Fatigue Symptoms and Respiratory Muscle Strength of Onco-hematological Patients in Chemotherapy

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Sintomas de Fadiga e Força Muscular Respiratória de Pacientes Onco-hematológicos em Quimioterapia

Síntomas de Fatiga y Fuerza de los M*úsculos* Respiratorios de Pacientes Onco-hematológicos en Quimioterapia

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ABSTRACT

Introduction: When exposed to chemotherapy, the onco-hematological patient is susceptible to several physical and respiratory complications, associated with side effects of these substances. **Objective:** Evaluate the impact on respiratory muscle strength when compared to the levels of normality and symptoms of fatigue of onco-hematological patients during chemotherapy treatment. **Method:** Observational cross-sectional study performed through a social demographic questionnaire and manovacuometry with analogical device. **Results:** The study population consisted of 19 subjects, 57.9% women and 42.9% men. The average age was 51.3 years old. The predominant diagnoses were leukemia, followed by lymphoma and myeloma. Among the complaints, dyspnea was present in 31.6% of the cases, chemotherapy was the protocol of choice for all the participants. During the evaluation, 52.6% reported tiredness, and among them, 70% claimed they feel better when at rest, followed by 50% precluded from performing their daily activities. Ex-smokers represented 70% of the study population and 84.2% did not practice physical activities. 62.4 % of the sample presented normal respiratory frequency, with the apical breathing pattern and predominant slender thorax. Significant results were observed in decreasing MIP and MEP with statistically conclusive values of p<0.001 for the two variables. **Conclusion:** The disease, the treatments and the hospitalizations this population was submitted provoked the reduction of the respiratory muscle strength and increase of the fatigue symptoms.

Key words: Muscle Strength; Hematologic Neoplasms/drug therapy; Total Lung Capacity.

RESUMO

Introdução: Quando exposto à quimioterapia, o paciente onco-hematológico está suscetível a várias complicações físicas e respiratórias, associadas aos efeitos colaterais dessas substâncias. **Objetivo**: Avaliar o impacto de força muscular respiratória quando comparada com os níveis de normalidade e sintomatologia de fadiga, durante recebimento do tratamento quimioterapêutico de pacientes onco-hematológicos. **Método:** Pesquisa observacional do tipo transversal, realizada por meio de questionário referente aos dados sociodemográficos e de manovacuometria com dispositivo analógico. **Resultados:** A pesquisa foi constituída por uma população composta de 19 pessoas, 57,9% mulheres e 42,9% homens. A idade média foi de 51,3 anos. A predominância diagnóstica foi leucemia, seguida por linfoma e mieloma. Entre as queixas, a dispneia esteve presente em 31,6% dos casos, sendo a quimioterapia o protocolo escolhido para todos os participantes. Durante a avaliação, 52,6% relataram cansaço e, entre eles, 70% relataram sentir-se melhor quando em repouso, seguidos por 50% impedidos de realizar suas atividades diárias. Ex-fumantes representaram 70% da população pesquisada e 84,2% não praticavam atividades físicas. Na amostra, 62,4% apresentaram frequência respiratória normal, predominando o padrão respiratório apical e o tórax longilíneo. Foram observados resultados significativos na diminuição de Pimáx e Pemáx, com valores estatisticamente conclusivos de p<0,001 nas duas variáveis. **Conclusão:** O quadro da doença, os tratamentos utilizados e as internações a que essa população foi submetida provocaram a diminuição da força muscular respiratória e o aumento dos sintomas de fadiga.

Palavras-chave: Força Muscular; Neoplasias Hematológicas/tratamento farmacológico; Capacidade Pulmonar Total.

RESUMEN

Introducción: Cuando se expone a quimioterapia, el paciente onco-hematológico es susceptible a diversas complicaciones físicas y respiratorias, asociadas a los efectos secundarios de estas sustancias. **Objetivo:** Evaluar el impacto de la fuerza de los músculos respiratorios en comparación con los niveles de normalidad y síntomas de fatiga, mientras reciben tratamiento de quimioterapia de pacientes oncohematológicos. **Método:** Investigación observacional transversal, realizada mediante un cuestionario referente a datos sociodemográficos y realizando manovacuometría con dispositivo analógico. **Resultados:** La investigación consistió en una población compuesta por 19 personas, 57,9% mujeres y 42,9% hombres. La edad media fue de 51,3 años. El predominio diagnóstico fue la leucemia, seguida del linfoma y el mieloma. Entre las quejas, la disnea estuvo presente en el 31,6% de los casos, siendo la quimioterapia el protocolo elegido para todos los participantes. Durante la evaluación, el 52,6% refirió cansancio y, entre ellos, el 70% refirió sentirse mejor en reposo, seguido del 50% incapaz de realizar sus actividades diarias. Los exfumadores representaron el 70% de la población encuestada y el 84,2% no practicaba actividad física. En la muestra, el 62,4% tenía frecuencia respiratoria normal, con predominio de patrón respiratorio apical y tórax longilineal. Se observaron resultados significativos en la disminución de Pimax y Pmax, con valores estadísticamente concluyentes de p<0,001 en ambas variables. **Conclusión:** Debido a la enfermedad, los tratamientos utilizados y las hospitalizaciones a las que esta población fueron sometidos provocaron la disminución de la fuerza de los músculos respiratorios y aumento de los síntomas de fatiga.

Palabras clave: Fuerza Muscular; Neoplasias Hematológicas/tratamiento farmacológico; Capacidad Pulmonar Total.

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INTRODUCTION

Data of the National Cancer Institute José Alencar Gomes da Silva (INCA) define cancer as an uncontrolled growth of cells that can invade tissues and/or organs and spread to the whole body through genetic mutation whose DNA changed, receiving erroneous orders on how to multiply. These cells are classified as carcinogenic, denominated according to its velocity of multiplication and capacity to spread to other tissues[1].

Hematologic cancers result from blood cells and are divided in leukemia, multiple lymphomas, and myeloma, the first characterized by the accumulation of young cells (called blasts) in the bone marrow, impeding the production of red blood cells (causing anemia), of white blood cells (causing infections) and platelets (may cause hemorrhage)[2,3].

In short, leukemia can be described as an abnormal and exacerbated multiplication of leukocyte cells (myelogenous or lymphogens), causing an accumulation in the hematopoietic system[4]. Its classification can be acute with short or chronic evolution, with long-term alterations. The individual's clinical complaint can occur days or weeks from the inappropriate onset of cellular growth[5].

Hodgkin lymphoma arises from lymph nodes (ganglia of the lymphatic system), triggering a mutation to malignant cells and non-Hodgkin lymphomas appear from the same origin and can be divided in more than 20 different types[2,3].

Multiple myeloma is the second onco-hematological cancer most frequent in the world caused by the malignant multiplication of lymphocytes B and producing immunoglobulin-deficient cells[2,3].

According to estimates of INCA[6], in Brazil, for each year of the triennium 2020-2022, 625,000 new cases of cancer will occur, 215.86/100 thousand for men and 145.00/100 thousand for women. It is expected 5,920 cases of leukemia for men and 4,890 for women; non-Hodgkin lymphoma will affect 6,580 men and 5,450 women and Hodgkin lymphoma, 1,590 men and 1,050 women.

The clinical complaints of solid tumors presented by the patient depend on the pressure the tumor exerts over the adjacent tissues and the respective functional activity of the site of manifestation. For cancer extension, the therapeutic modality was selected among locoregional (surgery to remove neoplastic cells and radiotherapy), systemic (chemotherapy, hormone therapy and immunotherapy) and recovery (physical and psychological to minimize adverse events). The objective of the therapeutic modality varies according to the disease in order to eliminate it completely, survive or restrain cell multiplication in addition to symptoms relief[2,7].

Radiotherapy is a localized ionizing treatment, most of the times used as adjuvant while chemotherapy extends with systemic treatment that does not distinguish healthy from malignant cells with global repercussions related to staging and quality of life of the patient. However, short, medium, and long-term effects are triggered (nausea, loss of appetite, skin reactions, alopecia, fatigue, and respiratory distress) that draw attention to the cost-benefit ratio that the treatment causes, which can restrain the process of cure and diminish the motivation of the patient in continuing with the medical plan[8,9].

Regarding non-solid tumors (leukemia and lymphoma), an array of pathological effects and changes can involve the cancer during the diagnosis as, for example, leukemia, where anemia, neutropenia, thrombocytopenia, fever, bleeding, osteoarticular pain, fatigue and dyspnea[4] stand out.

The interventions applied to fight liquid tumors can extend with the use of poly-chemotherapy where there is interaction of cytotoxic agents in combination with chemotherapy, potentializing the chemotherapic effects and delay of tumor growth, in addition to the decline of side effects because of the low dose applied during the cycles. Drugs are assigned according to the cellular specificity classified as specific and non-specific with curative or palliative character[10].

Hormone therapy involves the handling of exogenous hormones in order to associate them with the receptors of the individual to interrupt the tumor growth while immunotherapy intensified the capacity of the lymphocytes to destroy neoplastic cells and distinguish the healthy cells, reducing the systemic aggressions by cellular differentiation[11,12].

Bone marrow transplantation (BMT) has been shown to be effective when conventional treatments do not produce satisfactory results for cases of leukemia and lymphomas. This intervention can destroy the cells of the affected bone marrow and replace them by normal progenitor cells divided in autogenic and heterogenic[13].

In a patient with multiple myeloma, autogenic transplantation is the first treatment of choice due to lower risk of contamination and better adherence in the bone marrow, complemented by chemotherapy and total irradiation out of the body in the pre-transplantation phase. The heterogenic transplantation can lead to 5-year survival, but its use is limited because of donors incompatibility and the exclusive use of chemotherapy as treatment is typically practiced in individuals for whom palliation was suggested[3].

Chronic fatigue in onco-hematologic patient can be associated with a set of factors involving the control of the body energy, the metabolic status, and the unbalance of the distribution of nutrients among the organism

and tumor cells. The increase of the caloric expenditure associated with an inappropriate nutritional intake, the prolonged daily stress and the frustrations during the treatment must be considered as risk factors of cancer treatment when associated with chemotherapy[14].

Fatigue can be described not only as a limiting factor but also as a global symptom which depletes and is associated with the drop of all the other functions and functional capacities of the individual. It is considered that the reduction of the physical activity in addition to personal activities, exacerbates the side effects with subsequent feeling of fatigue and diminishing of the muscle strength[15].

While correlating with chemotherapy, studies reveal great functional impact, considering that the symptoms together with the treatment result in a hypermetabolic state, most of the times connected to an inappropriate intake of nutrients, resulting in loss of energy and total muscle strength[4].

In a comparative study among fatigue, respiratory muscle strength (RMS) and peripheral muscle strength of patients during chemotherapy alone or together with radiotherapy, a strong correlation has been proved[16] between the highest level of fatigue and the greatest reductions of pulmonary muscle strength and handgrip strength when compared with healthy patients.

Based in these justifications, the study had the objective to evaluate the impact of RMS in onco-hematologic patients while receiving chemotherapy treatment when compared with levels of normality and symptomatology of fatigue.

METHOD

Observational, cross-sectional study which enrolled 19 patients with onco-hematological diagnosis who were in chemotherapy treatment at the medical clinic 1, fourth floor of "*Hospital Estadual Mário Covas*" in the first semester of 2019. The Institutional Review Board of "*Faculdade de Medicina do ABC*" approved the study on March 13, 2019, report number 3.196.609.

The qualitative variables were represented by absolute and relative frequency. The quantitative variables, by mean, standard deviation and confidence interval of 95%, except the variables "length of hospitalization" and "smoking time", presented as median and percentile values of 25 and 75 through the Shapiro-Wilk test of normality.

It was utilized the test t of Student to compare the results between the observed and expected. The level of significance adopted was $p<0.05$. The statistical software utilized was Stata version 11.0.

Onco-hematologic patients in chemotherapy treatment hospitalized in the study hospital were enrolled with preserved level of consciousness to submit to manovacuometry.

Individuals with cognitive impairment impeding the evaluation, those who refused to participate or denied signing the Informed Consent Form, patients with clinical/medical contraindication for manovacuometer test and patients who later were unable to complete the test because of any discomfort reported were excluded.

The study participants were selected through electronic chart from the system of information MV® of "*Hospital Estadual Mário Covas*", where there were registers of who were the patients hospitalized in chemotherapy. Next, inclusion and exclusion criteria were applied to evaluate the feasibility of the test to be applied.

The initial evaluation was performed individually through the Questionnaire of Demographic Data (QDD) elaborated with self-reported, clear, and objective affirmations to avoid discrepancies between answers and responses. The questionnaire consisted in the identification of the patient (name, age, race, education, and profession), clinical data as diagnosis, length of hospitalization and personal history, objective questions about symptoms of fatigue – and open question about what bothered more – and life habits involving alcohol or tobacco use and after physical examination and inspection, pneumological data (presence of cyanosis, slimming, obesity, type of respiration, respiratory pattern etc.) were collected.

After the application of the QDD, the inspiratory and expiratory strength denominated MIP (maximum inspiratory pressure) and MEP (maximum expiratory pressure) were evaluated through manovacuometry. The analogic manovacuometer, brand Murena's® was utilized. The device consisted of a 40-cm silicon trachea and rectangular-like nozzle of polypropylene.

For the standardization of the test, all the patients remained in sedestation with the chest at 90º in relation to the hip and feet flat on the floor. The investigator, after explaining the procedure and ensuring it was understood, applied a nasal clip to avoid air scape during the maneuvers and asked for a forced inspiration through a nozzle, stimulating the patient during the test from a deep maximum expiration (to measure MIP) and after a pause for resting (nearly 30 seconds), to maximum expiration from a deep inspiration (to measure MEP). For both measurements, at least three attempts were made, all of them with obstruction valve closed.

After the results were obtained, the value used for the calculation was the highest collected in inspiration and expiration and applied in the following equations proposed by Neder et al.[17], individually. Men: MIP: y =

-0.80 × age + 155.3 and MEP: y = -0.81 × age + 165.3. Women: MIP: y = -0.49 × age + 110.4 and MEP: y = -0.61 × age + 115.6. Later, means for both results were calculated for each sex, no invasive procedures were performed as mentioned previously. The individuals responded only one questionnaire and performed a brief test with little energetic demand and minimum risk of exposure.

RESULTS

As shown in Table 1, 19 patients were enrolled in the study, females were predominant (57.9%). The mean age was 51.3±16.5, minimum 20 and maximum 74 years of age; in relation to the weight of the population investigated, 47.3% had normal weight, 11 of the 19 patients (57.9%) had mean height of 1.6±0.06, 31.5% completed high school and 15.8% completed university, 42.1% completed and 10.5% did not complete elementary school, 68.4% had no background information, 15.7%, systemic arterial hypertension and in 10.5% of the cases, the latter was associated with *diabetes mellitus*.

It is possible to notice the predominance of patients with diagnosis of leukemia, representing 42.1% of the whole sample, followed by lymphoma with 36.8% and only four (21%) with myeloma. Great part of the individuals reported tiredness when questioned whether they had any disturbing complaint, corresponding to 31.6% of the entire study.

When asked about the symptoms related to fatigue (Table 3), 52.6% felt tired during the evaluation; of these, 70% reported improvement when they rested, followed by 50% who felt impeded to perform their daily activities because of tiredness. Of the total analyzed, less than half (47.4%) reported they failed to feel any tiredness when asked.

Questioned about the daily living activities (DLA), 100% of the patients suspended the use of cigarettes during chemotherapy treatment, only 26.3% claimed they were ex-smokers. 78.9% did not claim they were alcohol users and only 15.9% of the sample practiced any kind of physical activity frequently.

Regarding the pneumological data shown in Table 4, large part of the sample did not present cyanosis, astheny or slimming. During the evaluation, only 31.5% of the patients presented tachypnea. The dominant respiratory pattern was mixed (57.9%) and the most frequent body type was ectomorph. It was observed a mean of 87.1±11.5 of heartbeat and 19.9 ± 4.2 of respiratory frequency of the patients analyzed.

After the analysis, significant results were observed for MIP and MEP when evaluated in onco-hematologic patients and compared with values of predicted normality.

Table 1. Personal and social profile of the study patients, 2019

Variables	N	%
Gender		
Female	11	57.9
Male	8	42.1
Body Mass Index		
Low weight	2	10.5
Regular weight	9	47.4
Overweight	8	42.1
Marital status		
Single	5	26.3
Married	11	57.9
Widow/widower	1	5.3
Divorced	2	10.5
Level of education		
University	3	15.8
Complete high school	6	31.5
Complete elementary school	4	21.0
Personal Background		
Systemic arterial hypertension	3	15.7
Diabetes mellitus	1	5.6
Systemic arterial hypertension/ diabetes mellitus	2	10.53
	Mean	**Standard deviation**
Height	1.6	0.09
Age	51.4	16.5
Weight	62.8	13.1

Table 2. Pathological profile and validity of chemotherapy

Variables	N	%
Diagnosis		
Leukemia	8	42.1
Lymphoma	7	36.8
Myeloma	4	21.0
Main complaint		
Dyspnea	1	5.3
Tiredness	6	31.6
Malaise	1	5.3
Painful conditions	2	10.5
No complaints	6	31.6
Chemotherapy treatment		
Yes	19	100
No	0	0
	Median	**p25 - p75**
Length of hospitalization	8	4 - 24

Table 3. Symptomatology of fatigue

Variables	N	%	N	%
Symptoms of fatigue	**Yes**		**No**	
Do you feel tired?	10	52.6	9	47.4
It improves when you rest?	7	70	3	30
It impedes you to perform your daily activities?	5	50	5	50

Table 4. Pneumological data

Variables	N	%
Types of breathing		
Eupneic	13	68.4
Tachypneic	6	31.5
Respiratory pattern		
Diaphragmatic	2	10.5
Apical	6	31.6
Mixed	11	57.9
Type of chest		
Endomorph	7	36.8
Ectomorph	8	42.1
Mesomorph	4	21.0

In relation to MIP and MIP predicted, it was found the mean -31.6 ± 4.8 and confidence interval between 41.7 to 21.4 and 88.5 to 106.7, simultaneously. For MEP and MEP predicted, the mean of 36.8 ± 100.9 was observed with confidence interval between 25.2 to 48.4 and 88.9 to 112.4, respectively with statistically conclusive result of $p<0.001$ in the two variables in investigation according to Table 5.

DISCUSSION

The survival of the oncologic patient increased considerable because of the innumerous lines of treatment and development of chemotherapics to fight the tumor malignancy. Consequently, this treatment started to cause adverse events in the short and long-term influencing directly and indirectly the functionality and conditioning of the individual exposed to this therapeutic[18].

According to the profile of the patients affected by onco-hematologic neoplasms more prevalent at the admission, it was observed the predominance of leukemia (42%), followed by lymphoma (36.8%) and myeloma (21%) in the current study, corroborating the findings of Calefi et al.[19] in a study conducted with 16 subjects of the Outpatient and High-Risk Chemotherapy Unit in a Teaching Hospital in Curitiba-PR, indicating the incidence of 80% of leukemias and 20% among lymphomas and multiple myeloma. The frequency of females was 57.9%, with balance among men and women regarding leukemia, in contrast with other authors[20] who presented higher values for the prevalence of leukemia in females.

Yeh and Bickford (apud Borges et al.)[18] quote fatigue as a classic symptom of the oncologic treatment because of the substances utilized in its fight and onset. According to Evans and Lambert (apud Borges et al.)[18], fatigue was related to cachexia and poor physical condition where 50% of the population investigated complained of tiredness and 84.2% admitted they did not practice any physical activity.

The cardiopulmonary decline can be substantially connected to symptoms of fatigue too, in addition to the administration of chemotherapics and hospitalization-related immobility, factors that together match the study discussed where the patients were hospitalized from four to 24 days and considerable reduction of RMS, possibly related to probable immobility and effects of the aggressive substances administered[18].

In the current study, it was noticed the reduction of the RMS with significant values of $p<0.001$ for both results of MIP and MEP, contrary to other authors who did not find alterations of MIP during measurements of RMS. This finding can be influenced due to low dexterity of the manovacuometer when utilized alone to measure RMS, based in the physiologic hypothesis that the activation of the inspiratory muscle

Table 5. Evaluation of the respiratory muscle strength with test t of Student

Categories	Variables			
	Mean	Standard deviation	Value of p	Confidence Interval (95%)
MIP	-31.6	4.8	<0.001	-41.7 - 21.4
Predicted MIP	97.6	4.3		88.5 - 106.7
MEP	36.8	5.5	<0.001	25.2 - 48.4
Predicted MEP	100.9	5.4		88.9 - 112.4

depends on the time of muscle activation, in contrast with the necessity of sub-maximum demand during DLA; therefore, the use of devices measuring the endurance of the muscle is more effective, correlated with the idea of time to recruit these fibres[21].

The utilization of the manovacuometer with nasal clip and rectangular-like nozzle to measure RMS in the present study was selected by the high adherence among physiotherapists and volatility of the test in question. In a cross-sectional study conducted by Lima et al.[21], a multiple choice questionnaire for 115 professionals was used to detect equipment, management and interpretation for measurement of RMS with peak during manovacuometer utilization and nasal clip, 42.5% and 51.8%, respectively, with variation of the application of different types of nozzles, reaching 24.1% of those utilizing rectangular-like plastic nozzle, the greater incidence among those who manage the tubular hard plastic or paper nozzle with 33% of the entire sample.

Although the length of hospitalization had not been the object of this study, Nascimento et al.[22] conducted an evaluation with manovacuometer in 15 onco-hematologic patients in the first, fifth and tenth days of hospitalization, showing reduction of MEP only, mainly between the fifth and tenth day because of the length of hospitalization and administration of cytotoxic drugs, in addition to the occurrence of low hematologic count when compared with the other days.

In Ruivo et al.[23], 24 patients with stomach and esophageal cancer, who submitted to pre-surgery manovacuometry were investigated, being detected the reduction of RMS of MEP ($p \leq 0.05$) in relation to the literature. Similar finding to the study of Baltieri et al.[24] with patients in pre-operation of pulmonary resection where coarctation of MEP occurred too.

In counterpart, the authors quote the significant reduction of 50% of the manovacuometry in the values of MIP in patients with cancer, being this result supported because of alterations of the effect of cancer in the central nervous system, respiratory muscle atrophy or isotonic contractile dysfunction of the diaphragm[23].

In a study of Lima et al.[21] about the explication provided on what happens before the test, more than half of physiotherapists (54.9%) associated the verbal command with the demonstration, consistent with the current study. At last, in relation to the interpretation after collecting the values, only 21.2% of the 73.5% who responded to this question adhered to predictive equations, whose majority utilized reference values, unlike the present investigation.

According to Santos et al.[25], the length of the trachea during the evaluation can influence the results obtained for RMS. Tests of trachea of 30 cm, 60 cm and 90 cm were performed in 50 individuals, with better results with tracheas smaller than 90 cm in MIP because of the low resistance imposed when these tests are used without conflicting differences of MEP, an information which potentializes the current results, given that the length of the trachea utilized was 40 cm for all the patients.

Another variable that can directly influence the results of RMS is the type of nozzle utilized, therefore, in the current study, the rectangular nozzle was selected in the attempt to achieve low air scape during the procedure. Onaga et al.[26], in a study conducted with 50 individuals compared the efficacy of the circular or rectangular nozzle and concluded the latter is more effective for expiration with a more anatomical nozzle, favoring less air waste but with relevant difference to measure MIP.

Given the paucity of the studies indicating predictive values or trustworthy equations to measure the RMS of the Brazilian population, Costa et al.[27] conducted a study with 120 healthy individuals (60 men and 60 females) from 20 to 80 years of age, attempting to identify variables that influence the RMS reference value. According to the author, the equation of Neder et al.[17] was unable to predict MIP (with significance of the results) or MEP (low values were obtained, yet not significant), through its equation and this result can be explained because of the lack of specification of the diameter of the orifice utilized, considering the action of the buccinator muscles interfering in the pression produced.

In counterpart, in this same study, it was observed that age, similarly utilized in the equation of Neder et al.[17], had the great predictive power, explained by the fact that RMS diminishes approximately 8-10% per decade from 40 years old, corroborating the results of the present study since the mean age was 51.4.

Leal et al.[28], in a Brazilian study with 495 adults in order to verify the veracity of the equations elaborated by Harik-Khan et al. (apud Leal et al.)[28], Neder et al.[17] and Black and Hyatt (apud Leal et al.)[28], concluded that the use of anthropometric information induces great trustworthiness of the result, being the calculations of Neder et al.[17] to measure MEP and Harik-Khan et al. (apud Leal et al.)[28] for MIP the best predictive to measure RMS. This is explained because respiratory muscle strength is influenced by the weight and height of the individual, variables not discussed by Neder et al.[17].

It is observed great use of the equation of Neder et al.[17] with methodologies close to the utilized in this study but with conclusions disseminated regarding its effectiveness. The principles utilized in the equation suggest effectiveness for population variables, presupposing the array of factors

that can influence the final result, becoming generalist in regard to the circumstances suggesting a succession of heterogeneous results, reason for which the authors of these studies opted for this equation.

For worse prognosis of the hospitalized individual in chemotherapy, factors of fatigue, bed-ridden mobility and reduction of RMS were considered as contributors, part due to the onset of the disease and also because of the agents administered during the treatment. The thorough evaluation of RMS during the time of hospitalization allows the early recognition of the muscle debility, a deficit implying in the reduction of the capacity of pulmonary ventilation and chest expansibility, consequently modifying the coughing mechanism, and increasing the infectious risks. A set that implies directly in the physiotherapy treatment with key role for the early recognition of these symptomatologies to diminish said morbidities[22].

In order to consummate the ideas exposed, it is suggested the standardization of the anthropometric and methodological variables adopted for authenticity of the performance of these equations. In addition, this methodizing must be applied to evaluate the muscle deficits – respiratory or not – and of fatigue in this population to achieve early detection, evidence-based effective treatment and decline of morbimortality.

CONCLUSION

The status of the disease, the treatments applied and the hospitalizations this population is submitted provoked the reduction of the RMS and increase of the fatigue symptoms. However, more studies with this population must be conducted because of the small size of the sample, further to the necessity of the implementation of the standardized equation of manovacuometry.

CONTRIBUTIONS

Bianca Kemmilly Rodrigues Paiva, Yohana Machado Sarandini and Amanda Estevão contributed substantially for the study design/conception, elaboration, collection, analysis and interpretation of the data, critical review, and final approval of the version to be published.

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DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

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