DOI: https://doi.org/10.36489/saudecoletiva.2021v11i68p7533-7544

Muscle strength, laboratory profile and quality of life in active and sedentary women with breast cancer

Fuerza muscular, perfil de laboratorio y calidad de vida en mujeres activas y sedentarias con cáncer de mama

Força muscular, perfil laboratorial e qualidade de vida em mulheres ativas e sedentárias com câncer de mama

ABSTRACT
Combined resistance and aerobic training are part of non-pharmacological treatment for cancer patients. Objective: Analise muscle strength, laboratory profile and quality of life of active and sedentary women with breast cancer. Method: A sample of 43 women with breast cancer attended by "Associação dos Amigos da Oncologia – AMO" at state of Sergipe, Brazil, followed for 6 weeks; by that amount, 27 accomplished combined training (experimental group – GE) , and 16 were sedentary (control group – GC). Results: All studied variables had bigger average at GE. Mann-Whitney test showed significant differences in muscle strength between both groups: upper limbs (Δ%=45,30 %; p=0,162); lower limbs (Δ%=50,95 %; p=0,536); and trunk (Δ%=42,00 %; p=0,704). At laboratory profile, there was a bigger difference in leukocytes. Lastly, the analysis of quality of life showed improvement at GE (Δ=57,34%, p>0,001). Conclusion: The physical activity triggers improvement in: strength muscle, laboratory profile (causing betterment of anemia and immune response) and also in quality of life.
DESCRIPTORS: Breast Neoplasms; Motor Activity; Muscle Strength; Laboratory Research; Indicators of Quality of Life

RESUMEN
Lo entrenamiento combinado (aeróbico + de resistencia) es parte del tratamiento oncológico non farmacológico. Objetivo: Analizar fuerza muscular, perfil de laboratorio y calidad de vida de mujeres atibas y sedentarias con cáncer de mama. Método: La amuestra fue de 43 mujeres con cáncer de mama de la "Associação dos Amigos da Oncologia – AMO", de Estado de Sergipe, Brasil; acompañadas por 6 semanas. De estas, 27 realizaran entrenamiento combinado (grupo experimental – GE), y 16 eran sedentarias (grupo controle – GC). Resultados: Todas las variables tuvieran mayor media en grupo GE. La prueba Mann-Whitney demostró diferencias significativas en la fuerza muscular entre grupos: miembros superiores (Δ%=45,30 %; p=0,162); miembros inferiores (Δ%=50,95 %; p=0,536); y maletero (Δ%=42,00 %; p=0,704). En perfil de laboratorio ha tenido mayor diferencia relativamente en los leucocitos. El análisis de calidad de vida se quedó mejor en GE (Δ%=57,34%, p>0,001). Conclusión: El ejercicio físico proporciona mejora de fuerza muscular, de perfil de laboratorio (desencadenando mejora en anemia y en la respuesta inmune), bien como en la calidad de vida.
DESCRIPTORES: Neoplasias de la mama; Actividad Motora; Fuerza Muscular; Investigación de Laboratorio; Indicadores de Calidad de Vida

RESUMO
O treinamento combinado (aeróbico + resistido) deve ser parte do tratamento oncológico não-farmacológico. Objetivo: Analisar força muscular, perfil laboratorial e qualidade de vida de mulheres ativas e sedentárias com câncer de mama. Método: A amostra foi de 43 mulheres com câncer de mama da Associação dos Amigos da Oncologia – AMO (SE), acompanhadas por 6 semanas; dessas, 27 realizaram treinamento combinado (grupo experimental – GE) e 16 eram sedentárias (grupo controle – GC). Resultados: Todas variáveis obtiveram média maior no GE. O teste Mann-Whitney demonstrou diferenças significativas na força muscular entre grupos: membros superiores (Δ%=45,30 %; p=0,162); membros inferiores (Δ%=50,95 %; p=0,536); e tronco (Δ%=42,00 %; p=0,704). No perfil laboratorial houve maior diferença comparativamente nos leucócitos. A análise da qualidade de vida apontou melhora no GE (Δ%=57,34%, p>0,001). Conclusão: O exercício físico propicia melhora da força muscular, do perfil laboratorial (desencadeando melhora da anemia e da resposta imune), bem como da qualidade de vida.
DESCRITORES: Neoplasias da Mama; Atividade Motora; Força Muscular; Investigação Laboratorial; Indicadores de Qualidade de Vida

RECEIVED ON: 06/04/2021 **APPROVED ON:** 06/16/2021

Rafaella Castro Gama
Medicine Course at Tiradentes University - UNIT, Aracaju, Brazil.
ORCID: 0000-0002-2617-9171

Beatriz Aguiar da Mota
Medicine Course at Tiradentes University - UNIT, Aracaju, Brazil.
ORCID: /0000-0001-8093-0205

Edízia Freire Mororó Cavalcante Torres
Medicine Course at Tiradentes University - UNIT, Aracaju, Brazil.
ORCID: 0000-0003-3479-9546

Evelini Veras de Jesus
Stricto Sensu Post-Graduate Program in Nursing and Biosciences – PPgEnfBio, Federal University of the State of Rio de Janeiro – UNIRIO, Rio de Janeiro, Brazil.
ORCID: 0000-0003-1677-9322

Jani Cleria Pereira Bezerra
Stricto Sensu Postgraduate Program in Health and Environment – PSA, from Tiradentes University – UNIT, Aracaju, Brazil.
ORCID: 0000-0001-6247-5480

Estélio Henrique Martin Dantas
Stricto Sensu Graduate Program in Nursing and Biosciences – PPgEnfBio, Federal University of the State of Rio de Janeiro – UNIRIO, Rio de Janeiro, Brazil.
ORCID: 0000-0003-0981-8020

INTRODUCTION

Breast cancer (BC) is the second most frequent neoplasm in Brazilian women, second only to non-melanoma skin cancer. [1] In a historical cohort from 2000 to 2014, the 10-year survival of these women was estimated; 471 were eligible in the time criterion, and 183 died; with an overall survival of 41,0% (CI 95% 36,1% 45,0%). [2]

As the malignant neoplasm that affects the breasts unilaterally or bilaterally with nodule(s) caused by mutations (change in genes) in ductal or lobular breast cells, it has a multifactorial etiology and can be acquired throughout life and/or by hereditary transmission. [3] Risk factors related to it are: female gender, age over 40 years, early menarche, late menopause, nulliparity, obesity, family history of breast cancer, alcohol consumption, exposure to ionizing radiation and high density of breast tissue. [4]

From prophylaxis, healthy lifestyle habits, such as the practice of physical exercise, the ingestion of fruits, vegetables, fish and olive oil are related to a lower probability of breast cancer, reducing mortality. [5] Breastfeeding is a protective factor, as it promotes complete breast maturation, making the breasts less dense, and alternatives such as chemoprophylaxis with tamoxifen in high-risk patients, or even risk-reducing surgery in BRCA (Breast Cancer Gene) mutation carriers. [6]

The data point to physical inactivity as being responsible for the incidence of 21% to 25% of malignant breast and colon tumors in women. Researches have related physical activity and cancer, showing that patients who practice physical exercises had improvement in several aspects, such as functional capacity, improvement in muscle strength and flexibility. [7]

Little is said about the non-drug treatment of cancer in the medical environment, after all, curative treatment is often a challenge in the BC for both the physician and his patient. However, BC needs much more than strictly drug therapy. This study sought to analyze muscle strength (MS), laboratory profile (LP) and quality of life (QoL) of active and sedentary women with BC.

METHODS

Observational, cross-sectional and analytical study submitted and approved by the Ethics and Research Committee Involving Human Beings (CEP), from Tiradentes University, as per opinion nº 4.264.002 – CAE: 23682219.0.0000.537.

Approximately 2.000 sheltered by the Association of Friends of Oncology – AMO (Associação dos Amigos da Oncologia), in the State of Sergipe, the sample was selected from this group through inclusion criteria: women aged 45 to 60 years, diagnosed with primary BC; have medical clearance; sign the Informed Consent Form (ICF) and exclusion: diagnosed with metastases; Body Mass Index (BMI) < 18,5 kg/m2 and weight loss (≥ 5% in 12 months or less); compromised immunity; edema considered severe; chronic or acute pulmonary or respiratory disease; chronic or acute muscle, bone or joint abnormalities and not authorized by the oncologist.

The sample size was estimated using

the G*Power 3.1 software. At the end of the process, the sample size was calculated in a total of 37 participants, being randomly separated into an experimental group (EG) - patients participating in the combined training program (aerobic + resistance) with 27 patients and a control group (CG) - sedentary patients with 16 patients.

To assess MS, the dynamometry method for static strength was applied, using a 400 pound Lafayete® model 32527 tt dynamometer. US 400-Pound Push/Pull Dynamometer Model 32527PP, following the analysis protocol for the movements. [8] The MS of upper limbs (biceps thread) the individual should remain standing with the device calibrated and zeroed; the individual was asked to position himself at the base of the device with his knees bent at approximately 120 degrees and his trunk bent, placing his hands in supination; without moving the trunk and lower limbs, the individual should flex the elbows, using the muscles of the arms in a bicep curl; trunk (anterior trunk flexion) the individual should adopt the following position on the platform: flex the hip, enough to hold the bar, with the hands in pronation; without bending the trunk backwards, the individual should pull the bar upwards with the greatest possible force, using the musculature of the lumbar region of the trunk and lower limbs (knee extension). [9] The individual should adopt the following position on the platform: flex the knees, at an angle of 130° to 140°, with hands in pronation; without leaning the trunk forwards or backwards, the individual should pull the bar upwards with the greatest possible force, using the knee extensor musculature.

To verify the LP, a complete blood count exam was used, by the automated system: flow cytometry, laser, spectrometric absorption, optical dispersion/fluorescence and impedance (PARDINI, 2003-2004), to verify the erythrogram (red blood cells, hemoglobin and hematocrit); the white blood cell count (leukocytes, neutrophils, lymphocytes and monocytes); and plateletgram.

Location and dispersion measures were used. Among the first, the mean (x) was calculated, a measure of central tendency, that is, it identifies the location of the center of the data set. Dispersion measures, on the other hand, estimate the existing variability in the data. For this purpose, the standard deviation was estimated, as indicated in the consulted literature.

On the other hand, QoL was assessed using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire "Core" 30 (EORTC-QLQ-C30) version 3.0 in Portuguese. [10]

The EG participated in the combined training program (aerobic + resistance) for 6 weeks, consisting of stretching, cardiorespiratory resistance and strength exercises, adopting the following criteria: weekly frequency three times in sessions of 40 to 50 minutes; each session has the following division: 5 minutes (stretching); 15 minutes (cardiorespiratory resistance) and 15-20 minutes (strength). The program was prescribed, observing the determination of the adequate load by controlling the intensity of effort, and maintained on a light to moderate scale, from 50% to 75% of the maximum heart rate, with a variation in the perceived exertion scale from 9 to 13. [11] And with consumption of 3 to 6 METs. [12,13]

The CG was monitored through weekly meetings with an integrative conversation circle with playful and participatory activities, and multidisciplinary follow-up for six weeks. After this period, both groups were submitted to diagnostic evaluation protocols.

Location and dispersion measures were used. Among the first, the mean (x) was calculated, a measure of central tendency, that is, it identifies the location of the center of the data set. Dispersion measures, on the other hand, estimate the existing variability in the data. For this purpose, the standard deviation was estimated, as indicated in the consulted literature. [14]

The causality of the collected data was verified using the Shapiro-Wilk test; evaluating the normality in relation to the characteristics of the sample at the end of 6 weeks. Aiming to contemplate the total possibilities of intergroup comparison, the Mann-Whitney test was applied, a non-parametric test deve-

loped to compare the central tendencies of two independent samples; equivalent to the t test. This test compared the difference between the two groups, with a significance level of $p < 0,05$. [15]

The present study, in order to maintain the scientificity of the research, admitted a significance level of $p < 0,05$, that is, a 95% probability that the affirmations and/or negatives denoted during the investigations are correct (α error), assuming, therefore, a probability of 5% for results obtained by chance. The power of the experiment, or the power of the experiment, was evaluated allowing an acceptance level corresponding to 80%. [16]

RESULTS

Table 1 shows the results of the sample static FM variable for upper limb biceps curl movement (UL), anterior trunk flexion and lower limb knee extension (LL) after the intervention; with mean and standard deviation values for EG and CG. The EG showed higher means when compared to the CG, and when we compared both groups, a hypothesis that actually demonstrates a difference between the groups in upper limbs, the p was 0,162; in the lower limbs, 0,536; in the trunk, 0,704.

Regarding LP, the variables red blood cells, hemoglobin, hematocrit, leukocytes, neutrophils, lymphocytes, monocytes and platelets were studied from the collection of blood counts after six weeks of each group. The analysis of the-

Table 1 - Mean values, standard deviation and comparison of upper limbs; lower members; trunk and strength index, Aracaju (2020).

VARIABLE	GROUP	MEAN (M)	STANDARD DEVIATION (SD)	UNPAIRED T-TEST AND MANN WHITNEY TEST (COMPARISON)
UL- Post-test	GE	26,59	13,74	
	GC	21,81	15,26	0,016
LL - Post-test	GE	23,70	13,84	
	GC	21,19	15,15	0,053
Trunk - Post-test	GE	21,67	13,37	
	GC	21,50	11,74	0,007

Note. UL = upper limbs; LL = lower limbs; and trunk. Source: Gama et.al (2021).

Table 2-Mean, standard deviation and comparison values for checking the erythrogram; of the white blood cell count and platelet count, Aracaju (2020).

MEASURE	GROUP	MEAN	STANDARD DEVIATION	UNPAIRED T-TEST AND MANN WHITNEY TEST (COMPARISON)
Hemac- Post-test	GE	4,24	0,29	< 0,0001*
	GC	3,84	0,29	
Hemoglob- Post-test	GE	13,40	0,80	0,002*
	GC	12,43	1,08	
Hematoc- Post-test	GE	40,40	2,70	< 0,0001*
	GC	37,27	1,83	
Leukoc- Post-test	GE	5,67	1,11	0,027*
	GC	4,92	0,90	
Neutrof- Post-test	GE	5,82	0,78	0,0002*
	GC	4,94	0,48	
Lymphoc- Post-test	GE	2,99	0,43	< 0,0001*
	GC	2,42	0,32	
Monoc- Post-test	GE	285,52	63,79	0,0003*
	GC	201,81	73,15	
Plat- Post-test	GE	272,59	60,94	0,0007*
	GC	198,44	69,23	

Note. Hemac = red blood cells; Hemoglob = hemoglobin; Hematoc = hematocrit; Leukoc = leukocytes; Neutrof = neutrophils; Lymphoc = lymphocytes; Monoc = monocytes; Plat = platelets. Source: Gama et.al (2021)

se data showed statistical difference of mean and standard deviation (p<0,05) for all measures observed in the experimental group, that is, the combined training group (aerobic + resistance) presented LP normalization values as shown in table 2.

In this table, it can be seen that comparatively, there was no great statistical difference between the groups, making the hypotheses null; however, leukocytes showed a greater difference between the two groups.

Finally, the QoL of these women with breast cancer, submitted or not to combined training (aerobic + resistance), was analyzed, table 3 presents the results. Analyzing it, we can see favorable intergroup results for the group that performed combined training (resistance + aerobic) (EG), to the detriment of the sedentary group (CG).

The analysis showed that there was a statistically significant difference (for p < 0,05) of mean (M) and standard deviation (SD) (M: 93,04; SD: 9,10) in the improvement of QoL in the post-test experimental group.

This study observed that women with breast cancer, submitted to combined training (aerobic + resistance) presented: higher muscle strength indexes; laboratory profile tending towards normality and a better quality of life. The observed power of the experiment was 99% by Wilks' Lambda test, table 5.

DISCUSSION

A systematic review studied the effects of resistance training (RT) programs during radiotherapy treatment in breast cancer. In the strength assessment, the RT increased muscle strength compared to the control group at the maximum isokinetic torque peak for knee flexion, internal and external rotations of the shoulders. [17] Compared to the present study, which intervened through a combined training program (aerobic + resistance), there was an improvement in static muscle strength in the variables for the upper limb, lower limb and trunk movements of the EG in the post-test.

Thus, the importance of early inclusion of guided physical exercise in the rehabilitation protocol of cancer patients is reaffirmed

In another study, the effects of a combined aerobic and strength program on physical activity level parameters were evaluated; body composition; and lipid and glycemic profiles in breast cancer survivors. After 24 weeks of training, they observed that the intervention group showed significant improvement in the variables BMI (-0,03%), total mass (-4,1%) and body composition. [18] Thus, these findings help us to understand that prolonged combined training not only helps directly in the variables of the present study (muscle strength, laboratory profile and quality of life). Thus, the importance of early inclusion of guided physical exercise in the rehabilitation protocol of cancer patients is reaffirmed.

In addition, a case report of an adult woman with breast cancer undergoing resistance training demonstrated: muscle mass gain; decreased body weight and fat percentage; improvement in blood circulation, fluid retention caused by medication, quality of sleep, bowel function, mood instability; alleviation of bouts of depression; and greater willingness to carry out their daily tasks. [19]

On the other hand, still in 1863, Rudolf Virchow raised the hypothesis

Table 3 - Mean, standard deviation and comparison values to verify the quality of life in women with breast cancer, Aracaju (2020).

VARIABLE	GROUP	MEAN (M)	STANDARD DEVIATION (SD)	MANN WHITNEY TEST (COMPARISON)
QoL- Post-test	GE	93,04	9,10	< 0,0001*
	GC	59,13	28,93	

Note. QoL = Quality of life. Source: Gama et.al (2021).

Table 5 - Power of the Experiment, Aracaju (2020).

EFFECT			VALUE	F	P- VALUE	OBSERVED POWER
	Group	Wilks Lambda	0,231	4,45	0,000	,998
Among-subjects	Time	Wilks Lambda	0,160	7,01	0,000	1,000
	Time * Group	Wilks Lambda	0,057	21,89	0,000	1,000

Source: Gama et.al (2021).

of the participation of the inflammatory process in the pathophysiology of cancer. It is known today about the concept of Tumor Microenvironment (TME). [20] A cohort study investigated the association of physical activity with health-related quality of life in 231 breast cancer survivors. The result was that patients who had a higher level of physical activity had lower levels of fatigue ($p = 0,001$) and pain ($p = 0,02$); better quality of life ($p = 0,64$); in addition to a higher sexual function score. [21] In the present study, evidence was produced that the prescription of a combined training program (aerobic + resistance) with a frequency of three times a week for women with breast cancer has a positive impact on QOL, making it relevant that exercises are also implemented before cancer treatment.

CONCLUSION

As demonstrated, the combined training improved muscle strength, the numbers of all variables in the blood count showed a trend towards normalization, as well as improving the quality of life, impacting the general health of these patients.

Physical exercise triggers anti-tumorigenic effects, disfavoring the tumor microenvironment - improving the survival and prognosis, in general, of the cancer patient, and should be the mainstay of the non-pharmacological treatment of breast cancer and strongly recommended for cancer patients who can perform it with release of your health care team.

REFERENCES

1.BRASIL, Instituto Nacional de Câncer José Alencar Gomes da Silva. Estimativa 2020: incidência de câncer no Brasil. Rio de Janeiro, 2019.

2. Ayala, A. L. M., Anjos, J. C. D., Cassol, G. A., & Höfelmann, D. A. (2019). Sobrevida em 10 anos em mulheres com câncer de mama: coorte história de 2000-2014. Ciência & Saúde Coletiva, 24, 1537-1550.

3.Cândido C.; Luz Gessilane.; Machado J.. Cargnin A. B. A carcinogênese e o câncer de mama. Revista Maiêutica. 2016, 4(1): 45-52.

4. Pereira Bmb, Guedes Cmf, Machado Cac. Terapia hormonal e câncer de mama. Rev Bras Mastologia. 2017;27(1):15-20.

5. Vieira, Sabas Carlos. Câncer de mama: Consenso da Sociedade Brasileira de Mastologia - Regional Piauí. Teresina: EDUFPI, 2017. 328 p.

6. Avelar CC, Abi-Ackel AM, Nunes LCG, & Avelar JT. Mastectomia profilática bilateral em mulheres com mutação de brca. e-Scientia. 2020; 12(2): 42-46.

7. Camargo, R. Z. T. Câncer: mais um motivo para se exercitar. Revista do DERC. 2015; 21(2).

8. Johnson, B.L.; Nelson, J.K. Measurement of Physical Performance. Resource Guide with Laboratory Experiments. Minneapolis, Minnesota; Burgess Publishing Company, 1979.

9. Charro, M. A.; Bacurau, R. F. P.; Navarro, F.; Pontes JR. F.L. Manual de Avaliação Física. Editora Phorte; 2010.

10. J. pais-ribeiro, J.; Pinto, C.; Santos, C. Validation study of the portuguese version of the QLC-C30-V. 3. Psicologia, Saúde e Doenças. 2008; 9 (1); 89-102.

11. Dimeo, F. et al. Benefits from aerobic exercise in patients with major depression: a pilot sutdy. British Journal of Sports Medicine. 2000; 35; 114-117.

12. Lee I-M. Physical activity and cancer prevention: data from epidemiologic studies. Medicine & Science in Sports & Exercise. 2003; 35:1823-7.

13. Bezerra, J.C.P. Estresse, Fadiga Oncológica e Qualidade de Vida em Pacientes com Distintos Níveis de Condicionamento Físico [Tese]. Rio de Janeiro. Universidade Federal do Estado do Rio de Janeiro, 2020.

14. Thomas Jr.; Nelson J. K.; Silverman S. J. Métodos de pesquisa em atividade física, 6. ed. Porto Alegre: Artmed; 2012.

15. Nobeschi L, Katayose J, Goto Re, Munhoz Bns, Melo Hjf. Aplicação de métodos de saturação de gordura por ressonância magnética no diagnóstico de câncer de mama. Rev Bras Mastologia. 2017;27(1):26-30.

16. Jesus E. V. Força muscular, fadiga oncológica, perfil imunológico e qualidade de vida de mulheres com câncer de mama participante de um programa de treinamento combinado. [Dissertação]. Aracaju. Universidade Tiradentes, 2021.

17. Siqueira, G. D. de J. et al. Efeitos do treinamento resistido durante o tratamento radioterápico em mulheres com câncer de mama: uma revisão sistemática. International Journal of Movement Science and Rehabilitation. 2019; 1(2): 30-46.

18. Viezel, Juliana. Responsividade das variáveis de composição corporal, perfil lipídico e nível de atividade física de mulheres em tratamento para o câncer de mama ao treinamento combinado. [Dissertação]. São Paulo. Universidade Estadual Paulista, 2018.

19. Gonçalves, J. A. Azevedo, F.G.S. Treinamento de Força como Aliado ao Tratamento de Pacientes com Câncer de Mama: Estudo de Caso. Disponível em: <https://ceafi.edu.br/site/wp-content/uploads/2019/05/treinamento-de-fora-como-aliado-ao-tratamento-de-pacientes-com-cncer-de-mama-estudode-caso.pdf>. Acesso em: 20. Maio. 2021.

20. Figueiredo, C. O intrigante paradoxo da inflamação associada ao câncer: uma atualização. Jornal brasileiro de patologia e medicina laboratorial. 2019; 55(3): 321-332.

21. Shin, W. K., Song, S., Jung, S. Y., Lee, E., Kim, Z., Moon, H. G., ... & Lee, J. E. The association between physical activity and health-related quality of life among breast cancer survivors. Health and quality of life outcomes. 2017; 15(1):1-9.