

Correlation between clinical parameters and health-related quality of life in women with COPD*

Correlação entre parâmetros clínicos e qualidade de vida relacionada à saúde em mulheres com DPOC

Nilton Maciel Manguiera, Isabel Lucena Viegã,
Melissa de Almeida Melo Maciel Manguiera, Alcimar Nunes Pinheiro,
Maria do Rosário da Silva Ramos Costa

Abstract

Objective: To correlate health-related quality of life (HRQL) of women with COPD with clinical parameters and with the six-minute walk distance (6MWD; six-minute walk test). **Methods:** Cross-sectional study involving 30 female patients diagnosed with mild or moderate COPD treated at the Respiratory Outpatient Clinic of the Presidente Dutra University Hospital. Patients completed the Saint George's Respiratory Questionnaire (SGRQ) and were evaluated in terms of respiratory pressures, spirometry parameters and 6MWD. Descriptive statistical analysis was carried out, as were Student's t-tests for dependent variables, together with Pearson's and Spearman's correlation coefficients for numerical and ordinal variables, respectively. **Results:** According to the SGRQ total scores, HRQL was impaired, to some extent, in most of the participants. Most SGRQ total scores were between the second and the third quartiles, reflecting poor HRQL. The participants also presented poor functional capacity. Mean 6MWD (317.7 m), inspiratory muscle strength ($-53.48 \text{ cmH}_2\text{O}$) and expiratory muscle strength ($69.5 \text{ cmH}_2\text{O}$) were all below reference values. We found that HRQL was not correlated with body mass index or pulmonary function. However, HRQL presented a negative linear correlation with age, MIP and 6MWD, as well as a positive correlation with the sensation of dyspnea and fatigue. **Conclusions:** In this study, HRQL, determined using the SGRQ, was severely impaired in COPD patients, who presented severe limitations in functional capacity, breath control and personal life.

Keywords: Quality of life; Pulmonary disease, chronic obstructive; Women.

Resumo

Objetivo: Correlacionar a qualidade de vida relacionada à saúde (QVRS) de mulheres portadoras de DPOC com parâmetros clínicos e com a distância percorrida no teste de caminhada de seis minutos (TC6). **Métodos:** Estudo transversal com 30 mulheres portadoras de DPOC leve ou moderada, atendidas no Ambulatório de Pneumologia do Hospital Universitário Presidente Dutra. Foi aplicado o *Saint George's Respiratory Questionnaire* (SGRQ), assim como foram realizadas as medidas das pressões respiratórias, da espirometria e dos resultados do TC6. Executou-se a análise estatística descritiva, assim como o teste t de Student para variáveis dependentes, o coeficiente linear de Pearson para correlações de variáveis numéricas e o de Spearman para variáveis ordinais. **Resultados:** A QVRS esteve, na grande maioria das mulheres entrevistadas, comprometida, em graus variados, de acordo com o escore total do SGRQ. Os escores totais do SGRQ da maioria das participantes estavam entre o segundo e o terceiro quartil, o que reflete baixa QVRS. As participantes apresentaram ainda baixa capacidade funcional no TC6, com distância média percorrida (317,7 m) e força muscular inspiratória ($-53,48 \text{ cmH}_2\text{O}$) e expiratória ($69,5 \text{ cmH}_2\text{O}$) abaixo dos valores de normalidade. Não houve correlação entre a QVRS e o índice de massa corpórea e a função pulmonar. No entanto, houve correlação linear negativa com a idade, a P_lmáx e o TC6 e correlação positiva com a sensação de dispnéia e de fadiga. **Conclusões:** A QVRS medida pelo SGRQ das pacientes com DPOC desta pesquisa esteve muito comprometida, de modo a provocar limitações graves na funcionalidade, no controle da respiração e na vida pessoal.

Descritores: Qualidade de vida; Doença pulmonar obstrutiva crônica; Mulheres.

* Study carried out under the auspices of the Programa de Assistência ao Portador de Asma – PAPA, Asthma Treatment Program – of the Universidade Federal do Maranhão – UFMA, Federal University of Maranhão – São Luís, Brazil.

Correspondence to: Nilton Maciel Manguiera. Rua da Física, 17, Qd 11, Cohafuma, CEP 65074-210, São Luís, MA, Brasil.

Tel 55 98 3256-2804. E-mail: niltonlama@yahoo.com.br

Financial support: None.

Submitted: 18 February 2008. Accepted, after review: 26 August 2008.

Introduction

Clinically characterized by the presence of obstruction to the airflow or chronic airflow limitation, COPD presents slow irreversible progression and is associated with an inflammatory response of the lungs to particles or noxious gases.^(1,2) Although COPD is more frequently observed in men, the number of cases and the mortality rates among women have been rapidly increasing.⁽³⁾

Smoking among women has been gradually increasing worldwide.⁽⁴⁾ Therefore, we have to consider that, due to smoking, the incidence rates of COPD in women might, in the near future, be comparable to those of men. In addition, smoke from wood-burning stoves, used by many women in kitchens in Brazil, continues to be a potential factor in the genesis of COPD.⁽⁵⁾

Despite the physical, physiological, hormonal, sociocultural and occupational differences among men and women, the study of COPD in women is especially relevant due to the combination of related factors that affect the etiology and progression of COPD in women.⁽⁵⁾ Women are more susceptible to developing COPD at an earlier age and with greater severity than are men. Although the precise reasons for these differences are unknown, it is known that the lungs of women are smaller than those of men; hence, less smoke exposure is required in order to produce the negative effects of tobacco.⁽⁶⁾

The chronic symptoms of COPD (dyspnea, wheezing, cough, expectoration and exercise intolerance, together with anxiety and depression) are the principal factors responsible for altering the relationship between health and quality of life (QL). However, it is known that the severity of the symptoms is not always directly related to the level of airflow limitation or oxygenation at rest, which is why there has been increasing interest in the study of QL in patients with COPD.⁽⁷⁾

The understanding of fundamental, material and spiritual needs, referring to the ability of living without disease or overcoming difficulties resulting from morbid conditions, constitutes health-related quality of life (HRQL).⁽⁸⁾ Therefore, we define HRQL as the value attributed to the duration of life when modified by the perception of physical, psychological and social limitations, as well as limitation of opportunities that are

influenced by the disease or by adverse health events.⁽⁹⁾

We define QL as the formal and standardized quantification of the impact of the disease on activities of daily living and on the well-being of the patient. The importance of standardized QL questionnaires is implicit in this concept, since they allow the objective comparison of the impact of interventions used in COPD through scores with numerical (absolute or percentage) expressions.⁽¹⁰⁾ In patients with COPD, HRQL can be measured based on the identification of the activities of daily living impaired by the limitations imposed by the disease. The Saint George's Respiratory Questionnaire (SGRQ), validated for use in Brazil in 2000⁽¹¹⁾ and modified in 2006,⁽¹²⁾ constitutes a standardized measurement with good reproducibility and sensitivity to determine, based on the patient responses, the impact of the disease on the QL of patients with airflow limitation.⁽⁷⁾

The annual number of new cases of COPD is increasing almost three times faster among women than among men. Despite this tendency, there is a pronounced scarcity of investigations relating the importance of gender to questions of etiology, diagnosis, self-care, HRQL or professional experiences in cases of COPD.⁽¹³⁾

The investigation of treatment, health status and health care policy for patients with COPD is of fundamental importance in order to gain a better understanding of and respond to the growing problem of COPD in women. Due to the

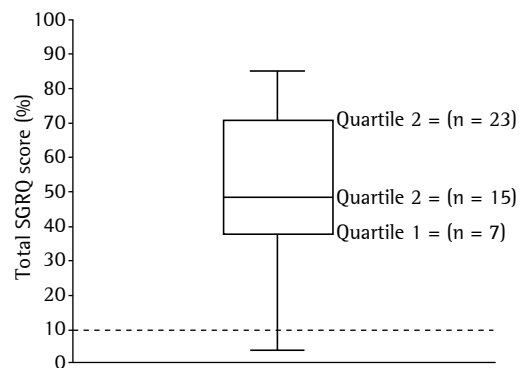


Figure 1 - Interquartile description of health-related quality of life using the total score of the Saint George's Respiratory Questionnaire (SGRQ) in women with COPD (n = 30) treated at the Respiratory Outpatient Clinic of the Presidente Dutra University Hospital, São Luís, Brazil, 2006.

scarcity of studies involving exclusively women with COPD, we have proposed, in this pioneering study, to contribute to the body of literature by drawing correlations between clinical parameters and HRQL in these patients.

Methods

This was a cross-sectional study involving 30 women with COPD, monitored via the COPD control and treatment program at the *Ambulatório de Pneumologia do Hospital Universitário Presidente Dutra* (APHUPD, Outpatient Pulmonary Clinic of the Presidente Dutra University Hospital), in the period of August 4, 2005 to October 30, 2006. The study design was approved by the Ethics in Research Committee of the Federal University of Maranhão Presidente Dutra University Hospital (ruling no. 150/2005).

The inclusion criteria were as follows: being female; having been diagnosed with mild or moderate COPD, according to the *Global Initiative for Chronic Obstructive Lung Disease*⁽¹⁴⁾; having been referred for evaluation by the APHUPD physicians; and presenting clinically stable status without episodes of exacerbation in the preceding 30 days. The following exclusion criteria were applied: having had a recent episode of unstable angina or acute myocardial infarction; presenting a cognitive deficit; and having any concomitant disease that might impede the performance of the study.

Pulmonary function tests were carried out using a spirometer (Pulmowin version 2.30E;

DTLI Datalink Instruments, Grabels, France) at the APHUPD Pulmonary Function Testing Laboratory, using the criterion of acceptance of curves proposed by the Brazilian Thoracic Association.⁽¹⁵⁾ The predicted values for the FVC maneuver and for inspiratory capacity were those suggested for the Brazilian population.⁽¹⁶⁾

The HRQL was evaluated using the SGRQ domains: 1) symptoms: questions about complaints of respiratory problems (cough, secretion, shortness of breath and wheezing); 2) activity: questions related to the activities that have typically caused shortness of breath in the preceding days (taking a shower, remaining seated and walking); and 3) impact: how the patient describes the respiratory disease and whether there is interference in the activities of daily living (whether cough and shortness of breath hinder activities of daily living). The scores of each SGRQ domain were summed, and the total is expressed as a percentage of the maximum. Values higher than 10% were considered indicative of altered QL.⁽¹¹⁾

The study volunteers were evaluated only once: on the day of the first medical appointment or on the day of the follow-up visit at the APHUPD. First, the SGRQ was applied, followed by measurement of the MIP, the MEP and the six-minute walk distance (6MWD), defined as the distance walked on the six-minute walk test (6MWT). In order to apply the SGRQ, we conducted an interview in which the questions related to each domain were explained in a clear and easy to understand manner, so that the patient was able to answer them without

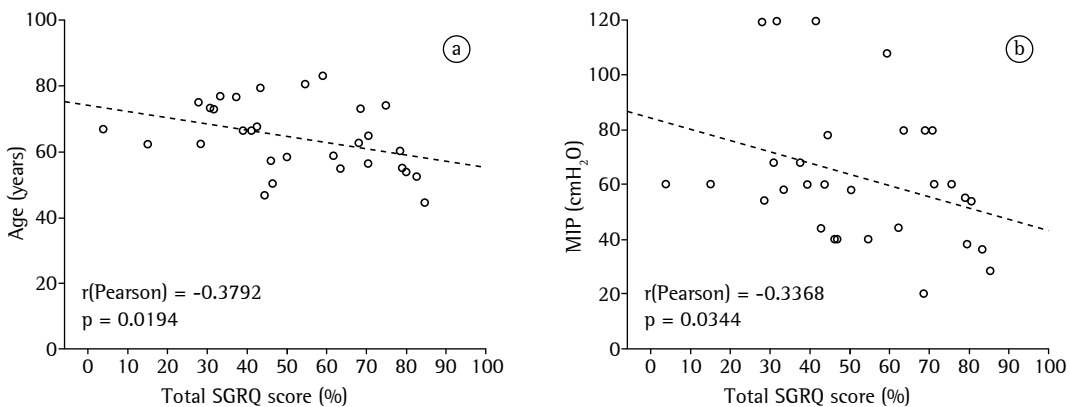


Figure 2 – Correlation between health-related quality of life, using the total score of the Saint George's Respiratory Questionnaire (SGRQ), and the age a) and MIP b) of women with COPD (n = 30) treated at the Respiratory Outpatient Clinic of the Presidente Dutra University Hospital, São Luís, Brazil, 2006.

influence. If the patient did not understand the question, the researcher repeated it until the patient knew how to choose the alternative she considered correct.

A vacuum manometer (Comercial Médica, São Paulo, Brazil) was used for the MIP and MEP measurements, MIP corresponding to the diaphragm strength index and MEP corresponding to the abdominal and intercostal strength.⁽¹⁷⁾ Three inspiratory and three expiratory maneuvers were performed with a nasal clip, and the highest value obtained was chosen. In order to register the MIP, we instructed the patient to exhale starting from total lung capacity (TLC) to residual volume with subsequent maximum inspiratory effort against an occluded valve. For the measurement of MEP, the patient was instructed to inhale starting from residual volume to TLC, with subsequent maximum expiratory effort against an occluded valve.⁽¹⁷⁾ The formula described by Black & Hyatt⁽¹⁸⁾ was used in order to calculate the normality of the respiratory pressures in women.

The patients remained seated for 10 min during the 6MWT. After this rest period, heart rate and oxygen saturation were measured (using an oximeter—Onyx 9500; Nonin Medical Inc., Minneapolis, MN, USA), as were respiratory rate and arterial pressure (systolic and diastolic), the last with a sphygmomanometer and a stethoscope (Becton Dickinson, Franklin Lakes, NJ, USA). The sensation of dyspnea and fatigue was measured by the Borg scale.⁽¹⁹⁾

In order to evaluate the 6MWD, the 6MWT was conducted in accordance with the recommendations of the American Thoracic Society.⁽²⁰⁾ The 6MWT was performed in an unobstructed, covered area of the APHUPD, on a course of fifteen linear meters, delineated with adhesive tape on the surface every five meters.

The patients were instructed to walk within their limits and to exert themselves only for the 6 min of the test period. They were instructed to slow down or interrupt the test if they felt tired or experienced any other limiting discomfort. They were allowed to stop or rest to continue the test, if conditions permitted. Patients were not encouraged to walk faster. At 6 min, the distance covered by each patient was registered, as they continued walking slowly until stopping and sitting down.

Data were processed using the biostatistics programs Statistical Package for the Social Sciences, version 16.0 (SPSS Inc., Chicago, IL, USA) and Epi Info 3.3.2. for descriptive statistical analysis and inferences. Student's t-test was used for analysis of the differences between two dependent variables measured prior to and after the 6MWT. Pearson's linear correlation coefficient was used to determine the direction and degree of association between two numerical variables, and Spearman's correlation coefficient was used between two ordinal or nominal variables. A 95% CI was adopted, and the level of statistical significance was set at $p < 0.05$.

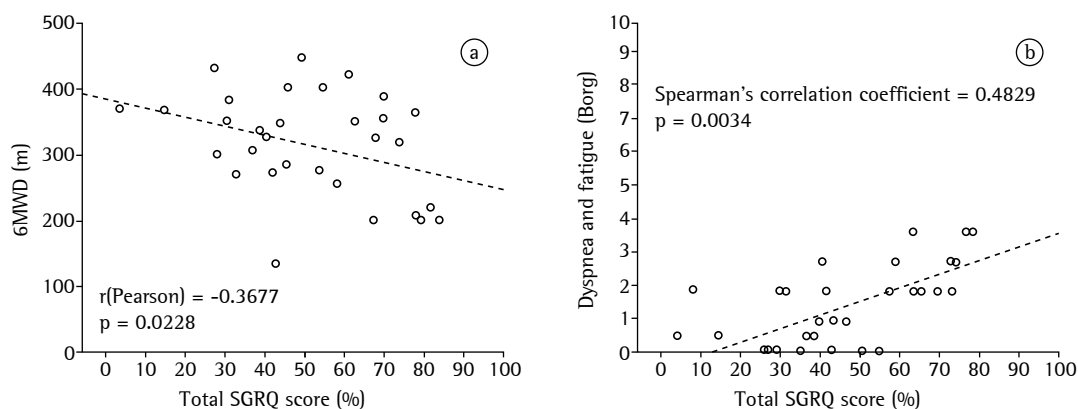


Figure 3 - Correlation between the total score on the Saint George's Respiratory Questionnaire (SGRQ), a measure of health-related quality of life, and the six-minute walk distance (6MWD, a), as well as between the total SGRQ score and the sensation of dyspnea/fatigue using the Borg scale b), in women with COPD ($n = 30$) treated at the Respiratory Outpatient Clinic of the Presidente Dutra University Hospital, São Luís, Brazil, 2006.

Results

This study comprised 30 female volunteers, there being no exclusions. Of those, 14 patients were diagnosed with mild COPD (47%) and 16 (53%) were diagnosed with moderate COPD. Of the 16 patients with moderate COPD, 13 (43% of the sample) were classified as having type AII and 3 (10% of the sample) were classified as having type BII. The mean age was 64.5 ± 10.4 years, the mean height was 150.2 ± 6.5 cm, and the mean body mass index (BMI) was 23.9 ± 4.4 kg/m². Pulmonary function testing revealed a mean FEV₁ of $58.2 \pm 26.8\%$ and a mean FVC of $69.2 \pm 26.4\%$, with a mean Tiffeneau index of 62.1 ± 13.5 .

In the great majority (86.7%) of the women interviewed, HRQL, as determined on the basis of the total SGRQ score (%), was found to be impaired to varying degrees. Values higher than 10% were considered indicative of some alteration in QL. A higher SGRQ score implies worsened HRQL. In Figure 1, we observe that 7 women were in the first quartile, with a SGRQ score of 36.37%. Of those 7, only 4 presented a score of $\leq 10\%$. The second quartile comprised 15 women, with a mean score of 48.20%, and the third quartile comprised 23 women, with a mean score of 70.46%.

Statistically significant differences between pre-6MWT and post-6MWT values were found only for heart rate ($p = 0.0431$), respiratory rate ($p = 0.0001$) and the sensation of dyspnea and fatigue, as measured by the Borg scale ($p = 0.0001$).

The mean 6MWD was 317.7 ± 77.9 m. This was 34.8% (169.7 m) lower than the expected value (487.4 m) and was 9.3% (32.6 m) below the lower limit (350.2 m) expected for women in this age bracket; these differences were statistically significant ($p = 0.0001$ for both). The respiratory muscle strength of the studied population was also inferior to that expected for the age bracket. This was especially evident in the values obtained for MEP. The mean values for MIP and MEP were significantly different from those predicted for the age bracket ($p = 0.0001$ for both).

We found that HRQL did not correlate significantly with pulmonary function test results ($p = 0.3720$), MEP ($p = 0.0809$) or BMI ($p = 0.3064$). However, HRQL presented a negative linear correlation with age and with MIP (Figure 2).

We found that HRQL presented a negative correlation with the 6MWD and a positive correlation with the sensation of dyspnea and fatigue, as measured by the Borg scale (Figure 3).

Discussion

Although the patients had COPD and were being monitored at the APHUPD in order to control exacerbations of the disease, HRQL, as determined using the SGRQ, was altered in practically all of the patients evaluated in this study. The difficulties imposed by the disease, dyspnea and the functional limitation contributed considerably to the perception of low HRQL. Socioeconomic difficulties and a lack of family support also played a role. The patients in this study considered COPD their major problem, as well as a limiting factor for most of the things they wished to do. There are reports in the literature stating that patients with COPD feel stigmatized by people around them, as well as by their physicians. In a study addressing this issue,⁽²¹⁾ the patients surveyed described a personal feeling of shame and embarrassment related to the use of complementary oxygen, since COPD is associated with smoking. In a qualitative study,⁽²²⁾ 21 women with COPD reported feeling stigmatized as a result of the disease. They also added that there is a feeling of anxiety when they are making great effort to breathe and encounter other people on the street. In studies of HRQL, women with COPD have had lower scores than have men. Using the SGRQ, one group of authors reported low HRQL with significant score in the activity and symptoms domains.⁽²³⁾ Taken together, these findings suggest the need to evaluate the psychological, socioeconomic and sociocultural factors in the female population with COPD as a possible means of understanding and explaining these alterations in the HRQL.⁽²³⁾

We also observed that the 6MWD and the maximal static pressures (MIP and MEP) measured in this study were much lower than those expected for the age bracket and gender. The women evaluated did not achieve even the lowest predicted 6MWD. Our results indicate that these patients presented considerable physical and functional limitation, health conditions that are insufficient for the performance of normal activities of daily living, such as getting dressed, eating, speaking, walking within the

home, showering and sleeping. Our findings also indicate their social isolation, due to the fact that they do not have the minimal walking capacity needed in order to visit other houses in the neighborhood, churches or grocery stores. These results corroborate those of another, prospective, study,⁽²³⁾ in which it was reported that COPD-induced limitations makes it difficult to perform low resistance activities, such as the 6MWT. In the same study, the authors reported that survival was longer among the COPD patients who presented higher 6MWD values. The authors concluded that the 6MWD correlated significantly with FEV₁, suggesting that the 6MWT can aid in the assessment of the pulmonary function and survival, as well as of the level of physical functionality, in patients with COPD.

The low respiratory muscle strength observed in our patients indicates, considering the values of MIP, that inspiratory effort started from an abnormally high pulmonary volume. Likewise, the reduction of MEP in these patients results from the decrease in the TLC, which alters the length of the expiratory muscles as well as reducing expiratory force.⁽²⁵⁾ The role of hyperinflation in the generation of dyspnea and exercise limitation in patients with COPD has been clearly established. Measurement of the inspiratory capacity, which is influenced by inspiratory muscle strength, as well as by the extent of the mechanical load imposed upon the muscles, indicates the degree of hyperinflation in COPD.⁽²⁶⁾ It is currently known that complementary measurements such as inspiratory capacity correlate strongly with COPD symptoms, principally dyspnea, which is one of the principal determinants of altered QL.⁽²⁷⁾ The progression of the disease affects the roles, responsibilities and interactions in the social/family context, resulting in profound, long-term changes in the QL of the individuals and their families.⁽²⁷⁾

In the present study, the impairment of HRQL was greater in the youngest patients than in the oldest patients. These results differ from those found in the literature, in which there is typically a direct relationship between age and low functional performance or decreased QL. Patients with COPD are generally older and are likely to, in part, associate age with the reduction of ability to perform activities.⁽²⁵⁾ Other researchers⁽²⁸⁾ add that, in order to maintain QL,

even in view of the progressive increase in age, it is necessary that the diet be appropriate to the nutritional needs, as well as that emotional balance and regular physical activity be maintained. Perhaps the explanation for the results obtained in our study is that the elderly patients sought treatment and monitoring in the COPD sector of the APHUPD, presenting greater adherence to the program, with greater attendance and frequency, than did the younger patients. The latter commonly sought treatment only when having an attack of dyspnea, avoiding full participation in the follow-up and COPD control program. The greatest determinants of QL alterations are the COPD symptoms, which frequently constitute the principal reason for seeking health care, since patients with mild COPD are oligosymptomatic and seek medical assistance only during attacks.⁽²⁹⁾

In the present study, patient HRQL did not present a linear correlation with BMI or with pulmonary function, regardless of the SGRQ domain evaluated. However, in a study on the influence of general characteristics on the QL of patients with COPD,⁽²⁸⁾ the SGRQ impact domain was found to correlate significantly with BMI as well as with pulmonary function, and the symptoms domain was found to correlate significantly with BMI. In the same study, the authors reported that, after multiple regression analysis, pulmonary function was found to have no influence on any of the SGRQ domains. However, in the patients evaluated, functional capacity, as measured by the 6MWT, worsened in parallel with worsening of HRQL, as did inspiratory strength (MIP), that is, a shorter 6MWD resulted in a higher SGRQ score and, therefore, worse HRQL. In a similar study,⁽²⁵⁾ the 6MWD was found to correlate negatively with the SGRQ domains activity and impact, this correlation being attributed to the limited functional and physical activity of the studied patients. In another study,⁽²³⁾ it was also demonstrated that the twelve-minute walk test results correlated negatively with the SGRQ activity and impact domains, as confirmed by multiple regression. The low exercise capacity and the dyspnea constitute etiological factors that, unlike the traditional factors, impair the HRQL of patients with COPD.⁽²³⁾

The sensation of dyspnea and fatigue was greater in patients who had worse HRQL. Dyspnea makes it difficult for patients with

COPD to perform simple activities of daily living, such as getting dressed, showering and eating, therefore constituting the principal symptom associated with incapacity, impairment of QL and worse prognosis. In one study,⁽³⁰⁾ patients with mild or severe COPD were found to present a pronounced decrease in HRQL, and dyspnea was shown to be the principal limiting factor of COPD.

Therefore, we conclude that HRQL, measured by the SGRQ, of patients with COPD in the present study was sufficiently impaired to cause severe limitations in functionality and in breath control. The reduced physical conditioning restricts the ability to perform activities of daily living, thereby isolating these patients from social interaction and damaging their personal and family relations. Investigations exclusively involving women with COPD, as did the present study, are important for elucidating the complex relationship between gender and this disease, as well as the associated complications. In addition, our findings suggest the need for further studies comparing men and women with COPD in terms of HRQL aspects.

References

1. Pauwels RA, Buist AS, Calverley PM, Jenkins CR, Hurd SS; GOLD Scientific Committee. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. NHLBI/WHO Global Initiative for Chronic Obstructive Lung Disease (GOLD) Workshop summary. *Am J Respir Crit Care Med.* 2001;163(5):1256-1276.
2. Sociedade Brasileira de Pneumologia e Tisiologia. II Consenso Brasileiro de Doença Pulmonar Obstrutiva Crônica - DPOC. *J Pneumol.* 2004;30 Suppl 5:S1-S42.
3. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med.* 2006;3(11):e442.
4. Sociedade Brasileira de Pneumologia e Tisiologia. Diretrizes para cessação do tabagismo. *J Pneumol.* 2004;30 Suppl 2:S3-S76.
5. Godoy I, Tami SE, Coelho LS, Martin RS, Parenti LC, Andrade LM, et al. Smoking cessation program as a tool for the early diagnosis of chronic obstructive pulmonary disease. *J Bras Pneumol.* 2007;33(3):282-6.
6. Mustonen TK, Spencer SM, Hoskinson RA, Sachs DP, Garvey AJ. The influence of gender, race, and menthol content on tobacco exposure measures. *Nicotine Tob Res.* 2005;7(4):581-90.
7. Jones PW. Health status measurement in chronic obstructive pulmonary disease. *Thorax.* 2001;56(11):880-7.
8. Minayo MC, Hartz ZM, Buss PM. Qualidade de vida e saúde: um debate necessário. *Ciênc Saúde Coletiva.* 2000;5(1):7-18.
9. Gerhardt CA, Britto MT, Mills L, Biro FM, Rosenthal SL. Stability and predictors of health-related quality of life of inner-city girls. *J Dev Behav Pediatr.* 2003;24(3):189-94.
10. Jones PW, Quirk FH, Baveystock CM. The St George's Respiratory Questionnaire. *Respir Med.* 1991;85 Suppl B:25-31; discussion 33-7.
11. Sousa TC, Jardim JR, Jones P. Validação do questionário do Hospital Saint George na Doença Respiratória (SGRQ) em pacientes portadores de doença pulmonar obstrutiva crônica no Brasil. *J Pneumol.* 2000;26(3):119-128.
12. Camelier A, Rosa FW, Salim C, Nascimento OA, Cardoso FC, Jardim JR. Using the Saint George's Respiratory Questionnaire to evaluate quality of life in patients with chronic obstructive pulmonary disease: validating a new version for use in Brazil. *J Bras Pneumol.* 2006;32(2):114-22.
13. Mannino DM, Homa DM, Akinbami LJ, Ford ES, Redd SC. Chronic obstructive pulmonary disease surveillance--United States, 1971-2000. *Respir Care.* 2002;47(10):1184-99.
14. GOLD - Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease [homepage on the Internet]. Executive Summary, Global Strategy for the Diagnosis, Management, and Prevention of COPD. Updated 2005 [cited 2006 Nov 19]. Available from: <http://goldcopd.org/Guidelineitem.asp?1=2&l2=1&tintld=1389>
15. Sociedade Brasileira de Pneumologia e Tisiologia. Diretrizes para Testes de Função Pulmonar. *J Pneumol.* 2002;28 Suppl 3:S1-S221.
16. Pereira CA. Espirometria. *J Pneumol.* 2002;28 Suppl 3:S1-S82.
17. Souza RB. Pressões respiratórias estáticas máximas. *J Pneumol.* 2002;28 Suppl 3:S155-S165.
18. Black LF, Hyatt RE. Maximal respiratory pressures: normal values and relationship to age and sex. *Am Rev Respir Dis.* 1969;99(5):696-702.
19. Borg GA. Psychophysical bases of perceived exertion. *Med Sci Sports Exerc.* 1982;14(5):377-81.
20. ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories. ATS statement: guidelines for the six-minute walk test. *Am J Respir Crit Care Med.* 2002;166(1):111-7.
21. Earnest MA. Explaining adherence to supplemental oxygen therapy: the patient's perspective. *J Gen Intern Med.* 2002;17(10):749-55.
22. O'Neill ES. Illness representations and coping of women with chronic obstructive pulmonary disease: a pilot study. *Heart Lung.* 2002;31(4):295-302.
23. De Torres JP, Casanova C, Hernandez C, Abreu J, Aguirre-Jaime A, Celli BR. Gender and COPD in patients attending a pulmonary clinic. *Chest.* 2005;128(4):2012-6.
24. Rodrigues SL, Assis-Viegas CA. Estudo de correlação entre provas funcionais respiratórias e o teste de caminhada de seis minutos em pacientes portadores de doença pulmonar obstrutiva crônica. *J Pneumol.* 2002;28(6):324-8.
25. O'Donnell DE. Hyperinflation, dyspnea, and exercise intolerance in chronic obstructive pulmonary disease. *Proc Am Thorac Soc.* 2006;3(2):180-4.
26. Freitas CG, Pereira CA, Assis CA. Inspiratory capacity, exercise limitation, markers of severity, and prognostic factors in chronic obstructive pulmonary disease. *J Bras Pneumol.* 2007;33(4):389-96.

27. Hajiro T, Nishimura K, Tsukino M, Ikeda A, Oga T. Stages of disease severity and factors that affect the health status of patients with chronic obstructive pulmonary disease. *Respir Med.* 2000;94(9):841-6.
28. Dourado VZ, Antunes LC, Carvalho LR, Godoy I. Influence of general clinical parameters on the quality of life of chronic obstructive pulmonary disease patients. *J Bras Pneumol.* 2004;30(3):207-214.
29. Lindberg A, Bjerg A, Rönmark E, Larsson LG, Lundbäck B. Prevalence and underdiagnosis of COPD by disease severity and the attributable fraction of smoking Report from the Obstructive Lung Disease in Northern Sweden Studies. *Respir Med.* 2006;100(2):264-72. Erratum in: *Respir Med.* 2007;101(12):2569
30. Sant'Anna CA, Stelmach R, Zanetti Feltrin MI, Filho WJ, Chiba T, Cukier A. Evaluation of health-related quality of life in low-income patients with COPD receiving long-term oxygen therapy. *Chest.* 2003;123(1):136-141.

About the authors

Nilton Maciel Manguiera

Assistant Professor I. Department of Physical Therapy Applied to Pulmonology, *Faculdade Santa Terezinha* – CEST, Santa Terezinha College – São Luís, Brazil.

Isabel Lucena Viega

Physical Therapy Student. *Faculdade Santa Terezinha* – CEST, Santa Terezinha College – São Luís, Brazil.

Melissa de Almeida Melo Maciel Manguiera

Professor. *Faculdade Santa Terezinha* – CEST, Santa Terezinha College – São Luís, Brazil.

Alcimar Nunes Pinheiro

Adjunct Professor IV. Department of Internal Medicine, *Universidade Federal do Maranhão* – UFMA, Federal University of Maranhão – São Luís, Brazil.

Maria do Rosário da Silva Ramos Costa

Adjunct Professor III. Department of Internal Medicine, *Universidade Federal do Maranhão* – UFMA, Federal University of Maranhão – São Luís, Brazil.