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Relationship between daily living activities (ADL) limitation and the BODE index in patients with Chronic Obstructive Pulmonary Disease

Relação entre a limitação nas atividades de vida diária (AVD) e o índice BODE em pacientes com doença pulmonar obstrutiva crônica

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Abstract

Background: Chronic Obstructive Pulmonary Disease (COPD) is a progressive disease that reduces functional capacity. deteriorating the ability to perform activities of daily living (ADL). A close relationship between morbidity and mortality with functional limitation is observed in patients with COPD. **Objectives:** To determine if there is a relationship between ADL limitation and the BODE index. which is a predictor of mortality. in patients with moderate to severe COPD. **Methods:** Thirty-nine patients with COPD GOLD 2 to 4 recruited by convenience. were submitted to the following tests: spirometry. body mass index (BMI). the London Chest Activity of Daily Living (LCADL) scale. six-minute walking test (6MWT). the Medical Research Council (MRC) scale and the BODE index was calculated. The total score and the percentage of the total score LCADL ($LCADL_{\%total}$) were compared between patients of the four quartiles of the BODE using the Analysis of Variance test. The Spearman correlation coefficient was used to investigate the association between scores of LCADL and BODE index. **Results:** Patients had an average of FEV_1%pred=37±12% and were on average 66±8 years-old. The $LCADL_{\%total}$ correlated with the BODE index (r=0.65. p<0.05) as well as with the variables FEV_1. dyspnea and walked distance in the 6MWT (r=-0.42. r=0.76 and r=-0.67. p<0.05. respectively). The comparison of the average scores of the $LCADL_{\%total}$ between BODE quartiles 1. 2. 3 and 4. demonstrated that only the 4th quartile differed significantly from the others (p<0.05). **Conclusions:** ADL limitation has a strong association with the BODE index in patients with moderate to severe COPD and with three of the four variables that composes it.

Keywords: chronic obstructive pulmonary disease; dyspnea; activities of daily living; walking; mortality.

Resumo

Contextualização: A Doença Pulmonar Obstrutiva Crônica (DPOC) é uma doença progressiva que reduz a capacidade funcional. comprometendo as atividades de vida diária (AVD). A morbidade e a mortalidade na DPOC apresentam uma estreita relação com a limitação funcional nesses pacientes. **Objetivos:** Verificar se há associação entre a limitação nas AVD e o índice preditor de mortalidade BODE em pacientes com DPOC moderada a muito grave e não moderada e grave. **Métodos:** Trinta e nove pacientes com DPOC GOLD 2 a 4. em uma amostra de conveniência. foram submetidos às avaliações: espirometria. índice de massa corpórea (IMC). escala London Chest Activity of Daily Living (LCADL). teste da caminhada de seis minutos (TC6min); escala Medical Research Council (MRC). e o índice BODE foi calculado. O escore total e o percentual do escore total da LCADL ($LCADL_{\%total}$) foram comparados entre os pacientes dos quatro quartis do BODE utilizando-se ANOVA. O Coeficiente de Correlação de Spearman foi utilizado para verificar a associação entre os escores da LCADL e do índice BODE. **Resultados:** Os pacientes apresentaram em média VEF_1%prev=37.0±12.2%. idade=66±8 anos. A $LCADL_{\%total}$ apresentou correlação com o BODE (r=0.65. p<0.05) e com as variáveis VEF_1. dispneia e distância no TC6min (r=-0.42; r=0.76 e r=-0.67. respectivamente; p<0.05). Comparando a média dos escores da $LCADL_{\%total}$ entre os quartis 1. 2. 3 e 4 do BODE. somente o quartil 4 diferenciou-se estatisticamente dos demais (p<0.05). **Conclusões:** A limitação nas AVD apresenta forte associação com o índice BODE em pacientes com DPOC moderada a muito grave e com três das quatro variáveis que o compõem.

Palavras-chave: Doença Pulmonar Obstrutiva Crônica; dispneia; atividades cotidianas; caminhada; mortalidade.

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Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a major cause of morbidity and mortality worldwide and it has been recently considered a serious public health problem[1]. COPD is characterized by chronic airflow limitation. pathological changes in the lung. comorbidities and significant extrapulmonary effects[2]. As the disease progresses. it is common to verify the development and worsening of dispneia[3]. reduction in peripheral muscle strength[4]. decrease in the quality of life[5] and reduction in the ability to perform activities of daily living (ADL)[6].

Forced expiratory volume in the first second (FEV_1) is the parameter used to evaluate the stage of the COPD[2]. however it does not evaluate the systemic repercussions of it. and may not accurately reflect the exercise capacity. the degree of dyspnea or the limitation to perform ADLs[6,7].

Celli et al.[8] developed the BODE index (Body Mass Index. Airflow Obstruction. Dyspnea and Exercise Capacity index). which is a multidimensional grading system composed of domains that measure the degree of impairment of lung function (FEV_1). perception of symptoms (dyspnea) and of the systemic effects of the disease (body mass index (BMI) and exercise capacity). covering. thus. the main signs and symptoms of COPD[8]. This index was demonstrated to be better than the degree of obstruction to predict which patients will remain active. as recommended by the American College of Sports Medicine (ACSM)[9].

The variable that evaluates the exercise capacity in the BODE index is the distance walked during the Six-Minute Walk Test (6MWT)[8]. Although the 6MWT reflects the ability to perform the ADL[10]. this test involves only the activity of walking. As the disease progresses other factors such as lung hyperinflation. may influence the ability to perform the ADL. especially those activities involving the upper limbs[11]. The ADL limitations can be evaluated globally by using scales that present domestic. physical and leisure daily activities domains[7,12].

Since the BODE index is a multidimensional instrument. which can evaluate the main sign and symptoms of the disease that result in limitation to perform the ADL. the present study has the hypothesis that the BODE index would correlate with ADL limitation. Therefore. the aims of this study were to investigate whether there is an association between ADL limitation and the BODE mortality index and also to investigate whether there is an association among the individual variables that comprise the BODE index and ADL limitation. In the case of finding an association. another objective of this study would be to investigate the best cutoff point of the London Chest Activity of Daily Living scale (LCADL) from the BODE classification.

Methods

The study was conducted at the Physical Therapy Clinic of the Universidade Vale do Itajaí. at Itajaí -SC. Brazil. Thirty-nine COPD patients (28 men) stages 2. 3 and 4 of the GOLD (Global Initiative for Chronic Obstructive Lung Disease)[2] were evaluated. selected from a convenience sample. In order to be included in the study the participants should present a diagnosis of COPD (stages 2. 3 and 4 of the GOLD); history of smoking over 20 pack-years and clinical stability in the last month prior to the beginning of the study. Participants who were unable to perform any of the assessments of the study and participants who presented associated diseases. such as cardiomyopathy. musculoskeletal conditions. tuberculosis and asthma. were excluded from the sample. All participants were informed about the procedures and signed an informed consent form. The study was approved by the Human Ethics Research Committee of the Centro Universitário do Triângulo. Uberlândia - MG. Brazil (number 509867).

The participants were weighed and measured in a scale with a stadiometer (FILIZOLA®) that was previously calibrated. The participants also underwent to an evaluation of the pulmonary function; completed the Medical Research Council (MRC) Dyspnea scale and the London Chest Activity of Daily Living scale (LCADL); as well as performed the 6MWT twice.

Spirometry

In order to evaluate the FEV_1 and the forced vital capacity (FVC). the spirometer MULTI SPIRO - SX/PC (USA) which was calibrated daily was used. being the methods and the criteria used were those recommended by the American Thoracic Society (ATS)[13]. The measurements were obtained before and 15 minutes after inhaling 400 μg of salbutamol. The reference values used were those recommended by Pereira[14].

Six-Minute Walk Test

The 6MWT was conducted following the recommendations of ATS[15]. Two tests were performed in a 25-meter-long corridor. by the same investigator. without accompaniment. with the use of standard phrases of encouragement at the end of each minute. The greater distance reached in the two tests was used for analysis.

London Chest Activity Daily Living Scale

The LCADL scale. proposed and validated for patients with COPD. was translated and validated into Portuguese recently[16]. This is a scale composed of four domains relating

to self-care. domestic. physical activities and leisure; allowing the evaluation of the degree of dyspnea on ADL and its response to a therapeutic intervention[7,12]. The LCADL scale is composed of ordinary ADL. such as dressing a shirt. wearing shoes with socks. making the bed. and others. comprising a total of 15 quantitative questions. For the questions 1 to 15. the patients report a score on a likert scale ranging from 0 to 5 with a total maximum score of 75 points. being the higher the score achieved. the greater the limitation to perform ADL due to dyspnea[7]. The scale can also be analyzed as a percentage of the total score ($LCADL_{\%total}$). For this purpose. the percentage of the total score of each domain was calculated in relation to the maximum score. When the patient reports the score zero ("I wouldn't do this activity because I have never had to do it or it is irrelevant") to any item. it was not considered in the calculation of the $LCADL_{\%total}$. Therefore. a new maximum value was used. subtracting 5 points for each item that was not considered[16].

BODE Index

The BODE index was calculated individually. incorporating the variables: FEV_1%pred (percentage of predicted forced expiratory volume in the first second. post-bronchodilator). distance walked in the 6MWT (in meters). degree of dyspnea and the body mass index (BMI). The degree of dyspnea was evaluated by the Medical Research Council (MRC) scale. which contains a score ranging from 0 to 4. where 4 indicates the highest degree of dyspnea[17]. The BMI was calculated using the formula: weight/height^2 (kg/m^2). The BODE index ranges from a minimum score of 0 to a maximum score of 10 points. The classification of patients was divided into quartiles. where: the quartile 1 include patients with scores ranging from 0 to 2; quartile 2 include patients with scores ranging from 3 to 4; quartile 3 include patients with scores ranging from 5 to 6 and quartile 4 include patients with scores ranging from 7 to 10. The higher the score the greater the risk of mortality in patients with COPD[8].

Statistical analysis

The Kolmogorov-Smirnov normality test was applied and according to the distribution of variables a parametric or nonparametric test was chosen. The LCADL scale score was analyzed in two ways: as a total score ($LCADL_{total}$) and as a percentage of the total score ($LCADL_{\%total}$)[16]. The Pearson's Correlation Coefficient was used to test the correlation among the LCADL score and the following variables: BMI. FEV_1%pred and distance walked in the 6MWT. The Spearman's test was used to test the correlation between LCADL score and the BODE index and the MRC score. The expected correlation between LCADL score and the BODE index was 0.45 or more. since it has been found correlation coefficients of the LCADL score with the distance walked in the 6MWT of -0.48[18] and with the shuttle test of -0.58[7]. For this expected correlation coefficient. choosing a power of 80%. the sample size would be 36 subjects[19].

The expected correlation between the LCADL score and the BODE index ranges from 0.50 to 0.60. since it has been found that the correlation coefficients of the LCADL score with distance walked in 6MWT is -0.48[18] and. with the shuttle test is -0.58[7]. For this expected correlation coefficient. the power of the test is 90% for an estimated sample of 25 to 38 subjects. respectively[19].

The analysis of variance (ANOVA) was used to compare the LCADL score among the four quartiles of the BODE index and the Friedman test was used to compare the MRC scale between the quartiles. The Tukey post hoc test was applied when we found a $p<0.05$ in the ANOVA[20]. Analysis of sensitivity and specificity and their confidence intervals (95% CI) were calculated for cutoff point of the scale's score. Data were analyzed with SPSS software. version 13.0. The level of significance was 5% ($p<0.05$).

Results

From a total of 39 evaluated patients. 9 (23.07%) were oxygen dependent for most ADLs; 8 (20.51%) presented moderate impairment of lung function (GOLD 2); 19 (48.72%) presented severe impairment of lung function (GOLD 3) and 12 (30.77%) presented very severe impairment of lung function (GOLD 4)[2]. Table 1 shows the characteristics of patients that were divided into the four quartiles of the BODE index. No statistical significance difference between the quartiles for the variables age and smoking history were observed. From the variables that compose the BODE index. only BMI did not significantly differ between the quartiles. Only patients in quartile 4 showed difference in the $LCADL_{total}$ (Table 2) and in the total $LCADL_{\%total}$ (Table 2. Figure 1). when compared with patients in other quartiles.

The $LCADL_{total}$ and the $LCADL_{\%total}$ demonstrated positive correlations with the BODE index. with $r = 0.52$ ($p<0.05$) and $r = 0.65$ ($p<0.05$) respectively. The $LCADL_{total}$ and the $LCADL_{\%total}$ also correlated with the variables FEV_1. distance in 6MWT and the MRC. as shown in Table 3. The correlation coefficient between the $LCADL_{total}$ and the $LCADL_{\%total}$ was 0.90 ($p<0.05$).

The best cutoffs between the highest sensitivity and specificity values based on the classification of the BODE index (≥ 7) were the threshold values $LCADL_{total} \geq 25$ (67% and 63% respectively) and $LCADL_{\%total} \geq 50\%$ (75% and 82% respectively).

Table 1. Characteristics of patients.

	All patients	Quartile 1	Quartile 2	Quartile 3	Quartile 4
	(n=39)	(n=4)	(n=12)	(n=11)	(n=12)
Age (years)	66±7.9	69±2.4	62.5±10.5	66.2±6.5	68.2±6.3
Pack-years	48.7±23.1	68.5±33.5	39.8±15.2	45.8±22.2	53.8±25.4
FEV_1 (liters)	1.0±0.4	1.4±2.1	1.15±0.30	1.0±0.37	0.7±0.31
FEV_1 (%pred)	37.0±12.2	52.7±2.9	43.5±10.0	36.7±8.2**	25.6±8.2‡§‖
FVC (liters)	2.0±0.7	2.9±0.5	2.2±0.6	2.1±0.7	1.5±0.5
FVC (%pred)	60.0±16.9	79.1±8.7	65.8±16.0	64.7±10.2	44.1±11.4
FEV_1/FCV %	62.5±15.5	67.2±8.1	66.9±10.0	56.7±5.4	61.9±24.8
BMI (Kg/m^2)	23.7±4.3	22.3±2.9	23.4±2.4	26.0±4.8	22.5±5.1
6MWT (m)	337.5±135.9	465.8±17.6	449.5±80.2	338.1±80.9**†	182.3±73.8 ‡§‖
MRC	3 (1-4)	1 (1-2)	2 (1-3)*	3 (3-4)**†	4 (2-4)§
BODE	5 (2-10)	2#	3 (3-4)	5 (5-6)	8 (7-10)

Mean ± SD. For MRC and BODE: Median (minimum and maximum). FEV1: forced expiratory volume in the first second. FEV_1%pred: percentage of predicted expiratory volume in the first second. FVC: Forced Vital Capacity; FVC%pred: percentage of predicted forced vital capacity. FEV_1/FVC%. BMI: Body mass index; 6MWT: six-minute walking test; MRC: Medical Research Council; BODE: index predictor of mortality. * p<0.05 quartile 2 vs quartile 1; ** p<0.05 quartile 3 vs quartile 1; † p<0.05 quartile 3 vs quartile 2; ‡ p<0.05 quartile 4 vs quartile 1; § p<0.05 quartile 4 vs quartile 2; ‖ p<0.05 quartile 4 vs quartile 3. #There was no variability in BODE index score in patients of Quartile 2.

Table 2. Scores of LCADL among the quartiles of the BODE index.

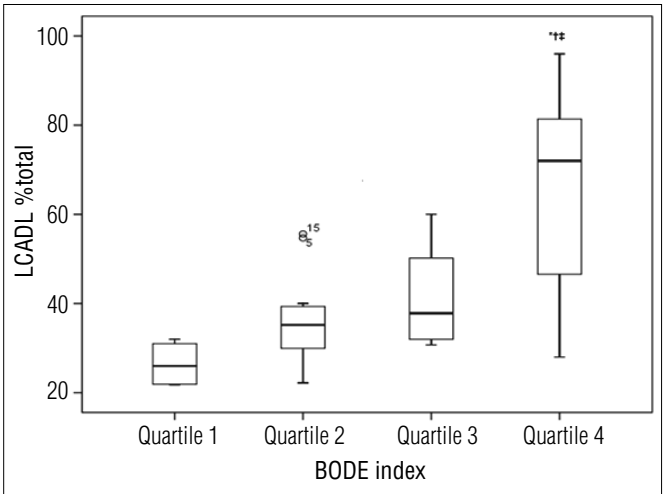
	Quartile 1	Quartile 2	Quartile 3	Quartile 4
	(n=4)	(n=12)	(n=11)	(n=12)
$LCADL_{total}$	14.3±3.3	23.9±7.7	24.3±7.39	40.1±20.8* †‡
(IC95%)	(13.3 to 15.0)	(21.5 to 26.3)	(21.9 to 26.6)	(33.6 to 46.6)
$LCADL_{\%total}$	26.4±5.3	36.5±10.2	41.6±11.1	65.2±22.6*†‡
(IC95%)	(18.0 to 35.0)	(30.0 to 43.0)	(34.0 to 49.0)	(50.9 to 79.6)

LCADL total: London Chest Activity of Daily Living Scale. the total score; $LCADL_{\%\ total}$: London Chest Activity of Daily Living Scale. Percentage of the total score. Mean ± SD (95% confidence interval); * p<0.05 quartile 4 vs. quartile 1; † p<0.05 quartile 4 vs. quartile 2; ‡ p<0.05 quartile 4 vs. quartile 3.

Table 3. Correlation coefficient (r) between the score of the LCADL and BODE index and its variables.

	$LCADL_{total}$	$LCADL_{\%total}$
BODE	0.52 *	0.65*
BMI (Kg/m^2)	- 0.11	- 0.12
FEV1 (%)	- 0.34 *	- 0.42*
6MWT (m)	- 0.54 *	- 0.67*
MRC	0.63 *	0.76*

$LCADL_{total}$:Total score London Chest Activity of Daily Living; $LCADL_{\%\ total}$: Percentage of total score of the London Chest Activity of Daily Living; BODE: mortality predictor index. BMI: body mass index. $FEV_{1\%pred}$: percentage of predicted expiratory volume in one second; 6MWT: six-minute walking test; MRC: Medical Research Council.* p<0.05.



* p<0.05 quartil 4 vs. quartil 1; † p<0.05 quartil 4 vs. quartil 2; ‡ p<0.05 quartil 4 vs. quartil 3.

Figure 1. Boxplot of the percentage of the total score LCADL compared to quartiles 1. 2. 3 and 4 of the BODE index.

Discussion

This study aimed to verify the association between ADL limitations and the mortality prediction BODE index in patients with moderate. severe and very severe COPD. A strong correlation between the score of ADL and the BODE index and also between the score of ADL and three of four individual variables of the BODE index: FEV_1. MRC and the distance walked in the 6MWT (Table 3) were found.

The peripheral muscle dysfunction induced by COPD has an important impact on functional capacity. It is observed that. as the disease progress. the functional capacity is compromised. making patients more disabled or dependent to perform ADL[7]. Furthermore. it is common for these patients to report greater difficulty in performing ADL with the upper limbs than in activities that involve the lower limbs[21]. such as walking. Activities with the arms raised without support can lead to thoracoabdominal asynchrony and dyspnea. even at lower intensities than activities performed with lower limbs[22]. It is likely to occur more often in patients whose the dynamic hyperinflation factor is present during exercise. limiting therefore the ADLs. In fact. a recent study showed that patients with greater dynamic hyperinflation perform less ADLs[23].

Static hyperinflation is strongly associated with mortality in patients with COPD[24]. Additionally. patients that present a higher static hyperinflation are also those with a greater dynamic hyperinflation during the exercise[25-27].

In the present study. patients with higher ADL limitation presented higher BODE index scores. Comparing the $LCADL_{total}$ and $LCADL_{\%total}$ scores among patients from the four quartiles of the BODE. those patients from the quartile 4 showed a significantly higher score compared to the patients from the other quartiles groups ($p<0.05$) (Table 2. Figure 1). The possibility that there was a type II error when comparing the LCADL score between the remaining quartiles groups cannot be ignored. Given the fact that only four patients from the sample were classified in the quartile 1 of the BODE index; it could reduce the probability of finding such differences. However. the BODE index itself seems to distinguish substantially more patients in the quartile 4 in relation to the other quartiles groups. as shown by Celli et al.[8]. in which the decrease difference in the survival rate of patients with COPD was higher among the quartiles 3 and 4 (around 40%) compared to patients in the quartiles 2 and 3 (around 10%) and in the quartiles 1 and 2 (around 15%)[8].

In this study. the association between the FEV_1 and the LCADL score was considered weak compared to other variables (Table 3). Patients with COPD present limited exercise capacity due to reduced lung function associated with peripheral muscle dysfunction[28]. The degree of expiratory airflow obstruction is an important marker of mortality in individuals with COPD[29]. however it provides no information to evaluate the patient's performance on ADLs. showing a weak correlation with the intensity of dyspnea and the capability to exercise[30]. The FEV_1. as an independent measure. does not represent the systemic manifestations of the disease and. therefore. it is not considered a good marker of functional capacity. especially in patients with higher levels of severity[31].

The distance walked in the 6MWT showed moderate and statistically significant association with LCADL scale (Table 3). The 6MWT is used to evaluate submaximal effort. indicating the ability to perform the ADL[32]. The findings of this study support. for example. the results found by Pitta et al.[6]. which have demonstrated that the reduced distance walked in the 6MWT was the best marker of the inactivity during the daily life of patients with COPD.

The existence of a greater association of 6MWT with LCADL scale with the degree of pulmonary obstruction indicates that ADL is best predicted by a global test than by an independent component of physical activity. such as FEV_1 or peripheral muscle strength[6,33-35].

Dyspnea is the main symptom that generates exercise limitation in patients with advanced stages of COPD and often leads to inactivity and consequent deconditioning of the peripheral muscles[36]. It was observed that the median of MRC score was 3 (minimum 1 – maximum 4) for the studied sample. denoting severe dyspnea[37]. The existence of a strong association between LCADL and MRC suggests a good agreement between the scales on the evaluation of dyspnea in its degree of impairment (Table 3). Also. how dyspnea is measured in LCADL scale (through recall. without experiencing the sensation during application of the instrument) is similar to the MRC[17,37]. However. the MRC is not specific to ADL. because it graduates dyspnea in different intensity of activities[38].

In contrast to the other three variables above. BMI was the only component that did not isolated correlate with the LCADL score (Table 3). Some authors state that there is a relationship between a lower BMI and peripheral muscle impairment and. consequently. with a lower exercise capacity in individuals with COPD[34,35]. However. in the opinion of other authors. BMI may not adequately determine the lean muscle mass loss[39,40]. neither BMI can be an indicator of the level of physical activities of daily living of patients with COPD. as demonstrated by Pitta et al.[6]. in which the BMI was not correlated with walking time in daily life monitored by an accelerometer.

In the studied sample. the BMI did not differ between the levels of disease severity (BODE quartiles 1 to 4). which may strengthen the lack of such association. It could also have occurred a type II error. however this possibility is unlikely. since

the sample size was sufficient to find significant associations between LCADL score and other variables that make up the BODE index.

The percentage of total LCADL score ($LCADL_{\%total}$) correlated better with the BODE and three of the four variables that comprise this index (FEV_1. MRC and the distance walked in the 6MWT) than with the total score ($LCADL_{total}$) (Table 3). This probably occurred because. in the present study sample. there were 28 (71.79%) male patients who responded: "I do not perform this activity (because I never had to do it or it is irrelevant)" for most issues in the domain "Domestic Activities". The scoring scale based on the calculation that ignores the issues with score zero ($LCADL_{\%total}$) may better reflect the limitation in AVD[16].

The LCADL scale has specificity with regard to the evaluation of dyspnea on ADL. filling an existing gap in the evaluation instruments for this population[7]. This scale had not yet been studied regarding its clinical interpretability. The found results indicate that the BODE index can be useful for this purpose.

The statistically significant difference observed in LCADL score between quartiles 3 and 4 suggests that a possible cutoff point in LCADL score could be located in a range close to these two quartiles (average of 42% to 65%). Probably. this cutoff point in the percentage of the total score could be 50%. since there is no intersection between the upper limit of the quartile 3 (49.0) and lower limit of the quartile 4 (50.9) (Table 2). Furthermore. this threshold value showed the best cutoff among the best sensitivity and specificity values[41] based on the BODE value equal to or greater then 7. So. probably. people who have scored above 50% in the percentage of LCADL fit BODE quartile 4 (from 7 to 10). which denotes worse disease state with possibly. also. a greater impairment of ADL due to dyspnea. However. the cutoff point with the best sensitivity and specificity for the absolute value of the score (greater than 25) is not equivalent to 50% of the maximum score of the scale (which corresponds to the absolute value of 32.5) on the results found in this study. Perhaps this is due to the fact that. by ignoring the issues which the patient indicates that he does not do the activity because he never had to do it (score zero). the total score does not really correspond to the percentage of the maximum total.

Since individuals with COPD are limited in their activities. it is essential to classify them by simple and easy to apply criteria in clinical practice. Thus. instruments that work with specific dimensions. such as the ADL. have proven to be useful in evaluating limitations in functional activities due to the deterioration of the disease. The application of this type of evaluation in pulmonary rehabilitation programs can provide additional information on functional limitations and on the gains achieved by therapeutic strategies addressed in the program. such as physical training. especially in patients with major limitation to daily activities.

The present study has some limitations. Firstly. the sample size may have influenced on the absence of some associations. However. significant associations were found between the LCADL score and the BODE index. indicating that the latter can help in the interpretability of the scale. With regards to significant correlations. with the studied sample size. statistical power was 90 to 95%. Another limitation is that the cutoff point of the LCADL score. originated from the data of the present study sample. was not tested in another sample of COPD patients to confirm their accuracy.

In summary. ADL limitation is correlated with the BODE index and with three isolated variables: FEV_1. MRC and the distance walked in 6MWT. It is suggested that values above 50% of the total percentage score of the scale are able to distinguish and to identify patients more limited on ADL due to dyspnea. More studies are needed to confirm these findings and to evaluate the accuracy of the cutoff point of 50% in LCADL score to determine the severity of ADL limitation.

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