Correlation between Muscle Strength, Symptom Scale and Functionality of Oncology Patients in Palliative Care

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Correlação entre a Força Muscular, Escala de Sintomas e Funcionalidade de Pacientes Oncológicos em Cuidados Paliativos

Correlación entre Fuerza Muscular, Escala de Síntomas y Funcionalidad de Pacientes Oncológicos en Cuidados Paliativos

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ABSTRACT

Introduction: The world estimates indicate that at each year, 56.8 million individuals require palliative care, of which 28.2% are patients with malignant neoplasms who need palliative care in adulthood. **Objective:** To assess the symptoms and functionality of oncology inpatients receiving palliative care and correlate with muscle strength. **Method:** Analytical cross-sectional study with inpatients, including all eligible patients during the study period who were epidemiologically evaluated in addition to the application of three scales: ESAS (*Edmonton Symptom Assessment System*), PPS (*Palliative Performance Status*) and FIM (*Functional Independence Measure*) and muscle strength test using a hydraulic dynamometer. **Results:** 53% were under 60 years old, 66% were women. According to FIM, the mean was 96, revealing a preserved functionality of 76.19% of the potential maintained, PPS reached a mean of 54, and muscle strength and ESAS exposed a below-standard mean. There was a correlation for dynamometry and ESAS in males, dynamometry and PPS in females, dynamometry and FIM in females and dynamometry and ESAS in patients who did not undergo chemotherapy. **Conclusion:** It was found a positive correlation between the functional scales and dynamometry for women. In addition, men showed greater muscle strength as greater were the symptoms, like the patients who did not undergo chemotherapy.

Key words: Symptom Assessment; Inpatients; Neoplasms; Palliative Care; Muscle Strength.

RESUMO

Introdução: A estimativa mundial estabelece que a cada ano 56,8 milhões de pessoas necessitam de cuidados paliativos, dos quais 28,2% correspondem aos pacientes com neoplasias malignas que precisam de cuidados paliativos na vida adulta. **Objetivo:** Avaliar os sintomas e a funcionalidade de pacientes oncológicos em cuidados paliativos internados e correlacionar com a força muscular. **Método:** Estudo transversal analítico em pacientes internados, tendo sido incluídos todos os pacientes elegíveis para a pesquisa no período do estudo e avaliados quanto à epidemiologia, além da aplicação de três escalas: *Edmonton Symptom Assessment System* (ESAS), *Palliative Performance Status* (PPS) e Medida de Independência Funcional (MIF), e do teste de força muscular com uso do dinamômetro hidráulico. **Resultados:** Um total de 53% dos pacientes tinha menos de 60 anos e 66% eram mulheres. Com uma média de 96, a MIF retratou uma funcionalidade preservada com 76,19% do potencial mantido, a PPS obteve média de 54, mas a força muscular e a ESAS revelaram médias abaixo do padrão. Houve correlação entre dinamometria e ESAS em homens, dinamometria e PPS em mulheres, dinamometria e MIF em mulheres e dinamometria e ESAS em pacientes que não realizaram quimioterapia. **Conclusão:** Constatou-se que existe correlação positiva entre as escalas funcionais e dinamometria para as mulheres. Além disso, os homens apresentaram maior força muscular quanto maior a sintomatologia, assim como os pacientes que não fizeram quimioterapia.

Palavras-chave: Avaliação de Sintomas; Pacientes Internados; Neoplasias; Cuidados Paliativos; Força Muscular.

RESUMEN

Introducción: La estimación global establece que cada año 56,8 millones de personas requieren cuidados paliativos, de los cuales el 28,2% corresponde a pacientes con neoplasias malignas que necesitan cuidados paliativos en la edad adulta. **Objetivo:** Evaluar los síntomas y la funcionalidad de pacientes oncológicos hospitalizados que reciben cuidados paliativos y correlacionarlos con la fuerza muscular. **Método:** Estudio transversal analítico en pacientes hospitalizados, incluyendo todos los pacientes elegibles para la investigación durante el período de estudio, evaluados respecto a datos epidemiológicos además de la aplicación de tres escalas: ESAS (*Edmonton Symptom Assessment System*), PPS (*Palliative Performance Status*) y MIF (Medida de Independencia Funcional) y de la prueba de fuerza muscular utilizando un dinamómetro hidráulico. **Resultados**: El 53% era menor de 60 años y el 66% eran mujeres. Con un promedio de 96, la MIF mostró una funcionalidad conservada con el 76,19% del potencial mantenido, el PPS obtuvo un promedio de 54, en cuanto a la fuerza muscular y al ESAS estas expusieron un promedio por debajo del estándar. Hubo una correlación para dinamometría y ESAS en hombres, dinamometría y PPS en mujeres, dinamometría y MIF en mujeres, y dinamometría y ESAS en pacientes que no recibieron quimioterapia. **Conclusión:** Se observó una correlación positiva entre las escalas funcionales y la dinamometría en el grupo femenino. Además, el grupo masculino mostró mayor fuerza muscular cuanto más eran los síntomas, al igual que los pacientes que no recibieron quimioterapia.

Palabras clave: Evaluación de Síntomas; Pacientes Internos; Neoplasias; Cuidados Paliativos; Fuerza Muscular.

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INTRODUCTION

Malignant neoplasms are characterized by the disordered multiplication of abnormal cells, which can target both adjacent and distant organs and parts of the body[1]. Regarding worldwide estimates, the International Agency for Research on Cancer (IARC) stipulates that by 2040, there will be 30.2 million people with neoplasms worldwide[2].

In Brazil, according to the National Cancer Institute (INCA), estimates for each year of the 2023-2025 period predict the occurrence of 704,000 new cancer cases. Thus, the disease is considered one of the main public health issues worldwide[3]. Each year, 56.8 million individuals require palliative care, of which 28.2% (about 14 million) are patients with malignant neoplasms who need palliative care in adulthood[4].

The disease usually progresses with signs and symptoms of pain, fatigue, nausea, vomiting, edema or lymphedema, constipation or intestinal obstruction, diarrhea, bleeding, and depression, which culminate in functional loss and decline of quality of life[5]. In the scope of oncological patients' treatment, palliative care has been redefined in a specialist consensus in 2020 as holistic care of individuals across all ages with serious health-related suffering due to severe illness and especially of those near the end of life.[6].

According to Santos et al.[7], the physiotherapist professional must be included in the interdisciplinary approach from prevention and treatment to palliative care, acting on functional kinetic disturbances derived from the disease or treatment, promoting quality of life and functionality. Thus, quantitative data assessment is essential to ground the therapeutic plan, which can be done by using scales as well as functional tests.

Due to the oncological patient's clinical condition, a comprehensive assessment is fundamental to collect data on the disease and functional level for physiotherapeutic diagnosis and prognosis. To precisely assess their functionality, data on patients' locomotion, overall mobility, need for help with daily living activities and instrumental activities, use of orthoses and walking aids must be collected[8].

However, assessment of this population is generalist and often fails to consider important aspects that directly influence disease prognosis and quality of life[8]. Given this, the Palliative Performance Scale (PPS)[8], elaborated specifically for patients in palliative care, considers walking, disease activity and evidence, self-care, intake, and cognition level. Considering the more frequently reported symptoms, the Edmonton Symptom Assessment System (ESAS)[8] is a score that allows presuming severity. The Functional Independence Measure (FIM)[9], on the other hand, can be a more assertive alternative, given that the score considers the independence level in performing self-care, sphincter control, mobility, locomotion, communication, and social cognition.

Moreover, peripheral muscle strength assessment is an important functionality predictor, being directly related to it, as demonstrated by Nava et al.[10]. However, despite what studies show, the correlation between muscle strength and functionality has not yet been approached in patients in palliative care. Therefore, the objective of this study was to assess the symptoms and functionality of oncology patients receiving palliative care and correlate them with muscle strength.

METHOD

Cross-sectional analytical study conducted in inpatients from the *Hospital Universitário João de Barros Barreto* at the High-Complexity Oncology Unit (Unacon). Patients identified for assessment were previously screened, considering only those who were in follow-up along with palliative care or exclusively in palliative care. All patients who met the eligibility criteria during the study period from May to December 2024 were included. A single researcher individually conducted the assessments. Patients authorized their participation by signing an Informed Consent Form.

The study included patients aged 18 and over, both sexes, who had a confirmed diagnosis of any malignant neoplasm and indication for palliative care. Patients with a Glasgow score below 8, low cognition level, hemodynamic instability, or who were in the active process of death were excluded.

The assessment comprised epidemiological data collection, application of ESAS, PPS, and FIM scales, and a muscle strength test using a hydraulic dynamometer.

ESAS is a scale of symptoms that classify from 0 to 10 the most reported symptoms by oncological patients, including pain, tiredness, nausea, depression, anxiety, drowsiness, appetite, well-being, shortness of breath, and sleep quality. The score is measured as follows: 0-30 light, 31-69 moderate, and 70-100 severe. Patients in palliative care are expected to show a high score[11].

PPS has a score ranging from 100% to 0%, considering five domains: walking, disease activity and evidence, self-care, intake, and cognition level. The lower the score, the less functional and nearer to death the patient is.

FIM assesses 18 items, referring to the self-care, sphincter control, locomotion, communication, and social cognitive aspect sub-scales. Information obtained for each item is scored from 1 to 7, where 1 represents total patient dependence and 7, total independence. The total

FIM score is calculated from adding points attributed to each item within the categories, with a minimum score of 18 and a maximum of 126; thus, higher scores represent better functionality.

Peripheral muscle strength was measured by assessing hand grip on the dominant side using a manual hydraulic dynamometer on a kilogram-force (kgf) scale, with the patient seated and the elbow positioned at a 90° angle. The patient was asked to perform maximum contraction against the device three times, and the results' mean was considered for the analysis. The normal parameters established were 15 kgf for women and 33.7 kgf for men. Due to the big disparity between parameters, we opted to consider a study with oncological patients[12].

The analyses were conducted on Stata[13] 18.0 software. The continuous variables were presented in median and interquartile interval, the categorical variables in absolute and relative frequencies. To assess the normality of quantitative variables, the Shapiro-Wilk test was used, and a normal distribution was considered when $p>0.05$. All the continuous variables presented normal distribution according to the Shapiro-Wilk test. The correlation analysis used the Spearman test with a significance level for rejection of null hypothesis previously established at 5%. Results were presented in tables and dispersion graphs.

This study has been approved by the Research Ethics Committees of the oncology research center (*Núcleo de Pesquisa em Oncologia)*, report number 7,325,228 (CAAE (submission for ethical review): 81519524.1.0000.5634), in compliance with Resolution 466/2012 of the National Health Council[14].

RESULTS

Thirty patients were included, of whom 50% were adults under 60 years, mostly (66%) women. Sixty percent had spouses, of whom 40% were their primary caregivers. The socioeconomic status also pointed out that 86% had low income. Of the total, 16 (53%) received some kind of pension, due to the illness or time worked, which made up the main family income. Moreover, 30% had been out of work and received no income, while 16% were still actively working, despite the severity of the illness, to make ends meet (Table 1).

Regarding lifestyle, although a significant number presented risk factors that contribute to the occurrence of neoplasms, such as smoking (43%), alcoholism (36%), and sedentary lifestyle (76%), there was no relationship with functional status through dynamometry and scales (Table 1).

Neoplastic characteristics showed digestive system tumors as the most prevalent (30%), followed by tumors of the genitourinary system (26%), respiratory system, and breast (16% each). Of the total, 66% showed genetic influence with the presence of other cases in their families. Of the antineoplastic treatments, 90% had undergone some intervention, of which 76% chemotherapy, 73% oncology surgery, and 50% radiotherapy. Although not a significant number, 10% had undergone no treatment, because the disease had already advanced by the time they were diagnosed and no longer had a performance status (Table 1).

Regarding the scales, with a maximum score of 96, FIM (max. 126) portrayed preserved functionality with 76.19% of potential maintained. PPS (mean 54) showed that given the extension of the disease, many patients were unfit for work, spent most of their time seated or in bed, did self-care with considerable assistance, had normal or reduced food intake, and their cognition level was total, or with some confusion.

Muscle strength measured by a hydraulic dynamometer with hand grip revealed a mean below normal parameters in comparison with oncological patients who are not in palliative care. On the other hand, an ESAS mean of 28.7 opposes the predicted result, considering it is a scale that scores the most usual symptoms and the clinical condition of hospitalized patients in palliative care.

The correlations between dynamometry and scales according to sex, age, radiotherapy, and chemotherapy are described in Table 2. There was a significant difference only for dynamometry and ESAS in males, dynamometry and PPS in females, dynamometry and FIM in females, and dynamometry and ESAS in patients who did not undergo chemotherapy. These data were grouped in graphs (Figure 1).

The female group obtained an assumed correlation between functional scales and dynamometry, showing that functionality and independence levels increase with muscle strength. In contrast, the male group showed muscle strength increased with symptoms, like patients who did not undergo chemotherapy presented a higher ESAS and muscle strength (Table 2 and Figure 1).

DISCUSSION

Studies with oncological inpatients in palliative care are rare and usually include generalist assessments focused on oncology. Given this scenario, the current study obtained relevant data with the use of specific scales to assess functionality and symptoms, as well as its correlation with a more objective assessment of muscle strength. Results from this research suggest a positive correlation between muscle strength and functionality for women. Moreover, it brought new elements, such as the

Table 1. Characterization of the sociodemographic profile, the neoplasm, and the symptom, functionality, and dynamometry scales mean

Variables	Frequency (%) / ±standard deviation
Age	
Mean	55.3/± 12.86
<60 years	16 (53.3)
>60 years	14 (46.6)
Gender	
Female	20 (66.6)
Male	10 (33.3)
Marital status	
Single	7 (23.3)
Married/stable union	18 (60)
Divorced	2 (6.6)
Widower	3 (10)
Origin	
Capital	17 (56.6)
Metropolitan Region	5 (16.6)
Interior of the State	8 (26.6)
Family income (in wages)	
<1 wage	5 (16.6)
1-2 wages	21 (70)
2-3 wages	4 (13.3)
Drinking	
Yes	11 (36.6)
No	19 (63.3)
Smoking	
Yes	13 (43.3)
No	17 (56.6)
Physical exercise	
Yes	7 (23.3)
No	23 (76.6)
Primary neoplasm	
Breast	5 (16.6)
Respiratory system	5 (16.6)
Digestive system	9 (30)
Genitourinary system	8 (26.6)
Others	3 (10)
Family history	
Yes	20 (66.6)
No	10 (33.3)
Antineoplastic treatments	
Radiotherapy	15 (50)
Chemotherapy	22 (73.3)
Oncological surgery	23 (76.6)
None	3 (10)
ESAS	
Mean	28.7/± 15.70
PPS	
Mean	54/± 12.20
FIM	
Mean	96/± 22.91
Dynamometry	
Mean	14.6/± 8.49

Captions: ESAS = Edmonton Symptom Assessment System; PPS = Palliative Performance Status; FIM = Functional Independence Measure.

relationship between greater muscle strength and greater symptomatology in men, and less symptomatology in those who underwent chemotherapy.

Regarding the profile of oncological patients in palliative care, the literature reports that, in the State of Pará alone, 25 new cases a month are expected, relying on a single specialized care unit[15]. Corroborating the findings of the current study, which shows that most patients are female, this can be explained by the greatest demographic density of women and having more chances of receiving diagnoses due to screening campaigns targeting this population[16-18].

Table 2. Correlation between dynamometry and ESAS, PPS, and FIM scales with variables sex, age, radiotherapy, and chemotherapy

Variables	Sex		Age		Radiotherapy		Chemotherapy	
	M	F	<60	>60	Yes	No	Yes	No
ESAS								
rho	0.68	-0.012	0.27	0.14	0.19	0.38	0.04	0.96
p	0.03*	0.95	0.3	0.6	0.48	0.16	0.85	0.0005*
PPS								
rho	-0.01	0.45	0.1	0.37	0.15	0.35	0.34	0.07
p	0.95	0.04*	0.7	0.18	0.57	0.18	0.1	0.87
MIF								
rho	-0.23	0.51	0.17	0.36	0.21	0.31	0.3	0.17
p	0.51	0.01*	0.52	0.19	0.44	0.24	0.16	0.7

Captions: ESAS = Edmonton Symptom Assessment System; PPS = Palliative Performance Status; FIM = Functional Independence Measure; rho = Spearman's rank correlation coefficient; * = values with identified correlations; M = male; F = female.

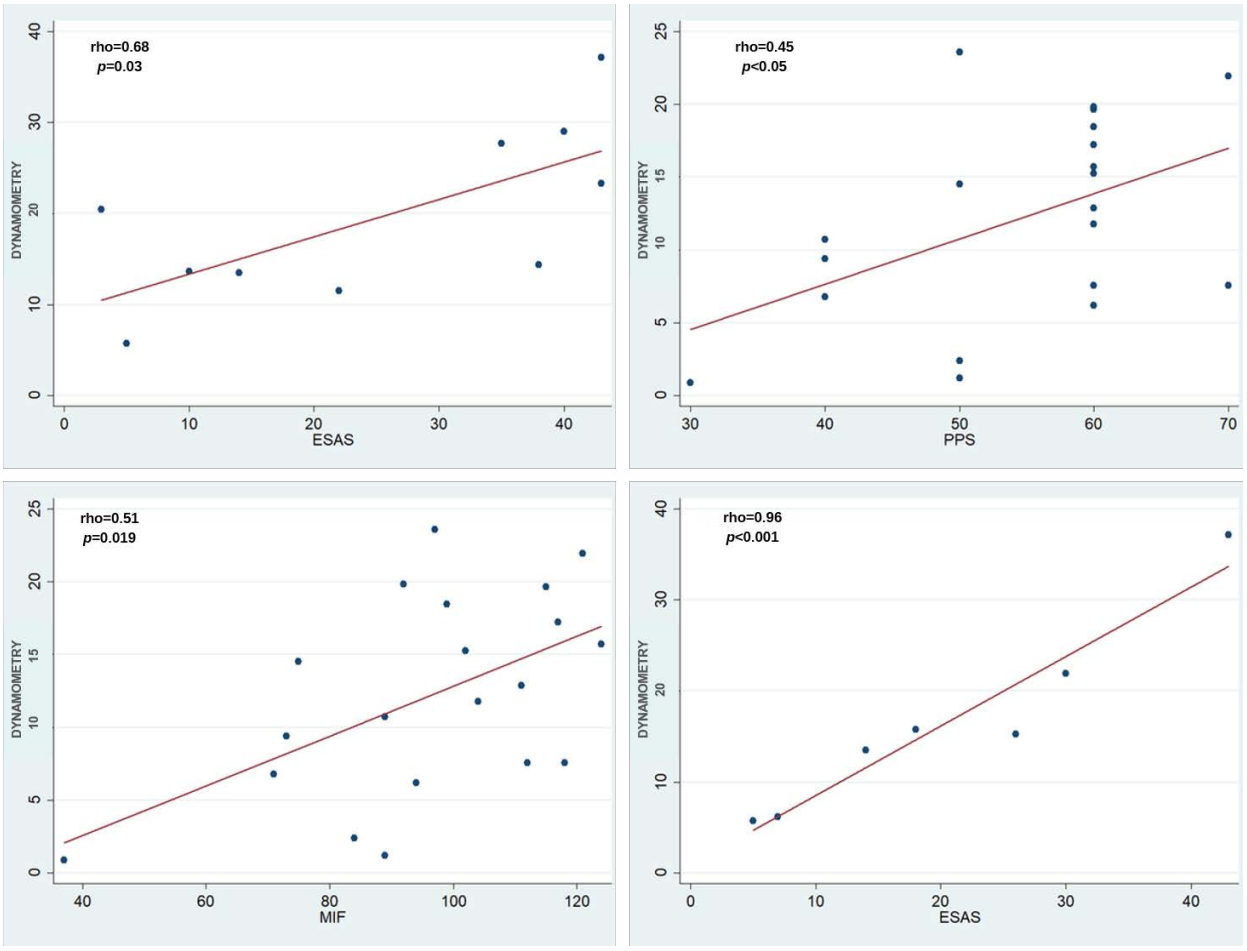

Figure 1. Correlations found in order: dynamometry and ESAS according to male sex, dynamometry, and PPS according to female sex, dynamometry, and FIM according to female sex, dynamometry and ESAS in patients who did not undergo chemotherapy

Captions: rho = Spearman's rank correlation coefficient; ESAS = Edmonton Symptom Assessment System; PPS = Palliative Performance Status; FIM = Functional Independence Measure.

The age group pointed by another study indicates a majority of elders[16-21], the only study in which the prevalent age group is 51-60 years is the one by Castôr et al.[22], however, the present research contradicts this expectation. As justification, it is induced that the data referring to the prevalence of a younger population are related to the greater severity of the disease with genetic factors, since this population was little exposed to risk factors determined by lifestyle.

Socioeconomic data reflect the current Brazilian society. Other epidemiologic studies also showed prevalence of a low-income population[22], which is directly related to fewer chances of receiving early diagnosis, consequently leading to a late discovery of cancer in a more advanced clinical stage.

Regarding lifestyle, the absence of physical activity must be highlighted, with 76% reporting they did not exercise before the treatment and the others having interrupted it after diagnosis. Physical exercise is known to be an important prevention factor, but more than that, it is also an ally in combating cancer, in addition to maintaining functional ability[23].

Cancer prevalence in the gastrointestinal tract corresponds to INCA's estimates[24], which ranked 3rd in Pará, after breast and prostate cancer, which have more visibility and diagnosis due to the awareness campaigns targeting these gender-specific cancers in men and women.

Regarding functional status, both previous studies and the current one observed a sustained satisfactory level, despite the differences in the scales used. Santos et al.[25], in a study designed for oncological inpatients in palliative care, found a mean of 72.39 on the Barthel index, suggesting occasional assistance.

Regarding muscle strength in oncological patients, a systematic review that considered patients in treatment also verified a reduction in muscle strength among them, compared to individuals without cancer, which suggests it may be a side effect of systemic treatments.[26]

Chemotherapy drugs have been proven to promote functional deficit of the skeletal muscle due to oxidative stress[27]. Moreover, the disease progression not only debilitates but also generates energy intake, so it is not unusual that these patients often present cancer-related fatigue.

Thus, the mean found below normal standards, exemplified by muscle strength being greater in patients who did not undergo chemotherapy, revalidates other studies, since this was the expected result due to the repercussions of cancer and its treatments. However, the fact that the group who did not undergo prior chemotherapy also presented more symptoms, according to ESAS, is explained by the fact that chemotherapy helps control neoplastic evolution and, consequently, symptomatology.

The presumed outcome that the greater the muscle strength, the greater the functionality and independence levels was confirmed in the female group. In contrast, the male group showed greater muscle strength accompanied by greater symptomatology.

Among the considered hypotheses, time spent in hospitalization could be considered, like in the study by Barci et al.[28], who assessed ESAS over the first three days and verified that the presence of symptoms was greater on the first day of hospitalization, with pain intensity, tiredness, and depression improving on the following days.

There are no studies that point to a correlation between muscle strength and symptoms; however, Mendes et al.[29] found a negative correlation between functionality and symptoms, indicating the presence of more symptoms in lower functional ability. The study also suggests that patients in palliative care presented some symptoms at higher levels than oncological patients and the general population.

In contrast with this research, which obtained an overall ESAS mean below the expected result, probably related to hospitalization time, the scale was observed to be only faithful for longitudinal follow-ups in cases where there is no effective symptom control.

CONCLUSION

The use of specific scales to assess the functionality and symptoms of oncological patients in palliative care is fundamental to determining their functional status and disease prognosis. In this sense, the present study addressed the correlation of scales with muscle strength and found a positive correlation between functional scales and dynamometry in the female group. In addition, the male group showed greater muscle strength as the symptoms increased, like the patients who did not undergo chemotherapy.

CONTRIBUTIONS

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

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

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

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