion Jr D. Comparação dos perfis dos pacientes hipertensos atendidos em pronto-socorro e em tratamento ambulatorial. Rev Esc Enferm USP. 2004; 38 (1): 90-8.
2. Coelho EB, Moyses Neto M, Palhares R, Cardoso MCM, Geleilete TJM, Nobre F. Relação entre a assiduidade às consultas ambulatoriais e o controle da pressão arterial em pacientes hipertensos. Arq Bras Cardiol. 2005; 85 (3): 157-61.
3. Jardim PCBV, Gondim MRP, Monego ET, Moreira HG, Vitorino PVO, Souza WKSB, et al. Hipertensão arterial e alguns fatores de risco em uma capital brasileira. Arq Bras Cardiol. 2007; 88 (4): 452-7.
4. Martin JFV, Higashiama E, Garcia E, Luizon MR, Cipullo JP. Perfil de crise hipertensiva: prevalência e apresentação clínica. Arq Bras Cardiol. 2004; 83 (2): 125-30.
5. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, et al. The National High Blood Pressure Education Program Coordinating Committee. Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. JAMA. 2003; 289 (19): 2560-72.
6. Mion Jr D, Kohlmann Jr O, Machado CA, Amodeo C, Gomes MAM, Praxedes JN. Sociedade Brasileira de Cardiologia. V Diretrizes brasileiras de hipertensão arterial. Arq Bras Cardiol. 2007; 89 (3): e24-e79.
7. Matos MFD, Silva NAS, Pimenta AJM, Cunha AJLA. Prevalência dos fatores de risco para doença cardiovascular em funcionários do Centro de Pesquisas da Petrobras. Arq Bras Cardiol. 2004; 82 (1): 1-4.
8. Mariath AB, Grillo LP, Silva RO, Schmitz P, Campos IC, Medina JRP, et al. Obesidade e fatores de risco para o desenvolvimento de doenças crônicas No transmissíveis entre usuários de unidade de alimentação e nutrição. Cad Saúde Pública. 2007; 23 (4): 897-905.
9. Saad MJA, Zanella MT, Ferreira SRG. Síndrome metabólica: ainda indefinida, mas útil na identificação do alto risco cardiovascular. Arq Bras Endocrinol Metab. 2006; 50 (2): 161-2.
10. Sposito AC, Caramelli B, Fonseca FAH, Bertolami MC, Afiune Neto A, Souza AD, et al / Sociedade Brasileira de Cardiologia. IV Diretriz brasileira sobre dislipidemias e prevenção da aterosclerose: Departamento de Aterosclerose da Sociedade Brasileira de Cardiologia. Arq Bras Cardiol. 2007; 88 (supl.1): 2-19.
11. Bray GA. Pathophysiology of obesity. Am J Clin Nutr. 1992; 55 (2): 488-94.
12. Radominski RB, Vezozzo DP, Cerri GG, Halpern A. O uso da ultra-sonografia na avaliação da distribuição de gordura abdominal. Arq Bras Endocrinol Metab. 2000; 44 (1): 5-12.
13. Van der Kooy K, Seidell JC. Techniques for the measurement of visceral fat: a practical guide. Int J Obes Relat Metab Disord. 1993; 17 (11): 669.
14. Ribeiro Filho FF, Mariosa LS, Ferreira SRG, Zanella MT. Gordura visceral e síndrome metabólica: mais que uma simples associação. Arq Bras Endocrinol Metab. 2006; 50 (2): 230-8.
15. World Health Organization. Obesity: preventing and managing the global epidemic. Report of a WHO consultation on obesity. Geneva; 1997.
16. Ferreira MG, Valente JG, Gonçalves-Silva RMV, Sichieri R. Acurácia da circunferência da cintura e da relação cintura/quadril como preditores de dislipidemias em estudo transversal de doadores de sangue de Cuiabá, Mato Grosso, Brasil. Cad Saúde Pública. 2006; 22 (2): 307-14.
17. Paccini MK, Arsa G, Glaner MF. Indicadores de gordura abdominal: antropometria vs absortometria de raio-X de dupla energia. Rev bras cineantropom desempenho hum. 2008, 10 (3): 283-8.
18. Instituto Brasileiro de Geografia e Estatística. (IBGE) Cidades. [Acesso em 2009 Mar 30]. Disponível em: http://www.ibge.gov.br
19. Londrina (PR). Secretaria Municipal de Saúde. Conselho Municipal de Saúde. Sistema de Informação da Atenção Básica. Indicadores/dados básicos para avaliação do nível de saúde entre unidades básicas: região leste. [Acesso em 2008 jul 23]. Disponível em: http://saude.londrina.pr.gov.br/relatórios, gestão/
20. Guedes DP, Guedes JERP. Controle do peso corporal: composição corporal, atividade física e nutrição. 2ª. ed. Rio de Janeiro (RJ): Shape; 2003.
21. Associação Brasileira de Empresas de Pesquisa. (ABEP) – Critério de classificação econômica Brasil. [Acesso em 2009 abr 16]. Disponível em: http://www.abep.org/codigosguias/ABEP_CCEB.pdf
22. Barros MBA, César CLG, Carandina L, Torre GD. Desigualdades sociais na prevalência de doenças crônicas no Brasil, PNAD-2003. Ciênc Saúde Coletiva. 2006, 11 (4): 911-26.
23. Barroso WKS, Jardim PCBV, Vitorino PV, Bittencourt A, Miquetichuc F.

Influência da atividade física programada na pressão arterial de idosos hipertensos sob tratamento No-farmacológico. Rev Assoc Med Bras. 2008; 54 (4): 328-33.

24. Lessa I, Magalhães L, Araújo MJ, Almeida Filho N, Aquino E, Oliveira MMC. Hipertensão arterial na população adulta de Salvador (BA) – Brasil. Arq Bras Cardiol. 2006; 87 (6): 747-56.

25. Pitanga FJG, Lessa I. Prevalência e fatores associados ao sedentarismo no lazer em adultos. Cad Saúde Pública. 2005; 21 (3): 870-7.

26. Castanheira M, Olinto MTA, Gigante DP. Associação de variáveis sócio-demográficas e comportamentais com a gordura abdominal em adultos: estudo de base populacional no Sul do Brasil. Cad Saúde Pública. 2003; 19 (supl.1): 55-65.

27. Lean MEJ, Han TS, Seidell JC. Impairment of health and quality of life in people with large waist circumference. Lancet. 1998; 351 (9106): 853-6.

28. Lin T, Cheng X, Liu J, Mai X, Rao X, Gao H, et al. Impact of dysglycemia, body mass index, and waist-to-hip ratio on the prevalence of systemic hypertension in a lean Chinese population. Am J Cardiol. 2006; 97 (6): 839-42.

29. Pitanga FJG, Lessa I. Indicadores antropométricos de obesidade como instrumento de triagem para risco coronariano elevado em adultos na cidade de Salvador – Bahia. Rev Bras Epidemiol. 2007; 10 (2): 239-48.

30. Cabral PC, Melo AMCA, Amado TCF, Santos RMAB. Avaliação antropométrica e dietética de hipertensos atendidos em ambulatório de um hospital universitário. Rev Nutr. 2003; 16 (1): 61-71.

31. Picon PX, Leitão CB, Gerchman F, Azevedo MJ, Silveiro SP, Gross JL, et al. Medida da cintura e razão cintura/quadril e identificação de situações de risco cardiovascular: estudo multicêntrico em pacientes com diabetes melito tipo 2. Arq Bras Endocrinol Metab. 2007; 51 (3): 443-9.

32. Olinto MTA, Nácul LC, Dias-da-Costa JS, Gigante DP, Menezes AMB, Macedo S. Níveis de intervenção para obesidade abdominal: prevalência e fatores associados. Cad Saúde Pública. 2006; 22 (6): 1207-15.

33. Cabrera MAS, Jacob Filho W. Obesidade em idosos: prevalência, distribuição e associação com hábitos e co-morbidades. Arq Bras Endocrinol Metab. 2001; 45 (5): 494-501.

34. Folson AR, Kushi LH, Anderson KE, Mink PJ, Olson JE, Hong CP, et al. Associations of general and abdominal obesity with multiple health outcomes in older women. Arch Intern Med. 2000; 160 (14): 2117-28.

35. Rezende FAC, Rosado LEFPL, Ribeiro RCL, Vidigal FC, Vasques ACJ, Bonard IS, et al. Índice de massa corporal e circunferência abdominal: associação com fatores de risco cardiovascular. Arq Bras Cardiol. 2006; 87 (6): 728-34.

36. Woodrow G. Body composition analysis techniques in the aged adult: indications and limitations. Curr Opin Clin Nutr Metab Care. 2009; 12 (1): 8-14.

37. Zafon C. Oscillations in total body fat content through life: an evolutionary perspective. Obes Rev. 2007; 8 (6): 525-30.

38. Fuchs FD, Gus M, Moreira LB, Moraes RS, Wiehe M, Pereira GM, et al. Anthropometric indices and the incidence of hypertension: a comparative analysis. Obes Res. 2005, 13 (9): 1515-7.

39. Neves EB. Prevalência de sobrepeso e obesidade em militares do exército brasileiro: associação com a hipertensão arterial. Ciên Saúde Coletiva. 2008; 13 (5): 1661-8.

40. Pereira RA, Sichieri R, Marins VMR. Razão cintura/quadril como preditor de hipertensão arterial. Cad Saúde Pública. 1999; 15 (2): 333-44.

41. Gus M, Cichelero FT, Moreira CM, Escobar GF, Moreira LB, Wiehe M, et al. Waist circumference cut-off values to predict the incidence of hypertension: an estimation from a Brazilian population-based cohort. Nutr Metab Cardiovasc Dis. 2009, 19 (1): 15-9.

42. Viacava F. Informações em saúde: a importância dos inquéritos populacionais. Ciênc Saúde Coletiva. 2002, 7 (4): 607-21.