



Validation of the St George's respiratory questionnaire and risks factors affecting the quality of life of Lebanese COPD and asthma patients

Zeina Akiki, Souheil Hallit, Nelly Layoun, Michelle Cherfane, Hala Sacre, Mirna Waked & Pascale Salameh

To cite this article: Zeina Akiki, Souheil Hallit, Nelly Layoun, Michelle Cherfane, Hala Sacre, Mirna Waked & Pascale Salameh (2018): Validation of the St George's respiratory questionnaire and risks factors affecting the quality of life of Lebanese COPD and asthma patients, Journal of Asthma, DOI: [10.1080/02770903.2018.1531996](https://doi.org/10.1080/02770903.2018.1531996)

To link to this article: <https://doi.org/10.1080/02770903.2018.1531996>



Published online: 25 Oct 2018.



Submit your article to this journal [↗](#)



Article views: 28



View Crossmark data [↗](#)



Validation of the St George's respiratory questionnaire and risks factors affecting the quality of life of Lebanese COPD and asthma patients

Zeina Akiki, MSc, PhD^{a,b,c}, Souheil Hallit, Pharm.D., MSc, MPH, PhD^{a,d} , Nelly Layoun, Pharm.D., MPH, PhD^e, Michelle Cherfane, Pharm.D., MPH^f, Hala Sacre, Pharm.D.^{a,g}, Mirna Waked, MD^h, and Pascale Salameh, Pharm.D., MPH, PhD^{a,e,i} 

^aEpidemiologie Clinique et Toxicologie, INSPECT-LB: Institut National de Sante Publique, Epidemiologie Clinique et Toxicologie, Beirut, Lebanon; ^bFaculty of Nursing and Health Sciences, Notre Dame Louaize University, Barsa, Lebanon; ^cFaculty of Public Health, Sainte Famille University, Batroun, Lebanon; ^dFaculty of Medicine and Medical Sciences, Holy Spirit University of Kaslik (USEK), Jounieh, Lebanon; ^eFaculty of Pharmacy, Lebanese University, Beirut, Lebanon; ^fSchool of Pharmacy, Lebanese International University, Beirut, Lebanon; ^gDrug Information Center, Order of Pharmacists in Lebanon, Beirut, Lebanon; ^hFaculty of Medicine, Balamand University, Balamand, Lebanon; ⁱFaculty of Medicine, Lebanese University, Beirut, Lebanon

ABSTRACT

Objective: We aimed to validate the Arabic version of the St George's Respiratory Questionnaire (SGRQ) for use in Lebanese Chronic obstructive pulmonary disease (COPD) and asthma patients and to identify risk factors that might affect the quality of life in these patients. **Methods:** COPD ($n = 90$) and asthma patients ($n = 124$) were recruited from the out-patient clinics of the Pulmonology department of a university hospital and a medical center in Beirut. They filled out a standardized questionnaire. The total SGRQ score and the component scores (symptoms, activity and impacts) were calculated. To confirm the SGRQ validity in the Lebanese population, factor analyses were applied for the whole sample, only asthma and only COPD patients, respectively. The associations between the total SGRQ score and FEV₁% predicted, CCQ score and MRC scale were assessed. Multiple linear regression models were used to evaluate the association between the total SGRQ scores and the socio-demographics and the diseases risk factors. **Results:** COPD patients had a higher SGRQ total and subscales scores compared to asthma patients. A high Cronbach's alpha was found for the whole sample (0.802), only COPD patients (0.833) and only asthma patients (0.734). A significant negative correlation was found between FEV₁% predicted and the total SGRQ scores. Occupational exposure, BMI and previous waterpipe smoking were among the factors that significantly and positively influenced a higher SGRQ score. **Conclusions:** The Lebanese version of the SGRQ emerges as a good health-related quality of life evaluative instrument that is reasonable to be used in COPD and asthma patients in Lebanon.

ARTICLE HISTORY

Received 24 April 2018
Revised 23 September 2018
Accepted 30 September 2018

KEYWORDS

COPD; asthma; SGRQ;
validation; Arabic version

Introduction

Chronic obstructive pulmonary disease (COPD) and asthma are the most common chronic respiratory diseases [1]. In addition to the severe airflow limitation, mainly due to the chronic inflammation in the lungs [1], patients often experience respiratory symptoms (chronic cough, bronchial secretions and shortness of breath) [2] in both types of diseases. Many risk factors were documented as correlates to respiratory diseases; these include family history of COPD [3], family history of asthma and atopy, low lung function [4], airway responsiveness [3,4], maternal smoking [4], lower respiratory tract infections [3], indoor [5] and outdoor air pollution [6], occupational exposures [5] and cigarette smoking [3]. These risk factors should be

avoided once the disease is diagnosed to obtain optimal treatment effects on clinical and other aspects.

A categorization of the severity of the disease is essential for initial evaluation, proper treatment and regular follow-up of these patients, which can be performed using simple clinical and physiological tools [1]. The measurement of the patient's health-related quality of life (HRQOL) is essential in patients with respiratory problems since they will undergo a progressive decrease in their lung function due to the diseases' symptoms (shortness of breath, wheezing, cough, etc.), which will consequently reduce their HRQOL [7]. Many generic scales have been used to assess HRQOL in both COPD [8–12] and asthma [13,14], however, the use of a disease-specific scale might be more responsive to the disease state.

CONTACT Zeina Akiki, MSc, PhD  zeinaakiki@hotmail.com  Lebanese University, Beirut, Lebanon; Souheil Hallit  souheilhallit@hotmail.com
 Street 8, Building 560, 1st floor, Biakout, Mount Lebanon, Lebanon.

© 2018 Taylor & Francis Group, LLC

Disease-specific measures of HRQOL have the advantage of frequently being more responsive and clinically useful than generic HRQOL measures, which do not focus on any specific condition [15]. Disease-specific instruments aim to collect information on symptoms or disease-specific health problems from more specific populations with a given disease or symptom (e.g. pain or aspects of treatment) [16], while generic measures have the advantage of enabling comparisons of QOL burden and treatment benefit across diseases [17]. Therefore, an important additional measurement in evaluating the disease severity in respiratory patients is to assess the patient's health status, along with his lung function.

The updated Global Initiative for Chronic Obstructive Lung Disease (GOLD) strategy also added the St George's Respiratory Questionnaire (SGRQ) as another method for grading symptoms [1]. The SGRQ is a self-administered questionnaire that was developed to measure health status in patients with diseases of chronic airflow limitation [18] and has been validated in COPD [19] and asthma [19] clinical studies. Using one scale for these two diseases makes it easier for physicians to apply health outcome measurements.

Despite the widespread use of HRQOL scales in respiratory patients in Western countries, the use of such scales in Lebanon remains scarce and insufficient. Translating a certain scale to a different language is unlikely to give an equivalent measure because of the influence of language and culture in health-related issues [20]. In fact, the Arabic version of the SGRQ was validated among Tunisian [21] and Moroccan COPD or asthmatic patients [19], but the language may differ between their culture and the Lebanese one. Some of the questions were modified in order to adapt them to the Moroccan and Tunisian cultures, respectively, especially the terms related to physical activities. Thus, a correct adaptation requires the technical and conceptual aspects involved in measuring health status [22]. In view of the lack of reliable, HRQOL instruments for respiratory adult patients in Lebanon, this study aims at linguistically validating the Arabic version of the SGRQ for use in Lebanese patients with asthma and COPD, and checking its reliability. Secondary objectives aimed at identifying risk factors that might affect the QOL in these patients.

Methods

Study design and participants

All COPD ($n=90$) and asthma patients ($n=124$) consulting at the outpatients' clinics of the

Pulmonology department of a university hospital and medical center in Beirut, Lebanon between June 2011 and April 2013 were recruited. COPD diagnosis was defined according to GOLD guidelines as having a post-bronchodilator ratio of the forced expiratory volume at one second (FEV_1)/forced vital capacity (FVC) being less than 70% [23]. Patients with asthma were defined according to GINA guidelines [24]. A clinical diagnosis based on symptoms (breathlessness, wheezing, cough and chest tightness), family history of asthma, worsening symptoms when exposed to various risk factors was performed and lung function measurements were assessed. Having another respiratory disease or having both COPD and asthma was the exclusion criterion for this study.

Ethical aspect

The Lebanese University Institutional Review Board waived approval of the study since it is an observational noninvasive study that respects participants' autonomy and anonymity. A written informed consent was signed by all participants.

Questionnaire

A standardized questionnaire, adapted to the local Arabic language, was filled out by all participants with the help of trained interviewers. It included information on the socio-demographic characteristics, exposure to the diseases risk factors, the Medical Research Council "MRC" breathlessness scale [25], the Clinical COPD Questionnaire score (CCQ) [26], the SGRQ [27] and smoking history.

The SGRQ was translated as follows. First, two of the researchers, both bilingual, forward-translated the questions into Arabic, with instructions to translate conceptually rather than literally and to use familiar and easy language to target the broadest possible audience. Second, discrepancies were resolved by consensus between those researchers and two others, i.e. the original translators and health experts, as well as experts with experience in instrument development and translation. Third, an independent translator with no knowledge of the questionnaire back-translated the questions into English. Translation discrepancies were resolved by consensus between the researchers and the translator.

The SGRQ [28] contains 17 questions; Part 1 (Questions 1–7) addresses the frequency of respiratory symptoms. It is not designed to be a precise epidemiological tool, but to assess the patient's

perception of their recent respiratory problems. Part 2 (Questions 8–14) addresses the patient's current state (i.e. how they are these days). The Activity score measures disturbances during daily physical activity. The Impacts score covers a range of disturbances of the psycho-social function [28]. Scores were calculated for a total score of respiratory health status and three domains: Symptoms (frequency and severity of respiratory symptoms), Activity (activities that cause or are limited by breathlessness) and Impacts (social functioning and psychological disturbances due to airway disease). Validation studies of the original SGRQ showed that this component relates in part to respiratory symptoms, but also correlates quite strongly with exercise performance (6-min walking test), breathlessness in daily life (MRC breathlessness score) and disturbances of mood (anxiety and depression). The Impacts score is, therefore, the broadest component of the questionnaires, covering the whole range of disturbances that respiratory patients experience in their lives [28]. Total and domain scores were calculated with all items weighted and were expressed as a percentage; 100 represents worst possible health status and 0 best possible health status.

Sample size calculation

Comrey and Lee suggested that a minimum of 10 observations per variable is necessary in order to avoid computational difficulties [29]. Since the SGRQ questionnaire contains 17 questions, a minimal sample of 170 patients is needed to conduct an exploratory factor analysis.

Statistical analyses

The total SGRQ score as well as the three component scores (symptoms, activity and impacts) were calculated for 1) all asthma and COPD patients, 2) only asthma patients and 3) only COPD patients. Descriptive statistics were performed to represent the participants' characteristics, the CCQ score, MRC scale and the total and the component scores of the SGRQ and expressed as percentages, mean $\pm$ SD, or median (Q1; Q3) when applicable.

To confirm the SGRQ construct validity in the Lebanese population, three factor analyses using the principal component analysis technique were applied for the whole sample, since the SGRQ is used for both asthma and COPD patients; and for each of these two subgroups separately, in order to compare to previous literature for each disease. We included

in the factor analyses all the items part of the SGRQ. Varimax rotations were applied. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were ensured to be adequate. The retained number of factors corresponded to Eigen values higher than one. Some items loaded on more than one factor. We considered only the highest loading. We conducted an exploratory factor analysis since we did not have any expectations with regard to the number of factor solution in the factor analysis and to the variance explained by the SGRQ. We conducted the factor analysis to compare the results we obtain to those obtained in other languages. In addition, Cronbach's alpha was recoded for reliability analysis for the total score and the subscale factors. A Cronbach alpha value of 0.7 or more is considered acceptable [30].

Moreover, the associations between the total SGRQ score (for all patients, for only asthma, and only COPD patients, respectively) and FEV₁% predicted, CCQ score and MRC scale were assessed when applicable using the Spearman correlation coefficient.

Three multiple linear regression models were used to evaluate the association between the total SGRQ score and the potential confounders. In the first regression, the total SGRQ score calculated for all asthma and COPD patients was the dependent variable, while in the second and the third regressions, the total SGRQ score calculated for asthma and COPD patients, respectively, were the dependent variables. The socio-demographic characteristics and the diseases risk factors having a *p* values of less than 0.2 in the bivariate analysis (such as age, gender, BMI, smoking, educational level, marital status, indoor and outdoor pollution, severe childhood lung and respiratory infections, exposure to allergens and occupational exposures) were included as covariates.

An alpha of 0.05 was used to determine statistical significance. All analyses were performed using the IBM's Statistical Package for the Social Sciences (SPSS) version 22.0 (IBM Inc., Chicago, IL).

Results

Participants' characteristics

The characteristics of the whole sample (*N* = 214), patients with asthma (*N* = 124) and COPD (*N* = 90) in terms of sociodemographic characteristics and the SGRQ scale and subscales description, are summarized in Table 1. The mean age for asthma and COPD

Table 1. Sociodemographic and other characteristics of the participants.

		Asthma + COPD <i>N</i> = 214	Asthma <i>N</i> = 124	COPD <i>N</i> = 90
Age, years	Mean $\pm$ SD	52.9 $\pm$ 17.7	47.9 $\pm$ 17.2	59.7 $\pm$ 16.2
Sex	Female %	120 (56.9%)	82 (67.8%)	38 (42.2%)
BMI, Kg/m ²	<18.5	5 (2.40)	4 (3.30)	1 (1.10)
	(18.5–25)	74 (34.9)	42 (34.1)	32 (36.0)
	(25–30)	77 (36.3)	44 (35.8)	33 (37.1)
	≥ 30	56 (26.4)	33 (26.8)	23 (25.8)
Marital status	Married %	131 (65.5)	70 (60.9)	61 (71.8)
Educational level	University vs. High school or less	55 (26.2)	43 (35.0)	12 (13.8)
Smoking status	Non-smokers	86 (40.2)	64 (51.6)	22 (24.4)
	Current smokers	81 (37.9)	38 (30.6)	43 (47.8)
	Ex-smokers	47 (22.0)	22 (17.7)	25 (27.8)
FEV ₁ % predicted	Mean $\pm$ SD	77.9 $\pm$ 20.6	85.1 $\pm$ 14.7	67.9 $\pm$ 23.4
CCQ score	Median (Q1; Q3)	–	–	28.0 (16.0; 44.5)
MRC scale	Median (Q1; Q3)	3.00 (3.00; 5.00)	3.00 (3.00; 4.00)	4.00 (3.00; 6.00)
Total SGRQ score ^a	Median (Q1; Q3)	26.2 (11.7; 44.8)	19.6 (9.80; 34.1)	38.6 (18.4; 55.4)
	Min–max	1.1–90.8	1.1–76.7	1.1–90.8
Symptoms score ^a	Median (Q1; Q3)	45.5 (27.2; 61.4)	38.7 (21.2; 55.6)	52.9 (35.7; 68.7)
	Min–max	6.3–100	6.3–97.5	6.3–100
Activity score ^a	Median (Q1; Q3)	30.0 (0; 63.4)	14.8 (0; 54.0)	53.9 (18.1; 75.1)
	Min–max	0–100	0–100	0–100
Impacts score ^a	Median (Q1; Q3)	15.5 (6.51; 31.9)	12.2 (4.00; 24.5)	24.5 (7.67; 41.7)
	Min–max	0–87.9	0–69.5	0–87.9

BMI: body mass index; CCQ: clinical COPD questionnaire score; MRC: medical research council; SGRQ: St George's respiratory questionnaire; COPD: chronic obstructive pulmonary disease.

^aFor all asthma and COPD patients.

patients was 47.9 ± 17.2 and 59.7 ± 16.2 years, respectively. Female participants represented 68% of asthma patients and 42% of COPD patients. Mostly the participants had a normal BMI or were overweight and had a high school educational level. Around half of asthma patients were nonsmokers and half of COPD patients were current smokers. It is of note that patients with COPD had a higher MRC score, SGRQ score and subscales scores compared to asthma patients. Overall, 46 (21.5%) participants reported other chronic diseases such as heart diseases, kidney diseases, diabetes, hypertension, hypercholesterolemia or hypertriglyceridemia. Concerning medications, 44.9% of the patients were taking Beta 2 agonists, 10.3% antimuscarinics, 10.7% leukotriene inhibitors, 4.7% antihistamines and 1.9% oral corticosteroids.

SGRQ reliability checking

The factor analysis was run on all asthma and COPD patients ($n = 214$). All variables were extracted from the list. The SGRQ items converged over a solution of five factors that had an Eigen value over 1. A KMO measure of sampling adequacy of 0.81 was found, with a significant Bartlett's test of sphericity ($p < 0.001$). These factors were able to explain 66.2% of the total variance. Moreover, high Cronbach's alpha was found for the whole scale (0.802) (Table 2).

A second principal component analysis, taking asthma patients only ($N = 114$), showed that the SGRQ items converged over a solution of six factors

(KMO = 0.73; Bartlett's test < 0.001), explaining 70.6% of the total variance. Factor 1 addresses activities and impacts on daily life, Factors 2, 3, 4 and 6 include questions about the description of the symptoms, whereas Factor 5 includes questions about the impacts on daily life. The items had good reliability and consistency, with a Cronbach alpha of 0.734 (Table 3).

When taking COPD patients alone ($N = 90$), the SGRQ items converged over a solution of five factors (KMO = 0.78; Bartlett's test < 0.001), explaining 71.22% of the total variance. The internal consistency was also high (Cronbach alpha = 0.833) (Table 4).

Relationships between total SGRQ score and FEV₁% predicted, MRC scale and CCQ score

The associations between total SGRQ score and FEV₁% predicted, MRC scale, CCQ score are summarized in Table 5. A significant negative correlation was found between FEV₁% predicted and the total SGRQ scores (for asthma and COPD patients, only asthma, only COPD, respectively), whereas a significant but positive correlation was found between the total SGRQ score and the MRC scale.

A first linear regression, taking the continuous total SGRQ score calculated for asthma and COPD patients as the dependent variable, and taking the sociodemographic characteristics and risk factors as independent variables, showed that age (Beta[95% CI] = 0.40 [0.19; 0.61]) and being a previous waterpipe smoker (15.6 [1.44; 29.8]) would significantly increase the total SGRQ score, whereas having a university level of

Table 2. Factor analysis of the SGRQ in asthma and COPD patients ($N = 214$).

	Question number	Loading factor
Factor 1 (21.97% of the variance)		
Activities affected by your breathing	15	0.868
Activities that usually make you feel breathlessness	11	0.851
How your chest trouble usually affects your daily life	16	0.801
Statement to describe how your chest affects you	17	0.772
Other effects your chest trouble may have on you	13	0.623
More questions about your cough and breathlessness	12	0.498
Have had shortness of breath the last month	3	0.475
Factor 2 (16.20% of the variance)		
Number of good days with little chest trouble	7	0.856
Duration for the worst attack of chest trouble	6	0.850
During the last month, number of severe attacks of chest troubles	5	0.834
How would you describe your chest condition	9	0.625
Factor 3 (10.01% of the variance)		
Over the last month, you have coughed	1	0.812
Over the last month, you have brought up phlegm	2	0.793
Factor 4 (9.49% of the variance)		
Over the last month, you have had attacks of wheezing	4	0.816
If you have a wheeze, is it worse in the morning	8	0.786
Factor 5 (8.55% of the variance)		
Questions about your medications	14	0.746
If you have ever had paid employment	10	0.538

Kaiser-Meyer-Olkin Measure = 0.81; Bartlett's test <0.001; 66.2% total variance explained.

SGRQ: St George's respiratory questionnaire; COPD: chronic obstructive pulmonary disease.

Cronbach's alpha for the full scale = 0.802; factor 1 = 0.820; factor 2 = 0.838; factor 3 = 0.648; factor 4 = 0.368; factor 5 = 0.109.

Some items loaded on more than one factor. We considered the highest loading (presented in the table). Following is the detailed loadings.

Item 3: loaded as well on factors 3 and 4 (loadings 0.464 and 0.373 respectively); Item 9 on factors 1 and 5 (0.316 and 0.383, respectively); Item 12 on factors 3 and 5 (0.304 and 0.340, respectively); and item 13 on factor 5 (0.516).

Table 3. Factor analysis of the SGRQ in asthma patients only ($N = 124$).

	Question number	Loading factor
Factor 1 (19.32% of the variance)		
Activities affected by your breathing	15	0.856
Activities that usually make you feel breathlessness	11	0.834
How your chest trouble usually affects your daily life	16	0.822
Statement to describe how your chest affects you	17	0.678
Have had shortness of breath the last month	3	0.613
Factor 2 (16.29% of the variance)		
During the last month, number of severe attacks of chest troubles	5	0.863
Number of good days with little chest trouble	7	0.816
Duration for the worst attack of chest trouble	6	0.809
How would you describe your chest condition	9	0.598
Factor 3 (9.45% of the variance)		
If you have a wheeze, is it worse in the morning	8	0.868
Over the last month, you have had attacks of wheezing	4	0.810
Factor 4 (9.20% of the variance)		
More questions about your cough and breathlessness	12	0.749
Other effects your chest trouble may have on you	13	0.597
Factor 5 (8.27% of the variance)		
Questions about your medications	14	0.756
If you have ever had paid employment	10	0.748
Factor 6 (8.04% of the variance)		
Over the last month, you have brought up phlegm	2	0.844
Over the last month, you have coughed	1	0.747

Kaiser-Meyer-Olkin Measure = 0.73; Bartlett's test <0.001; 70.6% total variance explained.

SGRQ: St George's Respiratory Questionnaire.

Cronbach's alpha for the full scale = 0.734; factor 1 = 0.766; factor 2 = 0.807; factor 3 = 0.371; factor 4 = 0.543; factor 5 = 0.201; factor 6 = 0.520.

Some items loaded on more than one factor. We considered the highest loading (presented in the table). Following is the detailed loadings.

Item 1: loaded as well on factor 4 (loading 0.323); Item 9 on factor 4 (0.384); Item 13 on factors 1 and 5 (0.369 and 0.352 respectively); Item 14 on factor 4 (0.342); and item 17 on factor 2 (0.372).

education (−8.58 [−15.6; −1.58]) and heating the house with diesel (−7.56 [−14.2; −0.96]) would significantly decrease the total SRGQ score (Table 6a).

When considering asthma patients alone, results showed that being a female (9.15 [2.81; 15.5]) and the BMI (0.69 [0.14; 1.25]) would significantly increase

Table 4. Factor analysis of the SGRQ in COPD patients ($N = 90$).

	Question number	Loading factor
Factor 1 (21.99% of the variance)		
Activities that usually make you feel breathlessness	11	0.833
Activities affected by your breathing	15	0.822
Statement to describe how your chest affects you	17	0.775
How your chest trouble usually affects your daily life	16	0.740
Other effects your chest trouble may have on you	13	0.724
More questions about your cough and breathlessness	12	0.589
Factor 2 (19.60% of the variance)		
Number of good days with little chest trouble	7	0.889
Duration for the worst attack of chest trouble	6	0.846
During the last month, number of severe attacks of chest troubles	5	0.821
How would you describe your chest condition	9	0.734
Questions about your medications	14	0.516
Factor 3 (13.31% of the variance)		
Over the last month, you have coughed	1	0.893
Over the last month, you have brought up phlegm	2	0.780
Have had shortness of breath the last month	3	0.626
Factor 4 (9.57% of the variance)		
Over the last month, you have had attacks of wheezing	4	0.824
If you have a wheeze, is it worse in the morning	8	0.792
Factor 5 (6.74% of the variance)		
If you have ever had paid employment	10	0.755

Kaiser-Meyer-Olkin Measure = 0.78; Bartlett's Test < 0.001; 71.22% total variance explained.

SGRQ: St George's respiratory questionnaire; COPD: chronic obstructive pulmonary disease.

Cronbach's alpha for the full scale = 0.833; factor 1 = 0.834; factor 2 = 0.841; factor 3 = 0.736; factor 4 = 0.335.

Some items loaded on more than one factor. We considered the highest loading (presented in the table).

Following is the detailed loadings.

Item 3: loaded as well on factors 1 and 4 (loadings 0.356 and 0.414, respectively); Item 9 on factor 1 (0.403); Item 12 on factor 3 (0.476); and item 13 on factor 2 (0.3).

the total SGRQ score, whereas a university level of education ($-8.20 [-14.7; -1.67]$) would significantly decrease the total SGRQ score (Table 6b).

When taking only COPD patients, results showed that that age ($0.56 [0.28; 0.83]$), BMI ($1.07 [0.22; 1.91]$) and living/working in an area full of cars and trucks ($26.5 [4.21; 48.8]$) would significantly increase the total SGRQ score (Table 6c).

Discussion

Ever since the original version of the SGRQ was developed [27], the questionnaire has been translated into many languages and validated for use in different populations. Few validation studies exist in Arabic speaking countries (Tunisia and Morocco), with a dialect different than the Lebanese one. To decide on the quality of an instrument, one should check the purpose of the development of that instrument, its validity, the minimization of the method effects that might influence the response behavior of the participant, its reliability, minimizing the processing error and the economic efficiency and reasonableness of the instrument [31]. We aimed at validating the Arabic version of the SGRQ questionnaire, expecting that it will measure the same components as the original version (which it did) and have similar or even higher Cronbach alpha than other linguistically validated SGRQ versions.

In our study, we were able to test and validate the Lebanese version of the SGRQ in patients with COPD or asthma. The Cronbach's alpha coefficient for the total SGRQ score had high values exceeding 0.7 in the whole sample and the COPD or asthma groups. In addition, the SGRQ total score significantly correlated negatively with FEV₁% predicted in all patients and among those with COPD or asthma. These findings support the reliability and validity of the scale as a HRQOL instrument that can be used in Lebanese patients with either COPD or asthma. Moreover, occupational exposure, BMI and previous waterpipe smoking were among the factors that significantly and positively influenced a higher SGRQ score.

The average total SGRQ score in our study sample was much lower than the average score reported in most studies [19,21]. When comparing COPD patients only, the average total score was also lower and was of 38.6 compared to scores of 63, 59 and 50 in Tunisian, Spanish and Nepali COPD patients, respectively [21,32,33]. Differences in patients' characteristics may influence the observed disparity as well as the severity of airway disease; our study sample may have milder, less severe cases as participants were recruited from the outpatient clinics. Of note that patients with COPD had an average impact score of 24.5 which was much lower to an average of 52.9 and 53.9 for symptom and activity scores, respectively. Since the impact score is related to different aspects of social

Table 5. Associations between total score and FEV₁% predicted, MRC scale, CCQ score in the whole sample, COPD patients alone and asthma patients alone.

	Total SGRQ score Asthma and COPD	Total SGRQ score Asthma	Total SGRQ score COPD
FEV ₁ % predicted ^a	$\rho = -0.4$ $p < 0.001$	$\rho = -0.2$ $p = 0.05$	$\rho = -0.5$ $p < 0.001$
MRC scale	$\rho = 0.7$ $p < 0.001$	$\rho = 0.5$ $p < 0.001$	$\rho = 0.7$ $p < 0.001$
CCQ score	–	–	$\rho = 0.8$ $p < 0.001$

^aAfter administration of a bronchodilator.

FEV₁%, forced expiratory volume in 1 s; MRC: medical research council; CCQ: clinical COPD questionnaire score; COPD: chronic obstructive pulmonary disease; ρ : Spearman correlation coefficient.

Table 6. Multivariable analyses for the total SGRQ score: Associations between the total SGRQ and socio-demographics, and the diseases risk factors.

	Beta (95% CI)	p Value
6a. Total SGRQ score for asthma and COPD patients as DV ($n = 214$)		
Age	0.40 (0.19; 0.61)	<0.001
Education – University level	–8.58 (–15.6; –1.58)	0.02
Heat the house with diesel	–7.56 (–14.2; –0.96)	0.03
Previous waterpipe smoker	15.6 (1.44; 29.8)	0.03
6b. Total SGRQ score for asthma patients as DV ($n = 124$)		
Female	9.15 (2.81; 15.5)	0.005
Education – University level	–8.20 (–14.7; –1.67)	0.01
BMI	0.69 (0.14; 1.25)	0.02
6c. Total SGRQ score for COPD patients as DV ($n = 90$)		
Age	0.56 (0.28; 0.83)	<0.001
BMI	1.07 (0.22; 1.91)	0.01
Live/work area full of cars and trucks	26.5 (4.21; 48.8)	0.02

Covariates: Socio-demographic and risk factors for asthma and COPD (age, gender, BMI, smoking, educational level, marital status, indoor and outdoor pollution, severe childhood lung and respiratory infections, exposure to allergens and occupational exposures) having $p < 0.2$ in the bivariate analyses.

SGRQ: St George's respiratory questionnaire; COPD: chronic obstructive pulmonary disease; BMI: body mass index.

functioning and psychological disturbances, a lower score may indicate a better psycho-social functioning and a better overall health status. This may as well explain a lower average total SGRQ score. Moreover, we assessed the SGRQ for the past month instead of the past year and this is known to produce marginally lower total score [28].

In addition, patients with COPD had a higher mean total SGRQ score compared to asthma patients. Similarly, they had a higher mean score in the three subscores: symptoms, impact and activity. This suggests that patients with COPD have an overall lower quality of life than asthma patients and could be explained by the fact that COPD patients were older, and have greater perceived respiratory disability evident by a higher MRC scale. In fact, the SGRQ total score significantly correlated positively with MRC scale in asthma and in COPD patients, strongly implying that the more disabling the dyspnea is, the poorer the quality of life. Although most studies compared SGRQ to COPD assessment test (CAT) [34], one study also found a strong correlation between SGRQ and MRC scale reporting a Spearman correlation factor of 0.7 similarly to our finding [45].

Furthermore, existing data suggest that dyspnea is the strongest factor affecting high SGRQ score regardless of severity of airflow limitation [35].

We observed a high positive correlation between the SGRQ and CCQ in patients with COPD (Spearman correlation coefficient of 0.8; $p < 0.001$), which is commonly seen in other validation studies [34]. This result further supports the validity of the SGRQ as a quality of life instrument.

Factor analysis in the whole sample and in patients with asthma or COPD resulted in comparable results. It yielded five factors in the whole sample and in COPD and six factors in asthma; it also showed positive correlations with items of symptoms, activity and impact. Little differences in the factors among the groups were very difficult to interpret; however, the first factor included common items, mainly related to activity and impact among all the study participants and in separate asthma and COPD groups. These finding could suggest that in our study population, a broad range of disturbances including exercise performance mood and breathlessness may be the main contributory factors to the patient's quality of life rather than their perceived respiratory symptoms. Although little is published about the item generation of the SGRQ, our analysis is more suitable than data published by Eisner et al. whereby their factor analysis presumed an 18-factor model that could not be interpreted and lacked homogeneity with almost 50% of the SGRQ items had a loading factor of 0.4 when a three factor analysis was designed [46].

Our results consolidated previous results where SGRQ scale was correlated negatively with FEV₁% predicted [36]. Several studies have attempted to link health status to the severity of airflow limitation in patients with COPD [37] but the relationship is at best a loose one. In addition, some studies provided weak associations with the degree of airflow limitation, as measured by FEV₁ [38,39] when assessing health status by the SGRQ. On the other hand, the MRC scale is a highly valid instrument that several studies used in assessing the validity of SGRQ in chronic pulmonary illnesses such as COPD and bronchiectasis [40]. In our study, the total SGRQ scale

showed a good positive correlation with the MRC scale, in line with another study [41].

As for the socio-demographics and risk factors associated with the SGRQ, we found a positive correlation between the age and being female and the SGRQ; similarly, de Torre et al. demonstrated that women had worse scores in all domains of the SGRQ [42]; whereas, two studies suggested that baseline SGRQ was not significantly related to gender or age, [4] although these have been reported in some but not all smaller studies [42,43]. Furthermore, we did not find an association between gender and the health status among COPD patients. Ferrari et al. contradicted our results and showed an association between gender and SGRQ [44]. In addition, we found that there was no significant correlation between age and SGRQ among asthmatic patients; this later is attributable to the higher age of our participants; it is known that asthma has a greater impact on young patients (between 12 and 17 years of age) than on adults, which might be attributable to poor treatment adherence. The negative impact of asthma on such patients includes lower participation in sports, physical activity, social activities and daily activities, as well as school/work absenteeism. Indeed, it was previously reported that the level of education is negatively correlated with SGRQ score among chronic COPD patients [45]. Our results are inconsistent with the latter as we showed no statistically significant association among COPD alone. However, we found statistically significant negative association between the level of education and the total SQRQ among COPD and asthma patients together and asthma patients alone.

In 2010, the American Thoracic Society estimated that more than 20% of COPD cases are attributable to occupational exposure [46]. Our study also revealed that the total SGRQ score among COPD patients was more affected by the impact of living or working in an area full of cars and trucks. In fact, Paulin et al. highlighted this concept and showed that job exposures were associated with worse SGRQ scale and focus on the role of clinicians in obtaining occupational histories from patients with COPD because work-related exposures may influence disease burden [47]. General population-based studies found an increased risk of COPD in subjects exposed to vapors, dust or gas, fumes (VDGF) or working in agricultural, paper, cleaning, wood and food processing industries [48,49]. The effect of these factors on quality of life has been also shown in a study conducted by Blanc et al. [50]. Moreover, we noticed that the BMI would significantly increase the total SGRQ scale among

COPD alone and asthma patients alone but with a minor influence. Similarly, Tabberer et al. found that BMI influence on SGRQ score was small, implying that sociodemographic characteristics would have minor influence on the SGRQ score, thus, allowing a wider recruitment of patients [51].

Concerning the influence of smoking on the total SGRQ score for COPD and asthma patients, our study showed that being a previous waterpipe smoker would significantly increase the total SGRQ score. Several studies have found that smoking is related to poor HRQL [52,53]. It also has been demonstrated that HRQL is inversely related to the number of cigarettes that people smoke [52], and this relationship is even stronger among the more nicotine-dependent smokers [53]. Therefore, it is crucial to increase the awareness of people about the devastating effect of waterpipe tobacco smoking on their respiratory health system, especially among COPD and asthma patients.

Limitations

This study has several strengths. This is the first study in Lebanon conducted for validating and checking the reliability of the Arabic version of the SGRQ for use in Lebanese patients with asthma and COPD. Second, asthma and COPD patients were defined according to GINA and GOLD guidelines, respectively. Third, the questionnaire used is a valid tool, thereby reducing the possibility of misclassification of symptoms. However, symptoms were self-reported, which might include the possibility of information or recall bias. Nevertheless, as patients knew that this study outcome may be beneficial in their medical follow up, we assumed that the information bias is minimized. Patients were recruited from one hospital, thus a selection bias could not be excluded, however, this hospital is located in the capital and it recruits patients from all districts of Lebanon. Although we conducted a multivariable analysis to decrease confounding factors as much as possible, there might be some factors which we did not consider in the analysis, thus, might lead to residual confounding.

Conclusion

The results of our study showed that the Lebanese Arabic version of the SGRQ has a high degree of validity and reliability. There was a strong correlation between SGRQ and CCQ in patients with COPD and a good negative correlation between SGRQ score and lung function tests. However, further studies should

continue the validation process through other studies, which include a test-retest validity, convergent and discriminant validity, and sensitivity to change. Occupational exposure, BMI and previous waterpipe smoking were among the factors that significantly and positively influenced a higher SGRQ score. Our data suggest that the Lebanese version of the SGRQ emerges as a good health-related quality of life evaluative instrument that is reasonable to be used in patients with asthma and COPD in Lebanon.

Disclosure statement

The authors declare no conflicts of interest.

ORCID

Souheil Hallit  <http://orcid.org/0000-0001-6918-5689>
Pascale Salameh  <http://orcid.org/0000-0002-4780-0772>

References

1. GOLD. Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease. 2017. Available from: www.goldcopd.org.
2. Viegi G, Pistelli F, Sherrill DL, Maio S, Baldacci S, Carrozzi L. Definition, epidemiology and natural history of COPD. *Eur Respir J* 2007;30:993–1013.
3. de Marco R, Accordini S, Marcon A, Cerveri I, Antó JM, Gislason T, Heinrich J, et al. Risk factors for chronic obstructive pulmonary disease in a European cohort of young adults. *Am J Respir Crit Care Med* 2011;183:891–897.
4. Postma DS, de Vries K, Koeter GH, Sluiter HJ. Independent influence of reversibility of air-flow obstruction and nonspecific hyperreactivity on the long-term course of lung function in chronic air-flow obstruction. *Am Rev Respir Dis* 1986;134:276–280.
5. Salvi SS, Barnes PJ. Chronic obstructive pulmonary disease in non-smokers. *Lancet* 2009;374:733–743.
6. Brunekreef B, Forsberg B. Epidemiological evidence of effects of coarse airborne particles on health. *Eur Respir J* 2005;26:309–318.
7. Nejari C, Tessier JF, Barberger-Gateau P, Jacqmin H, Dartigues JF, Salamon R. Functional status of elderly people treated for asthma-related symptoms: a population based case-control study. *Eur Respir J* 1994;7:1077–1083.
8. Mahler DA, Mackowiak JI. Evaluation of the short-form 36-item questionnaire to measure health-related quality of life in patients with COPD. *Chest* 1995;107:1585–1589.
9. Engstrom CP, Persson LO, Larsson S, Ryden A, Sullivan M. Functional status and well being in chronic obstructive pulmonary disease with regard to clinical parameters and smoking: a descriptive and comparative study. *Thorax* 1996;51:825–830.
10. Prieto L, Alonso J, Ferrer M, Anto JM. Are results of the SF-36 health survey and the Nottingham Health Profile similar? A comparison in COPD patients. Quality of life in COPD study group. *J Clin Epidemiol* 1997;50:463–473.
11. Yohannes AM, Roomi J, Waters K, Connolly MJ. Quality of life in elderly patients with COPD: measurement and predictive factors. *Respir Med* 1998;92:1231–1236.
12. Guyatt GH, King DR, Feeny DH, Stubbings D, Goldstein RS. Generic and specific measurement of health-related quality of life in a clinical trial of respiratory rehabilitation. *J Clin Epidemiol* 1999;52:187–192.
13. Bousquet J, Knani J, Dhivert H, Richard A, Chicoye A, Ware JE, Michel FB, et al. Quality of life in asthma. I. Internal consistency and validity of the SF-36 questionnaire. *Am J Respir Crit Care Med* 1994;149:371–375.
14. Espinosa De Los Monteros MJ, Alonso J, Ancochea J, Gonzalez A. [Quality of life in asthma: reliability and validity of the short form generic questionnaire (SF-36) applied to the population of asthmatics in a public health area]. *Arch Bronconeumol* 2002;38:4–9.
15. Health UDo, Evaluation HSFCfD, Research, et al. Guidance for industry: patient-reported outcome measures: use in medical product development to support labeling claims: draft guidance. *Health Qual Life Outcomes* 2006;4:1–20.
16. Fayers PM, Machin D. Quality of life: the assessment, analysis and interpretation of patient-reported outcomes. Hoboken, NJ: John Wiley & Sons; 2013.
17. Frendl DM, Ware JE. Jr., Patient-reported functional health and well-being outcomes with drug therapy: a systematic review of randomized trials using the SF-36 health survey. *Med Care* 2014;52:439–445.
18. Jones PW. St. George's respiratory questionnaire: MCID. COPD: J Chron Obstruct Pulmon Dis 2005;2:75–79.
19. El Rhazi K, Nejari C, Benjelloun MC, Bourkadi J, Afif H, Serhier Z, Tachfouti N, et al. Validation of the St. George's respiratory questionnaire in patients with COPD or asthma in Morocco. *Int J Tuberc Lung Dis* 2006;10:1273–1278.
20. Berkanovic E. The effect of inadequate language translation on Hispanics' responses to health surveys. *Am J Public Health* 1980;70:1273–1276.
21. Khalladi R, Gargouri I, Mahjoub M, Belhareth S, Ben Saad H. [Evaluation of quality of life (QOL) of Tunisians patients with COPD]. *Rev Pneumol Clin* 2017;73:231–239.
22. Hunt SM, Alonso J, Bucquet D, Niero M, Wiklund I, McKenna S. Cross-cultural adaptation of health measures. *Health Policy* 1991;19:33–44.
23. From the Global Strategy for the Diagnosis, Management, and Prevention of COPD, Global Initiative for Chronic Obstructive Lung Disease (GOLD). 2013. Available from: <http://www.goldcopd.org/>.
24. GINA_Pocket2013_May15_1.pdf. Available from: http://www.ginasthma.org/local/uploads/files/GINA_Pocket2013_May15_1.pdf. [last accessed 17 Sep 2015].

25. Stenton C. The MRC breathlessness scale. *Occup Med* (Lond) 2008;58:226–227.
26. Clinical COPD questionnaire. Available from: <http://www.cccq.nl>.
27. Jones PW, Quirk FH, Baveystock CM, Littlejohns P. A self-complete measure of health status for chronic airflow limitation. The St. George's respiratory questionnaire. *Am Rev Respir Dis* 1992;145:1321–1327.
28. Jones P, St George's respiratory questionnaire for COPD patients (SGRQ-C) manual, version 1.1, 11dec. 2008.
29. Comrey A, Lee H. A first course in factor analysis. Hillsdale, NJ: Lawrence Erlbaum Associates Inc., Publishers; 1992.
30. Nunnally J. Psychometric theory. 2nd ed. Hillsdale, NJ: Mcgraw-hill; 1978.
31. Group QSW. *Quality standards for the development, application, and evaluation of measurement instruments in social science survey research*. Working Paper Series des Rates für Sozial-und Wirtschaftsdaten; 2015.
32. Ferrer M, Alonso J, Prieto L, Plaza V, Monsó E, Marrades R, Aguar MC, et al. Validity and reliability of the St George's respiratory questionnaire after adaptation to a different language and culture: the Spanish example. *Eur Respir J* 1996;9:1160–1166.
33. Sherpa CT, LeClerq SL, Singh S, Naithani N, Pangeni R, Karki A, Chokhani RK, et al. Validation of the St. George's respiratory questionnaire in Nepal. *Chronic Obstr Pulm Dis* 2015;2:281–289.
34. Ringbaek T, Martinez G, Lange P. A comparison of the assessment of quality of life with CAT, CCQ, and SGRQ in COPD patients participating in pulmonary rehabilitation. *COPD* 2012;9:12–15.
35. Lee H, Jhun BW, Cho J, Yoo KH, Lee JH, Kim DK, Lee JD, et al. Different impacts of respiratory symptoms and comorbidities on COPD-specific health-related quality of life by COPD severity. *Int J Chron Obstruct Pulmon Dis* 2017;12:3301–3310.
36. Mirdamadi M, Rahimi B, Safavi E, Abtahi H, Peiman S. Correlation of cardiopulmonary exercise testing parameters with quality of life in stable COPD patients. *J Thorac Dis* 2016;8:2138.
37. Jones PW. Health status measurement in chronic obstructive pulmonary disease. *Thorax* 2001;56:880–887.
38. Spencer S, Calverley PM, Sherwood Burge P, Jones PW. Disease ISGISiOL. Health status deterioration in patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 2001;163:122–128.
39. Spencer S, Calverley PM, Burge PS, Jones PW. Impact of preventing exacerbations on deterioration of health status in COPD. *Eur Respir J* 2004;23:698–702.
40. Wilson CB, Jones PW, O'Leary CJ, Cole PJ, Wilson R. Validation of the St. George's respiratory questionnaire in bronchiectasis. *Am J Respir Crit Care Med* 1997;156:536–541.
41. Al-Shair K, Atherton GTW, Kennedy D, Powell G, Denning DW, Caress A. Validity and reliability of the St. George's respiratory questionnaire in assessing health status in patients with chronic pulmonary aspergillosis. *Chest* 2013;144:623–631.
42. de Torres JP, Casanova C, Hernández C, Abreu J, Montejo de Garcini A, Aguirre-Jaime A, Celli BR, et al. Gender associated differences in determinants of quality of life in patients with COPD: a case series study. *Health Qual Life Outcomes* 2006;4:72.
43. Miravittles M, Ferrer M, Pont A, Luis Viejo J, Fernando Masa J, Gabriel R, Jiménez-Ruiz CA, et al. Characteristics of a population of COPD patients identified from a population-based study. Focus on previous diagnosis and never smokers. *Respir Med* 2005;99:985–995.
44. Ferrari R, Tanni SE, Lucheta PA, Faganello MM, do Amaral RA, Godoy I. Gender differences in predictors of health status in patients with COPD. *J Bras Pneumol* 2010;36:37–43.
45. Dimitropoulos C, Theodorakopoulou E, Kopitopoulou A, et al. The health related quality of life of Greek patients with chronic obstructive pulmonary disease. *Pneumon* 2013;2:127–151.
46. Eisner MD, Anthonisen N, Coultas D, Kuenzli N, Perez-Padilla R, Postma D, Romieu I, et al. An official American Thoracic Society public policy statement: novel risk factors and the global burden of chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 2010;182:693–718.
47. Paulin LM, Diette GB, Blanc PD, Putcha N, Eisner MD, Kanner RE, Belli AJ, et al. Occupational exposures are associated with worse morbidity in patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 2015;191:557–565.
48. Blanc PD, Iribarren C, Trupin L, Earnest G, Katz PP, Balmes J, Sidney S, et al. Occupational exposures and the risk of COPD: dusty trades revisited. *Thorax* 2009;64:6–12.
49. Weinmann S, Vollmer WM, Breen V, Heumann M, Hnizdo E, Villnave J, Doney B, et al. COPD and occupational exposures: a case-control study. *J Occup Environ Med* 2008;50:561–569.
50. Blanc PD, Eisner MD, Trupin L, Yelin EH, Katz PP, Balmes JR. The association between occupational factors and adverse health outcomes in chronic obstructive pulmonary disease. *Occup Environ Med* 2004;61:661–667.
51. Tabberer M, Benson VS, Gelhorn H, et al. The COPD biomarkers qualification consortium database: baseline characteristics of the St George's respiratory questionnaire dataset. *Chronic Obstr Pulm Dis* 2017;4:112–123.
52. Mulder I, Tjhuis M, Smit HA, Kromhout D. Smoking cessation and quality of life: the effect of amount of smoking and time since quitting. *Prev Med* 2001;33:653–660.
53. Schmitz N, Kruse J, Kugler J. Disabilities, quality of life, and mental disorders associated with smoking and nicotine dependence. *Am J Psychiatry* 2003;160:1670–1676.