Anthropometry and lipid profile in women with breast cancer: a case-control study

Antropometria e perfil lipídico em mulheres com câncer de mama: um estudo caso-controle

Karine Anusca Martins[1]; Ruffo Freitas-Junior, TCBC-GO[2]; Estelamaris Tronco Monego[1]; Régis Resende Paulinelli[2]

A B S T R A C T

Objective: To assess body composition and lipid profile of women with and without breast cancer. **Methods**: We conducted a case-control study matched by age, including 62 women, 31 being newly diagnosed with breast cancer and 31 with benign breast changes. Data were collected through direct interview, with recording of sociodemographic characteristics, body composition assessment by anthropometry, including skinfolds (SF) and circumference, bioelectrical impedance (BIA) and ultrasonography (USG), as well as lipid profile evaluation. Statistical analysis used: Kolmogorov-Smirnov test (normally distributed variables), "t" test, chi-square test for trend (Mann-Whitney U), chi-square test, Fisher's exact test and Yates correction and "odds ratio". **Results**: When compared with controls, women with breast cancer (cases) had lower height (1.56 m ± 5.68 versus 1.59 m ± 6.92), p <0.03; higher percentage of body fat, assessed by Bioelectric Impedance (39.87% ± 8.26 versus 36.00% ± 6.85), p <0.049; and higher triceps skinfold thickness (27.55 mm ± 8.37 versus 22.81 ± 5.72 mm; p <0.01), respectively. **Conclusion**: Women with breast cancer had lower height, higher body fat percentage and higher triceps skinfold thickness. There was no difference in body mass index and waist circumference. There was no association between lipid profile and the occurrence of breast cancer.

Key words: Breast neoplasms. Epidemiology. Anthropometry. Body composition. Nutritional status.

INTRODUCTION

Breast cancer has been researched worldwide in recent years due to its high prevalence and incidence; it is the leading cause of cancer death among women[1], although advances in early detection and new therapeutic forms used have evolved over the last decades[2].

Among the aspects classically considered as risk factors for developing breast cancer are advanced age, low parity, early menarche, late menopause, obesity, alcoholism and increased height[3]. Among those linked to nutritional status, those related to body composition, such as obesity and/or overweight and inadequate distribution of body fat, especially in the post-menopause, are noteworthy[4].

Lipid profile seems to influence the development of female breast cancer, especially in the presence of an increased body mass index[5].

Among the techniques used in the determination of body composition in patients with cancer, there is anthropometry, an easy to perform, affordable and accurate exam, which allows obtaining reliable results[6-8].

In Brazil and other countries with large racial variation, anthropometric information related to body fat in women[9], especially those with breast cancer[7,10], have limitations that may be related to available resources, including technology and more precise equipment, or even to reasons of racial differences per se[11].

Given the above, the objective of this study was to determine the body composition and nutritional status of Brazilian women by using anthropometry and lipid profile. The individuals, with and without breast cancer, were from the mid-west region of the country an were followed by two reference centers in breast disease, belonging to the Goiás Mastology Research Network.

METHODS

This is a case-control study, with a sample that included women with breast cancer, with a 1:1 age matcd with controls without breast cancer.

Work was developed in the Goiás Mastology Research Network, Goiás – GO, Brazil.
1. Ph.D., Associate Professor, School of Nutrition, Federal University of Goiás – UFG; 2. Ph.D., Associate Professor, Department of Obstetrics and Gynecology, Faculty of Medicine, Federal University of Goiás – UFG.

We age-matched women newly diagnosed with breast cancer (cases) and women with benign breast changes (controls) at two referral services for diagnosis and treatment of cancer in Goiânia, (Goiás State capital): Mastology Program of the Hospital of the Federal University of Goiás-HC/UFG (22 cases and 27 controls, n = 49) and Gynecology and Breast Service of Jorge Araújo Hospital (nine cases and four controls, n = 13).

We used a questionnaire for direct interview with sociodemographic characteristics and assessed nutritional status, including percent body fat, obtained by the sum of skinfolds, bioelectrical impedance (BIA) and central fat, by abdominal ultrasonography.

We studied sociodemographic (age, marital status, place of residence, education level and family income) and anthropometric variables (weight, height, arm circumference, arm muscle circumference, waist circumference, biceps skinfold, triceps skinfold, suprailiac skinfold and subscapularis skinfold.

We calculated the Body Mass Index (BMI), fat percentage, lean body mass and body water, and we obtained measurements of the thickness of the subcutaneous fat and intra-abdominal fat by ultrasonography. Information was collected on menarche and menopause.

The interviewers and evaluators responsible for data collection were previously trained, using a manual Interviewer / anthropometrist with standardized collection of anthropometric measures previously validated by Habicht[12]. The previous training and completion of pilot study allowed greater reliability of results.

For anthropometric measurements, we observed the following standards classification: weight in kilograms and height in meters according to the techniques proposed by Lohman *et al.* [13], body mass index (BMI) calculated as weight divided by squared height and expressed in kg/m^2, obeying the cutoff points proposed by the World Health Organization[14]; waist circumference in centimeters: measurement performed according to the validated technique[13], whose classification indicates risk of metabolic complications associated with obesity [14]; percentage of body fat: the resulting body composition analysis using the sum of skinfolds and bioelectrical impedance; skinfold thickness in millimeters: using a caliper (*Lange Skinfold Caliper*), we performed measurements in triplicate of he triceps (TSF), biceps (DCB), subscapular (DCSE) and suprailiac (DCSI) skinfolds, with reference to the technique proposed by Lohman *et al.*[13]. The values obtained were compared with the reference standard[15], which allowed an indirect estimate of body fat percentage, using the sum of four skinfolds and the formulas proposed by Durnin and Womersley[16] and Siri[17]. For bioelectrical impedance (BIA) we gathered values of fat mass, lean mass and body water in percentage and kilograms using a bioimpedance device model 1500 Bodystat with simple frequency. To determine the nutritional status according to the percentage of body fat, we adopted the classification of Lohman *et al.*[18]; arm circumference in centimeters, a technique proposed by Lohman *et al.*[13], where the measurements were compared to the reference standard[15]; arm muscle circumference (AMC) in centimeters, estimated by the formula: AMC = BS - 3.14 x TS, whose results were compared with the reference standard[15]; thickness of abdominal fat (subcutaneous and intra-abdominal) measured by ultrasonography, according to a validated technique[19]. We obtained the estimation of visceral fat with the patient fasting for at least six hours, in the supine position, at the umbilicus, in the xifoumbilical line, with the minimum pressure necessary, by means of an ultrasound equipment.

In the data analysis we used the "t" test for continuous variables which displayed normal distribution according to the Kolmogorov-Smirnov test, while for nominal (categorical) variables we used nonparametric tests, such as chi- square for trend (Mann-Whitney U), Pearson chi-square test, Fisher exact test and Yates correction, considering the statistical significance of $p < 0.05$. In bivariate analysis of the case-control study, we calculated the measure of association "odds ratio", with a confidence interval of 95%.

The study was approved by the Ethics Committee on Human and Animal Research of the Hospital of the Federal University of Goiás (Protocol 073/2008 of 06.27.2008) and the Association Against Cancer of Goiás of the Araújo Jorge Hospital (Protocol 001/09 of 02.26.2009).

RESULTS

The 62 evaluated patients (31 cases and 31 controls) had a mean age of 48.19 years (± 8.99) in both groups, as they were matched by age. Twenty-eight (45.16%) women were aged between 50 and 65 years.

Most study participants, either cases or controls, had low education. Only one patient was illiterate, 20 cases (64.5%) and 23 controls (74.1%) had primary education and three cases (9.6%) and two controls (6.4%) had a college degree. There was no statistically significant difference between cases and controls.

The monthly income of study participants showed that 17 cases (54.8%) and 10 (32.2%) controls had family income of less than 0.5 minimum wage (MW) per capita; nine cases (29.0%) and 14 controls (45.1%) had a per capita income between 0.5 and 1.0 MW per month, 26 (83.8%) cases and 24 (77.4%) controls had a monthly per capita income above 1.0 MW. There was no significant difference (p=0.46) between cases and controls in relation to monthly income.

Although the majority of women live in Goiânia, about a third (32.2%) was from other Goiás cities or eventhe Midwest Region. Twenty-five (80.6%) cases and 22 (70.9%) controls were married or kept a consensual stable union, with no significant difference in these variables.

The average age of menarche ranged from 13.2 (± 1.5) for cases and 12.6 (± 1.4) years for controls, respectively, with no statistical difference (p = 0.16) between groups. It was observed that 46.7% of the population was postmenopausal. No cases and only two (3.2%) controls were in peri-menopause (no menses for less than one year), with no statistically significant difference.

The descriptive values of the anthropometric variables are shown in table 1. The average weight ranged between 67.4 kg (± 12.1) in the control group and 69.3 kg (± 18.2) in the case group. Significant differences between cases and controls were found for measures of height, body fat percentage (BF%), triceps skinfold thickness (TST) and lean muscle mass (LMM). The remaining variables did not show statistically significant differences between the two groups.

When analyzing BMI and Waist Circumference (WC) among women of groups with and without cancer, no significant difference was observed (Table 2).

With regard to the distribution of cases and controls according to reproductive and anthropometric variables, none of the studied variables showed a statistically significant association with breast cancer in the bivariate analysis (Table 3). There was no association between lipid profile and incidence of breast cancer (Table 4).

DISCUSSION

Although breast cancer is more detected in women from urban areas with more favorable socio-economic conditions[20], possibly due to ampler access to tests that enable early detection[21], the present study was conducted with a group of women with low education and low income. This profile of women seen in two specialized centers in the central region of Brazil resemble those of a previous study carried out in the south region of the country[22].

Through anthropometric measurements, we observed that the average weight of women was not significantly different between cases and controls. It was found that those with cancer had significantly lower average stature than controls, suggesting that women in this study, being shorter, showed a higher risk of breast cancer. These data are conflicting with studies in North American countries, which showed that taller women have higher risk of developing breast cancer[23]. In Brazil, considering the population of the south / southeast, in some studies height did not influence the risk for breast cancer[7,24].

The Household Budget Survey (Pesquisa de Orçamentos Familiares – POF)[25], conducted by the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística – IBGE) shows that there are population differences between the regions south/southeast and center of the country, suggesting that the profile of the women[9] from the latter region, also differs from the former, especially regarding breast cancer[26].

This situation can be explained by the mixing of races, as well as regional differences in food habits and culture, which may influence the development of this disease[27]. The findings related to the stature of women in the central region of the country are unprecedented and had not been previously observed by any other study.

When comparing the percentage of body fat, it was observed that regardless of the method of assessment (sum of skinfolds or BIA), cases had higher values than controls, with a statistically significant difference between

Table 1 - Nutritional parameters in women with and without breast cancer.

Variables	Cases Average (±SD)	Controls Average (±SD)	t Test	p *
Weight (Kg)	69.3 (±18.2)	67.4 (±12.1)	0.4	0.6
Height (m)	1.56 (±5.6)	1.59 (±6.9)	-2.1	0.03
BMI (Kg/m^2)	28.7 (±7.8)	26.7 (±5.0)	1.1	0.2
Weist Circunference (cm)	90.9 (±16.1)	89.6 (±12.4)	0.3	0.7
% Body fat (BIA)	39.8 (±8.2)	36.0 (±6.8)	2.0	0.04
% Body fat (SF)	37.3 (±5.7)	36.1 (±4.7)	0.8	0.3
% Lean Muscle Mass	60.1 (±8.2)	63.9 (±6.8)	-1.9	0.05
% Body water	46.9 (±5.8)	48.0 (±5.5)	-0.7	0.4
Brachial circumference (mm)	319.6 (±60.5)	312.9 (±42.0)	0.5	0.6
AMM (mm)	233.0 (±42.4)	241.2 (±31.9)	-0.8	0.3
Triceps skinfold thickness (mm)	27.5 (±8.3)	22.8 (±5.7)	2.6	0.01
ES-USG (mm)	23.8 (±8.7)	24.5 (±9.5)	-0.2	0.7
EIA-USG (mm)	56.6 (±10.7)	51.8 (±14.5)	1.2	0.2

*SD: Standard deviation, * p: Test "t" (significant p d" 0.05), BMI: Body Mass Index, (%): Percentage; BIA: Bioimpedance, SF: Skinfolds; AMM: Arm Muscle Circumference , ES-USG: subcutaneous thickness (ultrasound); EIA-USG: intra-abdominal thickness (ultrasound)*

Table 2 - Classification of women with and without breast cancer based on body mass index (BMI) and waist circumference (WC).

Variables	Cases		Controls		p *
	n	%	n	%	
BMI (Kg/m^2)					
Low weight	00	00.00	01	3.22	0.91
Normal (18.5-24.99)	11	35.48	08	25.81	
Overweight (25-29.99)	12	38.71	16	51.62	
Obesity (>30.0)	08	25.81	06	19.35	
Weist Circunference (cm)					
Adequate (< 80.0)	09	29.03	07	22.58	0.57
Increased (80.0-88.0)	05	16.13	05	16.13	
Highly increased (>88.0)	17	54.84	19	61.29	

** p: chi-square for trend (Mann-Whitney U)*

Table 3 - Odds Ratio (OR) for breast cancer cases and controls according to reproductive and anthropometric variables.

Variables	Cases		Controls		OR	CI 95%	p
	n	%	n	%			
Age > 50 years	14	45.1	14	45.1	1.0	-	1.0
Pre-menopause	17	54.8	16	51.6	1.1	[0.4-3.0]	0.06
BMI (Kg/m^2)							
25 - 29.99	12	38.7	16	51.6	0.6	[0.1-1.9]	0.4
> 30	08	25.8	6	19.3	1.0	[0.2-4.3]	0.9
% BF > 35% (up to 41-years-old)	02	6.4	0	0.0	-	-	0.4
% BF >38% (41 to 60-years-old)	15	48.3	11	35.4	0.7	[0.2-2.4]	0.3
Weist Circunference (cm)							
80.0 – 87.0	07	22.5	5	16.1	1.4	[0.3-6.6]	0.9
> 88.0	17	54.8	19	61.2	0.9	[0.2-3.0]	0.8

OR: "odds ratio", CI: confidence interval;% BF (body fat percentage), p: chi-squared

Table 4 - Odds Ratio (OR) for breast cancer cases and controls according to lipid profile.

Variables	Cases		Controls		OR	CI 95%	p
	n	%	n	%			
Total cholesterol (> 200 mg/dL)	06	19.3	10	32.2	0.5	[0.1-1.6]	0.3
HDL- cholesterol (<50 mg/dL)	21	67.7	27	87.1	0.3	[0.09-1.1]	0.1
LDL- cholesterol (>130 mg/dL)	08	25.8	11	35.4	0.6	[0.2-1.8]	0.5
Triglycerides (>150 mg/dL)	09	29.0	04	12.9	2.7	[0.7-10.1]	0.2

OR: "odds ratio", CI: confidence interval, p: Chi-square

in the BIA findings. Unlike the found by other authors[4,11], in this study no association was found between total body fat and increased occurrence of breast cancer.

The values of percentage body fat measured by BIA and sum of skinfolds showed statistically significant differences between cases and controls. These measures allow greater reliability in measuring body composition as opposed to weight [6,18].

Other parameters for assessing the nutritional status of women were arm circumference and arm muscle circumference, where cases and controls were within normal limits[15], with no significant differences between groups.

Despite not being the objective of the present work, it was observed by exploratory analysis that both women with cancer and in the control group showed increased prevalence of excess weight (overweight and obesity), reflecting the nutritional status of the population, which provides a historical trend of increase in body weight and BMI[9].

BMI assessed in this study proved not to be an important factor in the development of breast cancer, although other studies have demonstrated this association[28]. A prospective cohort study conducted in Paris[28] with 14,709 women with breast cancer aimed at establishing and validating the most appropriate cutoff points for different indicators of body size that may be associated with the prognosis of breast cancer. The authors suggest that, in order to avoid a worse prognosis, increased recurrence and shorter survival in cases of breast cancer, health experts should use the following cutoff points for identifying patients at higher risk of unfavorable prognosis: BMI of 25.00Kg/m^2, 60Kg of weight, ideal body weight ratio of 20% and body surface area of 1.70 m^2.

As in the present study, cases and controls had weight and BMI values greater than the cutoff points recommended[14]. It reinforces the importance of exercise caution and care in monitoring patients evaluated in both services and the development of health promotion activities and awareness about the risk of overweight.

Waist circumference is measured to assess abdominal fat (central adiposity) and is designed to estimate an additional risk for chronic diseases, especially cardiovascular ones[14]. The relationship between body fat and breast cancer has been observed for some years, in particular the increased abdominal or visceral fat (central adiposity), which is related to a higher likelihood of relapse and shorter survival, particularly in post -menopause, where the risk is higher[10,23].

The distribution of body fat (abdominal fat) exerts a greater influence on the metabolic risk factors than total body fat[29]. In the present study we observed that both cases and controls had greatly increased waist circumference (> 88cm), indicating additional risk related to metabolic risk factors[14].

It has been found in a previous study that increased rates of total cholesterol and triglyceride levels may be related to increased risk of breast cancer[5]. The lipid profile evaluation performed in this study showed no association with breast cancer. It is possible that this result was influenced by the sample size, but the differentiated condition in fat consumption, typical of this population, may have influenced serum lipoproteins[22,25].

Brazilian women of the central region of the country with breast cancer had lower height, higher body fat and greater total value of triceps skinfold thickness than controls. The lipid profile showed no correlation with breast cancer. There was no association between lipid profile and the occurrence of breast cancer.

RESUMO

***Objetivo**: avaliar a composição corporal e o perfil lipídico de mulheres com e sem câncer de mama. **Métodos**: estudo caso-controle pareado por idade, incluindo 62 mulheres, sendo 31 recém-diagnosticadas com câncer de mama e 31 com alterações mamárias benignas. Os dados foram coletados por meio de entrevista direta, com caracterização sociodemográfica, avaliação da composição corporal por antropometria, incluindo dobras cutâneas (DC) e circunferências, bioimpedância (BIA) e ultrassonografia (USG), além da avaliação do perfil lipídico. Utilizou-se na análise dos dados: Teste de* Kolmogorov-smirnov *(distribuição normal das variáveis), teste "t" de* Student*, Qui-quadrado de tendência (U de Mann-Whitney), Qui-quadrado de Pearson, Teste Exato de Fisher e Correção de Yates e "odds ratio". **Resultados**: comparadas aos controles, mulheres com câncer de mama (casos) apresentaram menor estatura (1,56m±5,68) e (1,59m±6,92), p<0,03; maior porcentagem de gordura corporal, avaliada pela Impedância Bioelétrica (39,87% ±8,26) e (36,00%±6,85), p<0,049; maior dobra cutânea tricipital (27,55mm±8,37 e 22,81mm±5,72; p<0,01), respectivamente. **Conclusão**: Mulheres com câncer de mama apresentaram menor estatura, maior porcentagem de gordura corporal e maior dobra cutânea tricipital. Não se observou diferença no Índice de Massa Corporal e na Circunferência da Cintura. Não foi encontrada associação entre o perfil lipídico e a ocorrência de câncer de mama.*

***Descritores**: Neoplasias da mama. Epidemiologia. Antropometria. Composição corporal. Estado nutricional.*

REFERENCES

1. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. CA Cancer J Clin. 2011;61(2):69-90. Erratum in: CA Cancer J Clin. 2011;61(2):134.
2. Colonna M, Delafosse P, Uhry Z, Poncet F, Arveux P, Molinie F, et al. Is breast cancer incidence increasing among young women? An analysis of the trend in France for the period 1983-2002. Breast. 2008;17(3):289-92.
3. Parkin DM, Bray FI, Devesa SS. Cancer burden in the year 2000. The global picture. Eur J Cancer. 2001; 37 Suppl 8:S4-66.
4. Cleveland RJ, Eng SM, Abrahamson PE, Britton JA, Teitelbaum SL, Neugut AI, et al. Weight gain prior to diagnosis and survival from breast cancer. Cancer Epidemiol Biomarkers Prev. 2007;16(9):1803-11.
5. Owiredu WK, Donkor S, Addai BW, Amidu N. Serum lipid profile of breast cancer patients. Pak J Biol Sci. 2009;12(4):332-8.
6. Martins KA; Monego ET; Paulinelli RR; Freitas Júnior R. Comparação de métodos de avaliação da gordura corporal total e sua distribuição. Rev bras epidemiol. 2011;14(4):677-87.
7. Vasconcelos AB, Mendonça GAS, Sichieri R. Height, weight, weight change and risk of breast cancer in Rio de Janeiro, Brazil. São Paulo med j. 2001;119(2):62-6.

8. Trintin LA. Avaliação nutricional. In: Ikemori EHA, Oliveira T, Serralheiro IFD. Nutrição em oncologia. São Paulo: Marina; 2003. p.45-82.
9. Brasil. Ministério da Saúde. Centro Brasileiro de Análise e Planejamento. Pesquisa nacional de demografia e saúde da criança e da mulher – PNDS 2006: dimensões do processo reprodutivo e da saúde da criança [internet]. Brasília (DF): Ministério da Saúde, 2009. 300 p. (Série G. Estatística e Informação em Saúde). Disponível em: http://bvsms.saude.gov.br/bvs/publicacoes/pnds_crianca_mulher.pdf
10. Felden JBB, Figueiredo ACL. Distribuição da gordura corporal e câncer de mama: um estudo de caso-controle no sul do Brasil. Ciênc saúde coletiva. 2011;16(5):2425-33.
11. Saquib N, Flatt SW, Natarajan L, Thomson CA, Bardwell WA, Caan B, et al. Weight gain and recovery of pre-cancer weight after breast cancer treatments: evidence from the women's healthy eating and living (WHEL) study. Breast Cancer Res Treat. 2007;105(2):177-86.
12. Habicht JP. Estandardización de métodos epidemiológicos cuantitativos sobre el terreno. Bol Oficina Sanit Panam. 1974;76:375-84.
13. Lohman TG, Roche AF, Martorell R, editors. Antropometric standardization reference manual. Champaign: Human kinetics; 1988.
14. World Health Organization. Division of Noncommunicable Diseases. Programme of Nutrition Family and Reprodutive Health. Obesity: preventing and managing the global epidemic: report of a WHO consultation on obesity. Geneva: WHO; 1998.
15. Frisancho AR. New norms of upper limb fat and muscle areas for assessment of nutritional status. Am J Clin Nutr. 1981;34:2540-5.
16. Durnin JV, Womersley J. Body fat assessed from total body density and its estimation from skinfold tickness: measurements on 481 men and women age from 16 to 72 years. Br J Nutr. 1974;32(1):77-97.
17. Siri WE. Body composition from fluid spaces and density: analysis of methods. 1961. Nutrition. 1993;9(5):480-92.
18. Lohman T, Going S. Assessment of body composition and energy balance. In: Lamb D, Murray R, editors. Perspective in exercise science and sports medicine. Carmel, IN: Cooper Publishing; 1998. p.61-105.
19. Radominski RB, Vezozzo D, Cerri GG, Halpern A. O uso da ultrassonografia na avaliação da distribuição de gordura abdominal. Arq bras endocrinol metab. 2000;44(1):5-12.
20. Porter PL. Cáncer de mama en el mundo: [revision]. Salud pública Méx. 2009;51(Suppl.2):s141-6.
21. Sclowitz ML, Menezes AMB, Gigante DP, Tessaro S. Condutas na prevenção secundária do câncer de mama e fatores associados. Rev saúde pública. 2005;39(3):340-9.
22. Di Pietro PF, Medeiros NI, Vieira FG, Fausto MA, Belló-Klein A. Breast cancer in southern Brazil: association with past dietary intake. Nutr Hosp. 2007;22(5):565-72.
23. Morimoto LM, White E, Chen Z, Chlebowski RT, Hays J, Kuller L, et al. Obesity, body size, and risk of postmenopausal breast cancer: the Women's Health Initiative (United States). Cancer Causes Control. 2002;13(8):741-51.
24. Pinho VFS, Coutinho ESF. Variáveis associadas ao câncer de mama em usuárias de unidades básicas de saúde. Cad saúde pública. 2007;23(5):1061-9.
25. Fundação Instituto Brasileiro de Geografia e Estatística (IBGE). Coordenação de Índices de Preços. Pesquisa de orçamentos familiares 2002-2003: primeiros resultados – Brasil e grandes regiões [internet]. Rio de Janeiro: IBGE; 2004. Disponível em:http://www.ibge.gov.br/home/estatistica/populacao/condicaodevida/pof/2002/pof2002.pdf
26. Brasil. Ministério da Saúde. Instituto Nacional de Câncer José Alencar Gomes da Silva. Coordenação de Prevenção e Vigilância. Estimativa 2012: incidência de câncer no Brasil [internet]. Rio de Janeiro: Inca, 2011. Acessado em: 2012 Jan 02. 118 p. Disponível em: http://www.inca.gov.br/estimativa/2012/estimativa20122111.pdf.
27. Key TJ, Allen NE, Spencer EA, Travis RC. Nutrition and breast cancer. Breast. 2003;12(6):412-6.
28. Majed B, Moreau T, Asselain B; Curie Institute Breast Cancer Group. Overweight, obesity and breast cancer prognosis: optimal body size indicator cut-points. Breast Cancer Res Treat. 2009;115(1):193-203.
29. Vega GL, Adams-Huet B, Peshock R, Willett D, Shah B, Grundy SM. Influence of body fat content and distribution on variation in metabolic risk. J Clin Endocrinol Metab. 2006;91(11):4459-66.

Received on 02/04/2012
Accepted for publication 06/06/2012
Conflict of interest: none
Source of Funding: Partially funded by the Foundation for Research Support of the State of Goiás (FAPEG), Case No. 00228648-96, Call in 01/2007

How to cite this article:
Martins KA, Freitas Júnior R, Monego ET, Paulinelli RR. Anthropometry and lipid profile in women with breast cancer: a case-control study. Rev Col Bras Cir. [periódico na Internet] 2012; 39(5). Disponível em URL: http://www.scielo.br/rcbc

Address for correspondence:
Ruffo Freitas Júnior
E-mail: ruffojr@terra.com.br