Cancer-Related Fatigue in the Postoperative Period of Breast Cancer: Influence of Clinical and Functional Variables

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Fadiga Oncológica no Pós-Operatório de Câncer de Mama: Influência de Variáveis Clínicas e Funcionais

La Fatiga Relacionada con el Cáncer en el Periodo Posoperatorio del Cáncer de Mama: Influencia de las Variables Clínicas y Funcionales

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ABSTRACT

Introduction: Individuals with breast cancer often experience adverse effects associated with both cancer treatment and disease progression, with cancer-related fatigue being a prominent issue. **Objective:** To determine the prevalence of fatigue among postoperative breast cancer patients treated at an oncology physical therapy clinic, as well as the influence of clinical and functional factors. **Method:** An observational, cross-sectional study on cancer-related fatigue and analysis of functional aspects. Fatigue was assessed using the Piper Fatigue Scale – Revised, classified as mild (score <4), moderate (score ≥ 4 and <6), and severe (score ≥ 6). Functional aspects included assessment of Hand Grip Strength (HGS), Calf Circumference (CC), and the Timed Up and Go (TUG) test. All variables, sociodemographic, clinical, and functional, were organized and compared across groups of individuals with mild, moderate, and severe fatigue. **Results:** The sample consisted of 84 patients, with a predominance of females (98.8%). Cancer-related fatigue was highly prevalent across all dimensions (behavioral, affective, sensory/psychological). Most patients had normal scores on the HGS (85.2%) and CC (95.1%) assessments, and no risk of falling based on TUG scores (85.7%). **Conclusion:** Fatigue was present in all evaluated patients, with a predominance of severe fatigue. No statistically significant associations were observed between fatigue and the clinical and functional variables analyzed.

Key words: Muscle Fatigue; Breast Neoplasms; Muscle Strength.

RESUMO

Introdução: Indivíduos com câncer de mama frequentemente apresentam efeitos adversos associados tanto ao tratamento oncológico quanto à progressão da doença, destacando-se a fadiga oncológica. **Objetivo:** Verificar a prevalência da fadiga de pacientes em pós-operatório de câncer de mama atendidos em um ambulatório de fisioterapia oncológica, bem como a influência dos aspectos clínicos e funcionais. **Método:** Estudo observacional e transversal sobre fadiga oncológica e análise de aspectos funcionais. A fadiga foi avaliada por meio da Escala de Fadiga de Piper – Revisada, sendo classificada em leve (escore <4), moderada (escore ≥4 e <6) e intensa (escore ≥6). Os aspectos funcionais incluíram a avaliação da força de preensão palmar (FPP), circunferência de panturrilha (CP) e o teste *Timed Up and Go* (TUG). Todas as variáveis, sociodemográficas, clínicas e funcionais, foram organizadas e comparadas entre os grupos de indivíduos com fadiga leve, moderada e intensa. **Resultados:** A amostra foi composta por 84 pacientes, com predomínio do sexo feminino (98,8%). A fadiga oncológica foi altamente prevalente em todas as dimensões (comportamental, afetiva, sensorial/psicológica). A maioria dos pacientes apresentou normalidade na avaliação da FPP (85,2%) e CP (95,1%), além de ausência do risco de queda conforme a pontuação na avaliação do TUG (85,7%). **Conclusão:** A fadiga esteve presente em todos os pacientes avaliados, com predomínio da fadiga intensa. No entanto, não foram observadas associações estatisticamente significativas entre a fadiga e as variáveis clínicas e funcionais analisadas.

Palavras-chave: Fadiga Muscular; Neoplasias da Mama; Força Muscular.

RESUMEN

Introducción: Las personas con cáncer de mama suelen presentar efectos adversos asociados tanto al tratamiento oncológico como a la progresión de la enfermedad, entre los que destaca la fatiga oncológica. **Objetivo:** Determinar la prevalencia de la fatiga en pacientes en el posoperatorio de cáncer de mama atendidos en una consulta de fisioterapia oncológica, así como la influencia de los aspectos clínicos y funcionales. **Método:** Estudio observacional y transversal sobre la fatiga oncológica y análisis de aspectos funcionales. La fatiga se evaluó mediante la Escala de Fatiga de Piper – Revisada, clasificándose en leve (puntuación <4), moderada (puntuación ≥ 4 y <6) e intensa (puntuación ≥ 6). Los aspectos funcionales incluyeron la evaluación de la fuerza de prensión palmar (FPP), la circunferencia de la pantorrilla (CP) y la prueba *Timed Up and Go* (TUG). Todas las variables, tanto sociodemográficas como clínicas y funcionales, se organizaron y compararon entre los grupos de individuos con fatiga leve, moderada e intensa. **Resultados:** La muestra estuvo compuesta por 84 pacientes, con un predominio de mujeres (98,8 %). La fatiga oncológica fue muy prevalente en todas las dimensiones (conductual, afectiva, sensorial/psicológica). Y la mayoría de los pacientes presentó resultados normales en la evaluación de la FPP (85,2 %) y la CP (95,1 %), además de una ausencia de riesgo de caídas según la puntuación en la evaluación del TUG (85,7 %). **Conclusión:** La fatiga estuvo presente en todos los pacientes evaluados, con predominio de la fatiga intensa. Sin embargo, no se observaron asociaciones estadísticamente significativas entre la fatiga y las variables clínicas y funcionales analizadas.

Palabras clave: Fatiga Muscular; Neoplasias de la Mama; Fuerza Muscular.

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INTRODUCTION

Cancer is one of the main causes of morbidity and mortality worldwide[1]. In Brazil, a total of 781 thousand new cancer cases is estimated for the 2026 to 2028 triennium[2]. Among the many different types of neoplasms, breast cancer is the most common in the female population, with 78,610 new cases estimated per year[3].

In a breast cancer treatment scenario, strategies vary depending on the molecular subtype, and they can include locoregional therapy and systemic therapy approaches[4,5]. Despite the different therapeutic modalities available, women with breast cancer often present with adverse effects associated with cancer treatment regarding disease progression, highlighting cancer-related fatigue as one of the most prevalent and incapacitating symptoms[6]. It can persist even after therapy completion and is associated with metabolic, endocrine, physical, functional, and psychological changes, with negative repercussions on functional capacity and quality of life[7].

Cancer-related fatigue is a multidimensional symptom, defined as a subjective, persistent, and anguishing sensation of physical, emotional, and/or cognitive exhaustion associated with the treatment. Unlike other types of fatigue, cancer-related fatigue is more severe and longer-lasting, disproportionate to the activity performed and not fully relieved by rest and sleep[8].

Although its etiology is not yet completely understood, its physiopathology involves central and peripheral mechanisms, including inflammatory and metabolic alterations that might compromise muscle metabolism, reducing protein synthesis and levels of adenosine triphosphate, contributing to weight and muscle strength loss, in addition to harming functional performance and the capacity to perform physical efforts[9].

Moreover, functional alterations in breast cancer survivors, such as reduced muscle mass and compromised mobility, have also been widely reported[10]. These changes can be attributed both to treatment and the disease's secondary, metabolic, and systemic effects and are associated with decreased capacity to perform daily life activities and increased functional dependence[11].

Although these outcomes are increasingly acknowledged, some gaps remain in scientific literature, especially regarding the multidimensional characterization of cancer-related fatigue, widely explored in relation to changes in muscle strength, muscle mass, and functional mobility, with conflicting results between studies[9,12].

Understanding the characteristics of fatigue, associated with the assessment of functional aspects, could provide important insights into the underlying mechanisms of this symptom and contribute to a better understanding of the functional changes often observed in this population. Such an approach is particularly relevant to support care and assistance strategies for affected and at-risk patients, aiming to minimize the negative impact of fatigue and functional dysfunctions.

Therefore, the present study aims to determine the prevalence of fatigue among breast cancer patients in the postoperative period treated at an oncology physical therapy clinic, as well as the influence of clinical and functional factors.

METHOD

Observational, cross-sectional study conducted with patients diagnosed with breast cancer and followed up at the clinic level from February to September 2025. The study was developed in the physiotherapy clinic of a tertiary hospital in the Federal District, a reference in physiotherapeutic follow-up of cancer patients at different treatment phases, including postoperative cancer surgeries, radiotherapy, and/or chemotherapy treatment.

The adopted criteria include individuals aged 18 or older, both sexes, in postoperative clinic physiotherapeutic follow-up, with a clinical diagnosis of breast cancer at any disease stage.

The exclusion criteria were patients with a second primary site; incapable of performing the standardized actions of hand grip strength (HGS) assessment using a digital dynamometer, due to paresis or plegia and anatomical alterations, such as hand deformities that impair them from executing the test; patients with severe mobility deficiency that impair them from performing the Timed Up and Go (TUG) test, defined as those incapable of standing up from a chair with no help or walking a minimum 3-meter distance; cognitive or linguistic barriers that impair them from understanding instructions, as well as participants who refused to take part by not signing up the Free and Informed Consent Form (FICF) or did not fully respond to the proposed questionnaires and assessments.

Data collection was done through a structured interview that used an assessment sheet elaborated by the authors and the application of validated questionnaires/instruments.

Previously, at the beginning of the collection, a pilot test was conducted with the aim of assessing the clarity of scales, appropriateness of language, average time spent on instrument application, and need for methodological adjustments. Data collection occurred weekly in the mornings and afternoons from February to September 2025. Patient screening was done using electronic records available in the MV PEP Soul® program, which enabled

the identification of eligible patients. After identification, patients were informed about the study and, after signing the FICF, questionnaires were administered and physical assessments were conducted.

The analyzed variables include sociodemographic, clinical, and functional aspects. Sociodemographic data included sex (female or male), age (years), and marital status (single, married, widowed, or divorced), which were identified using the institution's MV PEP Soul® program.

The following clinical variables were assessed: time since diagnosis (in months), presence of metastasis (yes or no), current oncological treatment (radiotherapy, chemotherapy, immunotherapy, hormone therapy), continued use medication (amount), body mass index – BMI (kg/m²) classified in eutrophic (18.50–24.99), overweight (25–29.99), grade I obesity (30–34.99), grade II obesity (35–39.99), and grade III obesity (≥40)[13], in addition to comorbidities (metabolic, kidney, respiratory, and cardiovascular diseases), smoking habits (non-smoker, former smoker, or current smoker), and physical exercise (yes or no).

Fatigue was assessed through a structured interview using Piper's Fatigue Scale – Revised, composed of 22 items distributed in 3 dimensions (behavioral, affective, and sensory/psychological). Each item was presented on a numeric scale (0 to 10), and the participant indicated the number that best described the fatigue they were feeling at that exact moment[14].

The scores were calculated by the mean of items in each dimension, and the total score by the mean of all items assessed in the scale. The total score and dimension scores are represented from 0 to 10, with higher scores indicating greater fatigue. Based on the total score, fatigue is classified as mild (score <4), moderate (score ≥4 and <6), and severe (score ≥6)[14,15].

Regarding functional aspects, HGS, calf circumference (CC), and TUG test were assessed.

HGS assessed muscle strength, using a manual dynamometer, model DM-100 Tmax®. In that assessment, individuals were seated, with one arm adducted and parallel to their body, flexed elbow at 90° and forearm and wrist in neutral position[16,17]. Three measurements were taken from the dominant limb, with a minimum interval of 30 seconds between them. The highest value was considered for analysis. The results were expressed in kilogram-force (kgf)[16,18]. Values lower than 27 kgf for men and 16 kgf for women were considered cutoffs[19].

CC, used to assess muscle mass, was conducted with an inelastic measuring tape by measuring the largest leg circumference spot, with the patient seated, leg forming a 90º degree angle, and feet flat on the ground[20]. Results were presented in centimeters, and the cutoff point adopted to define low muscle mass for this measure was ≤34 cm for men and ≤33 cm for women[21].

The TUG test was used as a functional test, capable of assessing mobility, balance, and functional ability. For this assessment, the patient was initially seated on a chair with no armrest, positioned against the wall. They were instructed to stand up without external help following a verbal cue, walk a 3-meter distance on a flat, unobstructed surface, at a comfortable pace, make a 180-degree turn, come back to the chair, and sit down. The necessary time to complete the test was recorded in seconds using a standardized digital chronometer[22]. Although different values are reported in the literature, the value of 12.47 seconds was adopted as a cutoff for being a better predictive value for the risk of falls in the Brazilian population[23].

The sample size was estimated through sample calculation in the Open Epi®[24] program, based on the monthly number of patients with breast cancer diagnosis cared for at a physiotherapy clinic of a tertiary hospital in the Federal District. Thus, using a statistical test with 95% power and an alpha error of 0.05, the minimum sample size was estimated at 78 participants.

The sample was characterized by descriptive data analysis with central trend measures and variability (mean and standard deviation), and absolute frequency and percentage. Data distribution was tested by the Kolmogorov-Smirnov[25] test. Sociodemographic, clinical, and functional variables were organized and compared between groups of individuals with mild, moderate, and severe fatigue, using the Analysis of Variance (ANOVA) test for continuous data and the chi-squared test (X^2)[25] for categorical data. The statistical analyses were conducted using the IBM SPSS Statistics for Windows software, version 29.0[26], considering a significance level of 5% for all tests.

This research has been approved by the Research Ethics Committee of the *Instituto de Gestão Estratégica do Distrito Federal*, report number 6.776.758 (CAAE (submission for ethical review): 34449720.8.0000.8153), in compliance with Resolution 466/2012[27] of the National Health Council.

RESULTS

In the present study, 90 patients were assessed. Of those, 6 participants were considered ineligible according to the eligibility criteria. The participant selection flowchart is presented in Figure 1.

The sample was composed of 84 patients, with a predominance of females (98.8%), a mean age of 52.7 years, and 48.8% being married. Regarding clinical

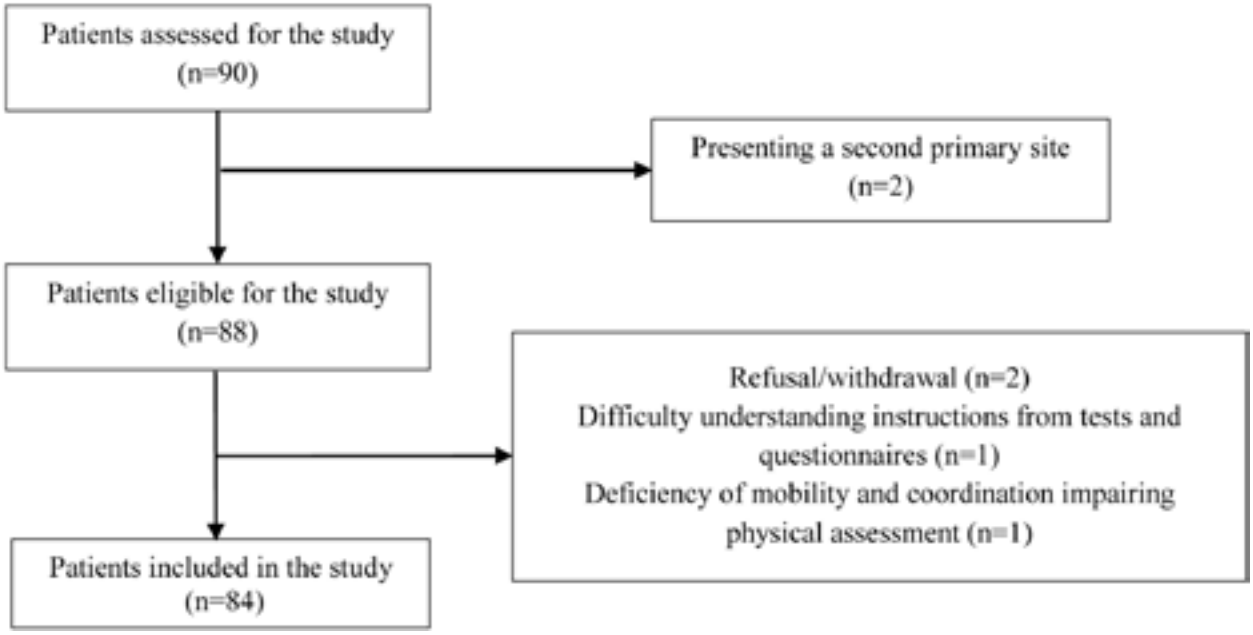

Figure 1. Flowchart of the study participants

characteristics, all included patients had already undergone some type of cancer treatment before data collection. Of those, 28 (87.5%) were in hormone therapy.

Regarding BMI classification, no statistically significant association was observed between the analyzed groups (p=0.52). Regarding BMI distribution in the total sample, most participants were classified as overweight (50.6%), followed by grade I obesity (20.5%). Regarding comorbidities, metabolic diseases were the most prevalent in the total sample (35.7%). In relation to smoking, its distribution between groups did not present statistically significant differences (p=0.14). Most participants reported they did not smoke (71.4%).

Regarding fatigue assessment, Table 2 shows a mean total score of 4.5 ± 0.2, which falls within the classification of moderate fatigue. Whereas in the functional variables, most patients had normal scores on the HGS (85.2%) and CC (95.1%) assessments, and no risk of falling based on TUG scores in 85.7% of the sample.

According to Table 3, cancer-related fatigue was highly prevalent across all dimensions (behavioral, affective, sensory/psychological), with most patients (38.1%) identified with predominantly severe fatigue.

In the dimension classification, there was a statistically significant difference in the distribution of fatigue severity in the behavioral, affective, and sensory/psychological dimensions (p<0.01 for all). In the behavioral dimension, severe fatigue predominated (45.2%). In the affective dimension, severe (39.3%) and mild (38.1%) fatigue presented similar frequencies, while moderate fatigue was less prevalent (22.6%). Whereas in the sensory/psychological dimension, severe fatigue was more frequent (38.1%), followed by moderate fatigue (35.7%).

Results in Table 4 show that there was no significant association with the clinical and functional variables collected.

DISCUSSION

The present study assessed reported fatigue, peripheral muscle strength, muscle mass, and risk of falling in patients with a breast cancer diagnosis followed up at a clinic. Women predominated (98.8%), with a mean age of 52.7 years, a profile compatible with that described in the literature for this population[5,11].

This finding reinforces the greater prevalence of female breast cancer, whereas in the male population it represents about 1% of cases and, due to a lack of preventive screening, is usually diagnosed at later ages and in more advanced stages when compared to the female population[28].

Regarding cancer-related fatigue, it constitutes a frequent and clinically relevant symptom, with significant impact in different life domains, being associated with multiple factors, including the disease itself, different oncological treatments, as well as conditions associated with the treatment, like pain and anemia[29].

Among the mechanisms described in the literature, systemic inflammation has stood out as the main physiopathological hypothesis, since activation of pro-inflammatory cytokines can trigger central alterations related to the perception of fatigue and reduction of physical and mental energy[30].

Previous studies in this population reaffirm that cancer-related fatigue presents a multidimensional nature[31]. Due to its subjective character, different instruments are used

Table 1. Sociodemographic and clinical characteristics of the study participants

	General sample (n=84)	Mild fatigue (n=27)	Moderate fatigue (n=25)	Severe fatigue (n=32)	*p*
Sex					0.43
Female	83 (98.8%)	27 (100%)	25 (100%)	31 (96.9%)	
Male	1 (1.2%)	-	-	1 (3.1%)	
Age (years)	52.7 ± 1.4	52.1 ± 3.1	51.5 ± 2.3	53.9 ± 2.3	0.84
Marital status					0.38
Single	28 (33.3%)	7 (25.9%)	11 (44%)	10 (31.3%)	
Married	41 (48.8%)	12 (44.4%)	12 (48%)	17 (53.1%)	
Widow(er)	4 (4.8%)	3 (11.1%)	-	1 (3.1%)	
Divorced	11 (13.1%)	5 (18.5%)	2 (8%)	4 (12.5%)	
Time since diagnosis (months)	29 ± 4.1	31 ± 8.4	26.6 ± 7.6	29.1 ± 6.2	0.70
Metastasis (yes)	4 (5.3%)	1 (4%)	-	3 (10%)	0.28
Current oncological treatment					0.58
Radiotherapy	1 (3.1%)	-	-	1 (7.7%)	
Chemotherapy	2 (6.3%)	1 (11.1%)	-	1 (7.7%)	
Immunotherapy	1 (3.1%)	-	1 (10%)	-	
Hormone therapy	28 (87.5%)	8 (88.9%)	9 (90%)	11 (84.6%)	
BMI (kg/m^2)	29.4 ± 0.5	29.5 ± 1.1	28.9 ± 1.0	29.7 ± 0.8	0.34
BMI (classification)					0.52
Eutrophic	11 (13.3%)	2 (7.4%)	6 (24%)	3 (9.7%)	
Overweight	42 (50.6%)	16 (59.3%)	10 (40%)	16 (51.6%)	
Obesity (grade I)	17 (20.5%)	6 (22.2%)	6 (24%)	5 (16.1%)	
Obesity (grade II)	11 (13.3%)	2 (7.4%)	3 (12%)	6 (19.4%)	
Obesity (grade III)	2 (2.4%)	1 (3.7%)	-	1 (3.2%)	
Comorbidities (yes)					
Metabolic diseases	30 (35.7%)	9 (33.3%)	9 (36%)	12 (37.5%)	0.94
Respiratory diseases	7 (8.3%)	3 (11.1%)	1 (4%)	3 (9.4%)	0.62
Cardiovascular diseases	28 (33.3%)	8 (29.6%)	7 (28%)	13 (40.6%)	0.53
Smoking					0.14
Yes	6 (7.1%)	4 (14.8%)	2 (8%)	-	
No	60 (71.4%)	17 (63%)	16 (64%)	27 (84.4%)	
Former smoker	18 (21.4%)	6 (22.2%)	7 (28%)	5 (15.6%)	
Physical exercise (yes)	52 (61.9%)	19 (70.4%)	16 (64%)	17 (53.1%)	0.38

Captions: BMI= Body mass index.
Note: Data expressed as absolute frequency and percentage, mean, and standard deviation.

for its assessment. Piper's Fatigue Scale– Revised stands out among them, developed to measure multidimensional fatigue and recommended by clinical guidelines for clinical practice assessment[32].

In the present study, all patients assessed had undergone some type of oncological treatment for breast cancer, including a surgical procedure for tumoral lesion resection. Moreover, they all reported some level of fatigue, with a predominance of the severe classification (38.1%). These findings corroborate the results by Matoso et al.[33], who identified fatigue in most women assessed.

Regarding surgical procedures, the literature describes that these can influence fatigue levels in patients with breast cancer. A study conducted with women before beginning adjuvant and neoadjuvant therapies demonstrated that mastectomy has been associated with higher levels of physical fatigue[34].

In this analysis, although it was not the objective to assess fatigue in the pre- and postoperative periods,

Table 2. Functional variables and fatigue

	General sample (n=84)	Mild fatigue (n=27)	Moderate fatigue (n=25)	Severe fatigue (n=32)	*p*
Total fatigue score (0-10)	4.5 ± 0.2	2.6 ± 0.1	4.2 ± 0.2	6.4 ± 0.1	**<0.01***
HGS (classification)					0.07
Normal HGS	69 (85.2%)	20 (76.9%)	20 (80%)	29 (96.7%)	
Reduced HGS	12 (14.8%)	6 (23.1%)	5 (20%)	1 (3.3%)	
CC (classification)					0.67
Normal CC	78 (95.1%)	23 (92%)	24 (96%)	31 (96.9%)	
Reduced CC	4 (4.9%)	2 (8%)	1 (4%)	1 (3.1%)	
TUG (classification)					0.54
Risk of falling	7 (8.3%)	3 (11.1%)	1 (4%)	3 (9.4%)	
No risk of falling	72 (85.7%)	23 (85.2%)	21 (84%)	28 (87.5%)	

Captions: * = *p*-value <0.05, statistical significance; HGS = hand grip strength; CC = calf circumference; TUG = Timed Up and Go test.
Note: Data expressed as absolute frequency and percentage, mean, and standard deviation.

Table 3. Classification of fatigue according to severity and dimensions

Classification of fatigue				
Presence of fatigue	**Mild**	**Moderate**	**Severe**	***p***
84 (100%)	27 (32.1%)	25 (29.1%)	32 (38.1%)	-
Classification according to dimensions				
	Mild	**Moderate**	**Severe**	***p***
Behavioral	27 (32.1%)	19 (22.6%)	38 (45.2%)	**<0.01 ***
Affective	32 (38.1%)	19 (22.6%)	33 (39.3%)	**<0.01 ***
Sensory/Psychological	22 (26.2%)	30 (35.7%)	32 (38.1%)	**<0.01 ***

Caption: * = *p*-value <0.05, statistical significance.
Note: Data expressed as absolute frequency and percentage.

Table 4. Comparison of functional variables between classification groups and dimensions of Piper's Fatigue Scale – Revised

	Mild fatigue	Moderate fatigue	Severe fatigue	*p*
HGS (Kgf – dominant arm)	21.1 ± 1.2	21.8 ± 1.3	23.4 ± 0.8	0.27
CC (cm)	37.2 ± 0.7	37.4 ± 0.6	37.9 ± 0.5	0.27
TUG (sec)	9.5 ± 0.3	9.8 ± 0.3	10.3 ± 0.3	0.73
Behavioral dimension				
HGS (Kgf – dominant arm)	20.9 ± 1.3	23.8 ± 0.9	22.1 ± 0.9	0.18
CC (cm)	36.6 ± 0.8	38.3 ± 0.5	37.8 ± 0.5	0.12
TUG (sec)	9.9 ± 0.3	9.5 ± 0.4	10.1 ± 0.2	0.91
Affective dimension				
HGS (Kgf – dominant arm)	21.2 ± 1.1	25.2 ± 2.3	19.7 ± 1.8	0.32
CC (cm)	37.6 ± 0.6	35.6 ± 0.7	34.8 ± 0.9	0.07
TUG (sec)	9.47 ± 0.3	10.6 ± 0.6	11.1 ± 1.4	0.93
Sensory/Psychological dimension				
HGS (Kgf – dominant arm)	21.5 ± 1.2	21.8 ± 1.2	23.6 ± 0.8	0.23
CC (cm)	37.5 ± 0.9	36.8 ± 0.5	38.3 ± 0.5	0.36
TUG (sec)	9.1 ± 0.3	9.7 ± 0.3	10.6 ± 0.3	0.22

Captions: * = HGS = hand grip strength; CC = calf circumference; TUG = Timed Up and Go test.
Note: Data expressed as mean and standard deviation.

all participants had undergone some type of surgical procedure and presented some level of fatigue. These findings reinforce the importance of integral follow-up of these populations in clinical practice and in further studies, highlighting the relevance of obtaining pre-surgical measures to establish a pre-treatment baseline[35]. We highlight, however, the existence of methodological challenges related to the recruitment and assessment of patients in the interval between diagnosis and surgery.

Still regarding treatment modalities, hormone therapy has been associated with the development and/or worsening of fatigue. Evidence indicates that hormone therapy constitutes a consistent risk factor for the occurrence of severe fatigue, with the identification of clearly distinct groups of patients who present more severe fatigue symptoms[36]. In the current research, 28 (87.5%) patients had hormone therapy as their current oncological treatment, and most of them presented a moderate or severe classification of fatigue, reinforcing the association described in the literature.

Regarding time since diagnosis, a study conducted with a sample of 6,057 cancer survivors demonstrated that affective, cognitive, and physical fatigue were prevalent even within 5 to 16 years after diagnosis[37]. In the present study, patients presented an average time of 29 months, showing that, even after a prolonged period, fatigue can persist to some extent.

Chronic fatigue is considered a frequent side effect after cancer therapy, especially among breast cancer survivors. Evidence indicates high prevalence and persistence of this symptom, mainly associated with combined systemic treatment and clinical and psychosocial factors (comorbidities, pain, depression, psychological suffering, and sleep disorders), with a low spontaneous recovery rate even after prolonged periods of follow-up[38,39].

Corroborating these findings, recent evidence indicates that fatigue, frequently followed by depressive symptoms, is one of the most relevant debilitating consequences of cancer survivorship in the long-term[40], with psychological factors considered the main predictors of persistent fatigue[39].

In this investigation, the lack of direct assessment of depressive symptoms, pain, and changes in sleep quality restricts a more detailed understanding of their association with persistent cancer-related fatigue. However, these findings reinforce the importance of longitudinal follow-up with systemic fatigue assessment, aiming to early identify vulnerable individuals and to intervene regarding potentially modifiable factors, preventing the symptom from becoming chronic[39].

In the present research, fatigue presented a high prevalence in every assessed dimension (behavioral, affective, and sensory/psychological), showing that this symptom, regardless of severity, exerts a significant impact on multiple domains of this population's life (p<0.001). Comparable results were observed in the study by Tanigaiselvane et al.[41], in which the sensory dimension was the most severely affected among all participants, being related to physical sensations and body perceptions associated with fatigue.

In this analysis, no statistically significant associations were observed between fatigue and the clinical and functional variables assessed. This finding suggests that, in the analyzed sample, fatigue can be strongly related to subjective aspects, such as behavioral and psychological components, instead of strictly physical or functional components. Such a result reinforces the multifactorial nature of fatigue, especially in clinical populations where different factors can influence its manifestation[31].

In contrast, literature presents divergent results. Parveen et al.[35] demonstrated that patients with higher fatigue levels showed more pronounced functional deficits, with a consistent association between fatigue and progressive worsening of functional capacity. Additionally, lower fatigue levels were observed in individuals with greater muscle mass[9].

In a recent study, lower HGS has been associated with greater depressive symptoms, increased fatigue, and anxiety[40]. In the present sample, no significant association was observed between fatigue levels, peripheral muscle strength, and muscle mass. Moreover, most patients (85.2%) presented normal HGS values, which could be related to an active lifestyle, evidenced by the practice of physical exercises, as well as clinic physiotherapeutic follow-up in the postoperative period pursued by the study participants.

These findings are in consonance with previous evidence that did not identify significant differences in average HGS between cancer survivors and healthy control individuals, suggesting that the muscle strength of survivors can be compared to that of individuals who do not have cancer when the overall health condition is preserved[42].

On the other hand, individuals with high BMI tend to present significantly higher fatigue scores[43], which can, along with other factors, explain the presence of fatigue observed in the participants of this study, considering the high prevalence of overweight and obesity identified in the sample.

In this context, such discussions reinforce the importance of contributing to maintaining the overall health condition of this population[11], with interventions that promote regular exercise practice, bringing a positive impact to overall health and quality of life[40].

In this study, most patients (61.9%) reported some level of physical exercise practice in the period of data collection, among which 70.4% presented fatigue classified as mild. These findings suggest a possible beneficial effect of physical exercise practice in attenuating fatigue[44].

Despite the relevance of findings, some limitations must be considered in the interpretation of results. The reduced sample size stands out, which might have compromised statistical power and the detection of significant associations, as well as sample heterogeneity, since the diversity of participant characteristics may have influenced the consistency of results. Moreover, the study was conducted at a single center and adopted a cross-sectional design, which restricts temporal analysis and impairs inferences of causality between fatigue, diagnosis, and cancer treatment.

Despite these limitations, the findings present clinical and scientific relevance that could contribute to advancing knowledge about the population with a breast cancer diagnosis and on the occurrence of fatigue, a multidimensional symptom strongly influenced by physical, psychological, and social factors. Furthermore, the findings reinforce the importance of systematically evaluating fatigue in clinical practice, even in the absence of important functional alterations, contributing to guiding multiprofessional care strategies, physiotherapeutic follow-up, and interventions targeted at improving the functionality and quality of life of these patients.

Lastly, further studies with a longitudinal design and larger, more diversified samples of cancer survivors are needed to confirm these results and extend their external validity.

CONCLUSION

Results from the present study demonstrate that fatigue was present in all evaluated patients, with a predominance of severe fatigue, highlighting its high prevalence even after a prolonged period since diagnosis, suggesting that this symptom can persist at different degrees throughout the course of the illness.

Additionally, no significant associations have been observed between fatigue and the clinical and functional variables analyzed, indicating that, in the studied sample, fatigue was more strongly related to subjective, behavioral, and psychological aspects, instead of strictly physical or functional components.

These findings reinforce the multidimensional and multifactorial character of cancer-related fatigue, whose manifestation seems to involve not only physical and functional alterations but also clinical and psychosocial aspects. In this context, we highlight the importance of systematically assessing fatigue in clinical practice, as well as adopting multiprofessional strategies targeted at integral patient follow-up, considering the high prevalence of cancer-related fatigue and its impacts.

CONTRIBUTIONS

All the authors have substantially contributed to the study design, data acquisition, analysis, interpretation, wording, and critical review. They approved the final version for publication.

DATA AVAILABILITY STATEMENT

All the contents associated with the article are included in the manuscript.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interest to declare.

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