Validation of the Airways Questionnaire 20 – AQ20 in patients with chronic obstructive pulmonary disease (COPD) in Brazil*

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Introduction: A great emphasis has been placed on health-related quality of life of COPD patients and specific questionnaires have been developed in order to measure it. **Objective:** This study describes the language and cultural adaptation of a new (and short) disease-specific health status questionnaire developed for chronic obstructive pulmonary diseases: the Airways Questionnaire 20 (AQ20). **Methods:** In order to validate this questionnaire in Brazil, it was initially translated into Portuguese. The cultural adaptation was taken into consideration and then a back translation to English was undertaken, in order to obtain a final Portuguese version. Correlations were made with FEV₁, SpO₂, BMI and another disease-specific health status questionnaire, the Saint George Respiratory Questionnaire (SGRQ), previously validated in Brazil. The interclass correlation ratio was done to test the reproducibility of AQ20. **Results:** The interclass correlation ratio for the total score was $\alpha = 0.90$ (intra-observer variability) and $\alpha = 0.93$ (inter-observer variability) ($p < 0.05$ for both). The correlation with total SGRQ score was 0.76, with $p < 0.001$. The average time to answer the AQ20 was 4 min and 6 s. **Conclusion:** The Brazilian Portuguese version of AQ20 is reproducible, of fast application and with good a correlation with SGRQ total score, which makes it a valid questionnaire to measure health status in obstructive patients in Brazil. (*J Pneumol.* 2003; 29(1): 28-35)

Key words – Obstructive lung diseases. Questionnaire. Quality of life. Reproducibility of results.

Abbreviations used in this study

AQ20 – Airways Questionnaire 20
SGRQ – Saint George Respiratory Questionnaire
CRQ – Chronic Respiratory Questionnaire
SF36 – Short Form 36
AQLQ – Asthma Quality of Life Questionnaire

COPD – Chronic Obstructive Pulmonary Disease
GOLD – Global Initiative for Obstructive Lung Disease
HS – Health status
FEV₁ – Forced expiratory volume on the 1st second
FVC – Forced vital capacity
PO₂ S – Pulse oxygen saturation
BMI – Body mass index
SEC – Socioeconomic classification

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INTRODUCTION

The emphasis on the treatment of COPD patients has been directed at reduction of symptoms, increased physical tolerance and improvement of health-related quality of life, also named health status (HS)⁽¹⁻³⁾. Several worldwide studies have incorporated HS measurement as a parameter to evaluate the efficacy of several interventions⁽⁴⁻⁸⁾. However, to measure HS in languages and cultures different from the original one, it is recommended that these instruments undergo a validation process^(9,10). Of the HS questionnaires used in COPD, two were already validated in Brazil: the SF-36⁽¹¹⁾ and the SGRQ^(12,13). The length of the questionnaire may be important⁽¹⁴⁾ and, in 1994, short 20-item questionnaire was composed, called Airways Questionnaire 20 – AQ20, with validity and reproducibility demonstrated in the literature^(15,16). AQ20 has similar discriminative and responsivity properties when compared to SGRQ ($r = 0.86$ in COPD⁽¹⁷⁾) and to the Asthma Quality of Life Questionnaire (AQLQ); $r = 0.80$ ⁽¹⁶⁾.

The present study describes the adaptation to the Brazilian language and culture of a new (and short) questionnaire of disease-specific health status developed for chronic obstructive respiratory diseases: the Airways Questionnaire 20 – AQ20.

MATERIAL AND METHODS

A) Sample: The AQ20 was applied to 30 patients, selected from the COPD Ambulatory of Pneumology/UNIFESP.

B) Inclusion criteria: I – COPD diagnosis: established according to the criteria of GOLD consensus⁽¹⁾; II – Clinical stability, before and after the study, according to the criteria established in a previous study⁽¹²⁾.

C) Exclusion criteria: I – Presence of pulmonary diseases other than COPD; II – Presence of other non-pulmonary diseases considered incapacitating, severe or of difficult control and III – Patient's request and/or non-attendance to the programmed consultations;

D) Protocol: In a similar way, this study used in Brazil the phases described for validation and cultural adaptation of the SGRQ⁽¹²⁾ and the SF-36⁽¹¹⁾, as well as the validation of the Swedish version⁽¹⁸⁾ and the Spanish version of the SGRQ⁽¹⁹⁾, in addition to other phases described in the International Quality of Life Assessment Project⁽²⁰⁾.

D.1) Translation into Portuguese - language/cultural equivalence:

The questions of the original English version of the AQ20 were initially translated into Portuguese (the conceptual, rather than the literal translation, was emphasized), obtaining the first Portuguese version. This initial version was applied in 13 COPD patients enrolled in the Pulmonary Rehabilitation Program of UNIFESP, and possible text-related doubts and difficulties were investigated. The second Portuguese version was made after this initial assessment. Subsequently, a retrograde translation into English was performed by a Brazilian physician with a good knowledge of English, who, however, was not familiar with the AQ20. The two English versions (original and retrograde) were compared. Finally, a final version of the AQ20 in Portuguese was written (Appendix 1). No specific item in the cultural adaptation needed to be replaced.

D.2) Evaluation of reproducibility and validity of the AQ20:

The AQ20 was applied three times to the same patient, twice on the first day and a third one 15 days later. Only two experimenters participated in the application of the questionnaires. In the first consultation, AQ20 was applied twice in different moments, randomly (by raffle), by different experimenters (experimenter 1 and 2) who had no previous access to the answers of each application. This procedure was used to assess the inter-observer reproducibility. After a period of 15 days, AQ20 was again applied by experimenter 1, for the study of intra-observer reproducibility. AQ20 validity was evaluated by examination of its score relationship with that of SGRQ, FEV₁, FEV₁/FVC, SpO₂ (%), BMI and SEC.

D.3) Assessment for AQ20 validation:

Spirometry, performed in a Vitatrace equipment – VT 130SL and previously described⁽²¹⁾; oxygen saturation (SPO₂), measured at rest (after 15 min seating) breathing environmental air with a Pulse oximeter Model 300 – Palco Laboratories; Questionnaire of Clinical Stability, standardized by UNIFESP/Pneumology⁽¹²⁾; BMI (kg/m²), where malnutrition was considered as below 22, eutrophism, between 22 and 27, and overweight, with a BMI above 27⁽²²⁾ and SEC⁽²³⁾, according to the Brazilian Society of Market Research.

D.4) Doubts: patients were requested to answer a standard questionnaire at the end of AQ20 application, in order to provide complementary information about the easiness and difficulties to answer the AQ20.

Patients signed a free informed consent form and the protocol was approved by the Ethics Committee in Medical Research of Hospital São Paulo/UNIFESP.

APPENDIX 1			
Airway Questionnaire 20 (AQ20)			
The following questions refer to the <u>effect of the pulmonary disease in your daily life</u>			
Please, answer Yes, No or Does not apply for each item. Do not leave any blanks.			
Question	Yes	No	Does

			not apply
1. Do you have cough crisis during the day?			
2. Do you often feel tired due to your pulmonary disease?			
3. Do you feel short of breath when taking care of your garden due to your pulmonary disease?			
4. Would you mind going to a friend's house if there were something that might cause you a crisis of pulmonary symptoms?			
5. Do you have pulmonary symptoms when exposed to strong smells, cigarette smoke or perfume?			
6. Is your spouse bothered by your pulmonary disease?			
7. Do you feel short of breath when trying to sleep?			
8. Are you concerned with the long-term effects on your health caused by medications that you have to take because of your pulmonary disease?			
9. Do your pulmonary symptoms get worse when you are upset?			
10. Are there moments when you have difficulty walking back home due to your pulmonary disease?			
11. Do you feel short of breath doing your work activities due to your pulmonary disease?			
12. Do you feel short of breath going upstairs due to your pulmonary disease?			
13. Because of your pulmonary disease do you feel short of breath to accomplish domestic chores?			
14. Because of your pulmonary disease do you have to go back home earlier than other people after a night out?			
15. Do you feel short of breath when you are laughing due to your pulmonary disease?			
16. Do you often feel impatient due to your pulmonary disease?			
17. Because of your pulmonary disease do you feel you can not get the best of your life?			
18. Because of your pulmonary disease do you feel weak after a cold?			
19. Do you feel a constant weight in your chest?			
20. Are you very concerned about your pulmonary disease?			

e) Statistical analysis: A descriptive statistical analysis was used for demographic and clinical characterization of the patients. The Pearson Chi-Square test was used to examine the relationship between two dichotomic variables. Comparison between two dependent samples was made by the Wilcoxon matched pairs test. Comparison of two independent samples was performed by the Mann-Whitney U Test. Cronbach's coefficient was used to assess AQ20 reproducibility. Correlation between two ordinal variables was carried out by the Spearman Correlation Coefficient. Since correlation coefficient

evaluates the level of association between the score obtained in a test-retest situation, but does not indicate the direction of such association, the graphic disposition of Bland and Altman was used, since it examines the difference between scores obtained in the AQ20 and SGRQ. In this graphic disposition, the differences are placed, the general mean and variances are calculated, and a 95% confidence interval around the mean is built, assuming a normal distribution^(24,25). The Kappa confidence coefficient was used to measure the level of concordance between two evaluations arranged by categories (nominal level). The level of significance was set at $p < 0.05$.

RESULTS

Thirty five patients were initially recruited; however, three of them presented clinical instability and two did not return for the second consultation, making up a total of 30 patients. The mean time of AQ20 application was four minutes, The main characteristics of the 30 patients who concluded the study are shown in Table 1.

Of the 30 patients, 25 were male (83.3%), seven (23.4%) were undernourished and 14 (46.6%), obese; regarding their socioeconomic classification, two patients belonged to B1 class (6.7%), four to the B2 class (13.3%), 16 to class C (53.3%) and eight, to class D (26.7%). None of the patients belonged to class A. Seven patients (23.3%) were illiterate and, in this case, the questionnaires were read aloud by the experimenter, rigorously following the author's instructions. There were no significant alterations of pulmonary function and SpO_2 in the evaluation days (Table 2). Regarding the stage of the disease, four (13.3%) were in stage I, 11 (36.7%) in stage IIa, 10 (33.3%) in stage IIb and five (16.7%) in stage III, according to GOLD classification⁽¹⁾. Five patients (16.7%) were hypoxemic ($SpO_2 \leq 88\%$) and used continuous home oxygen therapy.

Intra-class correlation coefficient for analysis of intra-observer variability (total score with 15 days of interval) showed an $\alpha = 0.90$. Inter-observed analysis of variability evaluated in the same day revealed an $\alpha = 0.93$ and in different days the $\alpha = 0.92$; all of these correlations were considered excellent⁽²⁶⁾.

AQ20 score is obtained according to the type of answer chosen by the patient. The options allowed by the questionnaire are "Yes", "No", "Does not apply". For the study of intra-observer concordance (in different days) the Kappa was calculated individually for each question, and the values are listed in Table 3; for the intra-observed concordance (same day), data are shown in Table 4 (the answers "No" and "Does not apply" were considered as distinct, despite representing same score).

Other correlations were evaluated with measurements performed in the clinical practice, such as FEV_1 (%), FEV_1/FVC , SpO_2 , BMI, education and SEC (Table 5).

Spearman correlation analyses of AQ20 and symptom, activities and impact domains of the SGRQ are presented in Table 6. The correlation between total score of the SGRQ and AQ20 was considered good ($r = 0.76$) as shown in Figure 1. Since AQ20 is not divided in domains, the result of its correlation with total score of SGRQ can be emphasized. For analysis of individual variability to compare the results of AQ20 x SGRQ (total %), the Bland and Altman graphic arrangement was performed as shown in Figure 2.

Patients were distributed as severe ($FVE_1 < 40\%$) and not severe ($FVE_1 > 40\%$)⁽²⁷⁾, hypoxemic ($SpO_2 \leq 88\%$) and not hypoxemic, in order to study the changes of correlations of AQ20 and SGRQ. The data are presented in Table 7.

Figure 1 – Spearman correlation between total scores (%) of the AQ20 and SGRQ

Figure 2 – Graphic arrangement (Bland and Altman) of the differences between AQ20 (%) – SGRQ (total %) versus the average scores.

DOUBTS

All 30 patients answered to some standard questions on possible doubts about the AQ20 at the time of the second consultation. Twenty five patients (83.3%) considered the questionnaire of good size and 28 (93.3%), easy to answer. Twenty six patients (87.7%) did not have any doubt to answer the AQ20. The four questions that raised doubts were: 1) question 5: patient 5 wanted to have another alternative to answer, besides yes or no; 2) question 8: patient 7 initially did not understand the question statement; 3) question 18: patient 17 felt weak because of a diet; 4) question 6: patient 3 did not know his spouse's opinion.

TABLE 1
BMI, FEV₁, FEV₁/FVC (absolute) and SpO₂
values of 30 patients who answered to the
Airway Questionnaire 20 (AQ20) twice

	Mean	Median	Standard deviation
Age (years)	8.6	68.5	8.5
BMI	25.7	26.3	4.7
FEV ₁ (L)	1.26	1.10	0.50
FEV ₁ (5)	56.8	50.2	23.3
FEV ₁ /FVC	47.1	46.1	11.0
SpO ₂ (%)	92.3	93.0	3.5

TABLE 2
FEV₁, FEV₁/FVC and SpO₂ values of 30 patients
who answered to the AQ20 twice within 15 days interval

	Mean		Median		Standard deviation		p
	1 st day	2 nd day	1 st day	2 nd day	1 st day	2 nd day	
FEV ₁ (L)	1.26	1.25	1.10	1.07	0.50	0.48	0.91
FEV ₁ (%)	56.8	56.8	50.2	49.7	23.3	22.3	0.97
FEV ₁ /FVC	47.1	47.3	46.1	47.8	11.0	11.1	0.68
SpO ₂	92.3	92.1	93.0	93.0	3.5	3.0	0.51

TABLE 3
Kappa and p values calculated for each answer of the 1st
AQ20 questions compared with those of the 3rd AQ20

	Kappa value	P
Question 1	0.201	0.27
Question 2	0.336	0.06
Question 3	0.645	< 0.01
Question 4	0.248	0.06
Question 5	0.597	< 0.01
Question 6	0.501	< 0.01
Question 7	0.493	< 0.01
Question 8	0.132	0.21
Question 9	0.524	< 0.01
Question 10	0.667	< 0.01
Question 11	0.361	< 0.01
Question 12	0.429	0.02
Question 13	0.659	< 0.01
Question 14	0.243	0.04
Question 15	0.400	< 0.01
Question 16	0.286	0.10
Question 17	0.526	< 0.01
Question 18	0.560	< 0.01
Question 19	0.147	0.20
Question 20	0.795	< 0.01

TABLE 4
Kappa and p values calculated for each answer of questions from the 1st
AQ20 versus the 2nd AQ20 (inter-observer concordance in the same day)

	Kappa value	P
Question 1	0.661	< 0.01
Question 2	0.537	< 0.01
Question 3	0.600	< 0.01
Question 4	0.664	< 0.01
Question 5	0.578	< 0.01
Question 6	0.524	< 0.01
Question 7	0.783	< 0.01
Question 8	0.460	< 0.01
Question 9	0.444	< 0.01
Question 10	0.426	< 0.01
Question 11	0.522	< 0.01
Question 12	0.700	< 0.01
Question 13	0.731	< 0.01
Question 14	0.474	< 0.01
Question 15	0.308	< 0.01
Question 16	0.730	< 0.01
Question 17	0.591	< 0.01
Question 18	0.530	< 0.01
Question 19	0.446	< 0.01
Question 20	0.507	< 0.01

TABLE 5
Non-parametric correlation (Spearman) between total score
and percentage of AQ20 (AQ20 and AQ20%, respectively) and FEV₁
(absolute and percentage values), FEV₁/FVC, SpO₂ (%)
socioeconomic class (SEC), education and BMI

	1st AQ20	1st AQ20%
1st FEV₁ (%)		
Correlation coefficient	-0.216	-0.216
p	0.251	0.251
1st FEV₁/FVC		
Correlation coefficient	-0.108	-0.108
p	0.569	0.569
1st SpO₂ (%)		
Correlation coefficient	-0.069	-0.069
p	0.717	0.717
SEC		
Correlation coefficient	-0.099	-0.099
p	0.602	0.602
Education		
Correlation coefficient	0.038	0.038
p	0.841	0.841
BMI (kg/m²)		
Correlation coefficient	-0.159	-0.159
p	0.401	0.401

TABLE 6
Non-parametric correlation (Spearman) between AQ20
and the results of the three domains of the SGRQ
(symptoms, activities and impact) on the first application

1 st SGRQ%	1 st AQ20%
Symptoms	
Correlation coefficient	0.40
p	0.03
Activities	
Correlation coefficient	0.67
p	< 0.001
Impact	
Correlation coefficient	0.71
p	< 0.001
Total	
Correlation coefficient	0.76
p	< 0.001

TABLE 7
Non-parametric correlation (Spearman) between AQ20(%)
and the SGRQ results (total %) of the non-severe
(FEV₁ ≥ 40), severe (FEV₁ < 40), non-hypoxemic
(SpO₂ ≥ 88%) and hypoxemic (SpO₂ < 88%) patients

1 st SGRQ%	1 st AQ20%
Non severe	
Coefficient correlation	0.72
p	< 0.01
Severe	
Coefficient correlation	0.93
p	< 0.01
Non-hypoxemic	
Coefficient correlation	0.77
p	< 0.01
Hypoxemic	
Coefficient correlation	0.77
p	< 0.001

DISCUSSION

AQ20 is a questionnaire of HS specific for obstructive respiratory diseases, with only three reports of its use in the literature until then⁽¹⁵⁻¹⁷⁾. Its great advantage is the shorter time of application with maintenance of measurement's properties. In order for a new test or instrument to be considered appropriate for the scientific community, the items are usually evaluated are reproducibility and its correlation with measurements traditionally used⁽²⁸⁾. During the study of reproducibility intra- and inter-observed, the intra-class correlation (Cronbach) was calculated and an excellent concordance was observed when the application was made by the same person or by different experimenters. The minimum acceptable value to demonstrate reproducibility of a new instrument is an intra-class correlation coefficient equal or higher than 0.70 for a new questionnaire and higher than 0.80 for an old questionnaire⁽²⁹⁾. In the present study the coefficients found were equal or higher than 0.90. In the individual analysis of the answers obtained by the same experimenter on different days, a statistically significant concordance was observed in 14 of 20 questions of the AQ20 (Kappa confidence correlation). For different experimenters and questionnaire application on the same day, a significant concordance was found for all AQ20 questions. The difference between intra- and inter-observer did not influence the total score of the questionnaire, according

to the results of the correlation coefficients described for both situations. This variation could be accounted for by application on different days, when factors such as anxiety and depression could influence HS⁽³⁰⁾. Nonetheless, the hypothesis of an important individual variability of questionnaires and scales in general⁽³¹⁾ can not be excluded.

Comparisons with total score and domains of the SGRQ, a questionnaire widely used in the literature^(4,32-34) and validated in Brazil, was used to test the validation of AQ20, and a correlation coefficient (r) of 0.76 ($p < 0.01$) for total score was found. These results are in accordance with two reports in the literature ($r = 0.80$ and $r = 0.86$)^(16,17). In the comparative analysis between these two questionnaires, according to the graphic arrangement of Bland and Altman, a tendency of underestimation of the measurements of health status by the AQ20 was obtained, when compared to the SGRQ. This characteristic may be related to the small number of questions of AQ20. After a sample distribution according to the level of airflow limitation, excellent correlation was found for severe patients ($r = 0.93$) and moderate correlation ($r = 0.72$) for non-severe patients. The difference of correlation between both group observed in this study may reflect a loss of sensibility of the AQ20 for measurement of health status in non-severe patients⁽¹⁷⁾, although the present study was not designed to assess this aspect. In regard to the level of SpO₂ at rest, the correlation of AQ20 x SGRQ for hypoxemic and non-hypoxemic were similar ($r = 0.78$ for hypoxemic and $r = 0.77$ for non-hypoxemic), therefore AQ20 demonstrated a good correlation with a traditional measurement of health status.

The main factors that influenced COPD patient's health status are dyspnea and psychological status, whereas the physiological parameters such as exercise capacity and FEV₁ usually do not contribute so much to justify the alterations of this measurement⁽³⁰⁾. To define the characteristics of a new instrument, however, it is necessary to know the correlations with routine measurements of clinical assessment. Therefore, correlations between AQ20 and FEV₁, FEV₁/FVC, SpO₂, BMI and SEC were made. None of these variables showed a significant correlation with AQ20 score when analyzed for the sample as a whole. Up to the present date, the only study in the literature which evaluated the correlation between AQ20 and physiological parameters in COPD patients did not demonstrate a significant correlation with FEV₁, and with hyperinflation (ratio residual volume/total pulmonary capacity, measured with pletismography)⁽¹⁷⁾. For asthma patients there is a significant correlation with AQ20 for values in the peak of expiratory flow ($r = 0.30$ when measured in the morning and $r = 0.29$, at night), but no statistical difference was found for FEV₁⁽¹⁶⁾.

One of the advantages of AQ20 mentioned in the literature is the time spent to apply it and, in the present study, the average was approximately four minutes, which is an advantage over CRQ and SGRQ.

In summary, we can conclude that AQ20 is a reproducible questionnaire, of fast application, with a good correlation with SGRQ, and which can be used to evaluate the health status of patients with obstructive disease in Brazil, especially in situations when time available for analysis of quality of life is short. As a basis for future studies, this group suggests a research for normal values of AQ20, as well as the definition of clinically relevant minimum differences, aspects that are extremely important to support its routine use.

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