ORIGINAL ARTICLE

COMPARATIVE STUDY BETWEEN DIFFERENT RESPIRATORY QUESTIONNAIRES IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE AT SOHAG CHEST HOSPITAL

By

Tarek Safwat,[1] Iman Hassan,[1] Ashraf Hafez[2]

[1]Pulmonary Medicine Department, Ain Shams University. Egypt, [2]Sohag Chest Hospital, Egypt

Correspondence to: Iman Hassan, Email: dr.imangalal@gmail.com

Background: *The development and validation of questionnaires targeting the assessment of health–related quality of life (HRQL) have recently gained great attention among patients with chronic obstructive pulmonary disease (COPD) to identify and treat the functional problems that are most important among those patients.*

Aim: *This study was designed to compare between different respiratory questionnaires in COPD.*

Methods: *The study was conducted at Sohag Chest Hospital upon one hundred patients with stable COPD (GOLD stage I–IV), their mean age was 58.01 ± 12.92 years and their mean post–brochodilator FEV_1 was 51.24 ± 21.77%. All recruited subjects completed three standardized questionnaires [English version of Clinical COPD Questionnaire (CCQ), Arabic version of Saint George's Respiratory Questionnaire (SGRQ), and Arabic version of Short Form–36 (SF–36)].*

Results: *Both CCQ and SGRQ were significantly correlated in both total score and all domains. SF–36 partially correlated significantly with both CCQ and SGRQ. Post-brochodilator FEV_1 statistically correlates with the total scores of the three questionnaires.*

Conclusion: *Although there was complementarity between the three questionnaires and spirometry among COPD patients yet, CCQ has the advantage of being an easy, short, simple, self–explanatory questionnaire that can be completed for most patients on their own.*

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a chronic debilitating disease affecting 210 million people worldwide according to the latest estimates of the World Health Organization (WHO) with more than 3 million people dying of COPD in the year 2005 particularly in low and middle income countries.[1]

In recent years, a great deal of attention has been paid to developing and validating health–related quality of life (HRQL) questionnaires for patients with COPD in order to identify and treat the functional problems that are most important to these patients. These questionnaires are now being used extensively in clinical trials yet, it was assumed that these questionnaires often correlate poorly with the clinical status of the airways.[2]

A number of questionnaires for the assessment of HRQL and health status which cover a broader view of patients' well–being have been introduced into clinical practice since the late 1980s. These include COPD specific tools,

such as the Clinical COPD Questionnaire (CCQ), the Saint George's Respiratory Questionnaire (SGRQ), and the generic instruments such as the Medical Outcomes Study Short Form–36 (SF–36).[3]

The aim of the present study was to compare between different types of respiratory questionnaires in COPD.

PATIENTS AND METHOD

Subjects: This study was carried out on 100 patients with stable COPD at Sohag Chest Hospital in the period from January 2010 till May 2010. These COPD patients were recruited randomly from both the outpatients' clinics at Sohag Chest Hospital and from the COPD patients' candidate for discharge after admission at Sohag Chest Hospital. Among the 100 COPD patients included in this study 74 were males and 26 were females; their mean age was 58.01 ± 12.92 years while their mean post–brochodilator FEV_1 was $51.24 \pm 21.77\%$. The diagnosis of COPD was established by clinical symptoms, physical examination, chest radiography and pulmonary function testing according to the current GOLD guidelines.[4] The COPD subjects were further classified into stages (I–IV) on the basis of their post–bronchodilator FEV_1/FVC and $FEV_1\%$ predicted. FEV_1/FVC was $< 70\%$ and FEV_1 fell into set bands (stage 1: $FEV_1 \geq 80\%$; stage 2: $50\% \geq FEV_1 < 80\%$; stage 3: $30\% \geq FEV_1 < 50\%$; stage 4: $FEV_1 < 30\%$ or $FEV_1 < 50\%$ plus chronic respiratory failure).[4] 18 patients had mild COPD, 31 had moderate COPD, 30 had severe COPD, whereas the remaining 21 had very severe COPD.

The exclusion criteria in this study included: patients with obstructive pulmonary diseases other than COPD as well as patients presenting with respiratory failure. In addition, patients with contraindications for performing lung function tests according to the guidelines of the American Thoracic Society[5] were excluded: myocardial infarction within one month, chest or abdominal pain of any cause, oral or facial pain exacerbated by a mouthpiece, stress incontinence, and dementia or confusional state.

Lung Function: Forced expiratory volume in one second (FEV_1), forced vital capacity (FVC), peak expiratory flow (PEF), and FEV_1/FVC ratio were measured using the spirometry system (ChestGraph HI–701 Spirometer).

The following activities were avoided prior to the spirometric study according to the guidelines of the American Thoracic Society:[5]

- Smoking within at least one hour of testing.
- Consuming alcohol within 4 hours of testing.
- Performing vigorous exercise within 30 minutes of testing.
- Wearing clothing that substantially restricts full chest and abdominal expansion.

- Eating a large meal within 2 hours of testing.
- Taking long–acting bronchodilators for 12 hours, inhaled short–acting bronchodilators for 6 hours, and sustained–release theophyllines 24 hours before the test.

Readings were performed in triplicate, with the highest values recorded and expressed as a percentage of the predicted value.

Obstructive pattern with an $FEV_1/FVC < 0.70$ together with FEV_1 degree of reversibility $< 12\%$ and < 200 ml from the pre–bronchodilator values indicates airflow limitation that is not fully reversible consistent with the diagnosis of COPD.[4]

Questionnaires:

SGRQ:

The SGRQ is a standardized self–administered airways disease–specific questionnaire divided into three subscales: symptoms (eight items), activity (16 items), and impacts (26 items), and one overall score. Each score ranges from zero (no impairment) to 100 (maximum impairment).[6,7]

CCQ:

The CCQ consists of 10 items with overall score and 3 domains: symptoms (4 items), functional state (4 items) and mental state (2 items). All scores range from 0 to 6; (0 = no impairment).[3,8,9]

SF-36:

The SF–36 provides a descriptive measure of generic HRQL and is valid for use in COPD. The SF–36 contains 8 scales that measure physical functioning (10 items), role physical (4 items), bodily pain (2 items), general health (5 items), vitality (4 items), social function (2 items), role emotional (3 items), and mental health (5 items). All scale scores are transformed to range from 0 (worst health) to 100 (best health).[10-12]

All recruited subjects have completed 3 standardized respiratory questionnaires (English version of CCQ, Arabic version of SGRQ, and Arabic version of SF–36). The physician asked the questions of the questionnaire to the patients & explained those items not clear to the patient.

Statistical Analysis: Statistical analyses were performed utilizing statistical software SPSS (statistical package for social sciences) version 17.0; SPSS Inc, Chicago, IL for Windows XP. Descriptive statistics were presented as mean values ± standard deviation (SD) and range. Differences in measures between groups were assessed using analysis of variance (ANOVA) test. Pearson's

correlation coefficients were applied to determine the relationships between the 3 questionnaires as well as to assess the correlation between FEV_1 and the total scores of the 3 questionnaires. The following cut–off points were used: < 0.3 for weak correlations, 0.3–0.7 for moderate correlation, and > 0.7 for strong correlations. Statistical significance was set at $p < 0.05$ and statistical high significance was set at $p < 0.01$.

RESULTS

100 stable COPD patients participated in this study [74 males and 26 females; mean age, 58.01 ± 12.92 years (range 22–81 years); mean post–brochodilator FEV_1, 51.24 ± 21.77%]. According to the GOLD guidelines, 18 patients had mild COPD, 31 had moderate; 30 had severe; whereas the remaining 21 had very severe COPD. 32 patients were non–smokers; 24 were smokers (with Pack year 29); while the remaining 44 patients were ex–smokers (with Pack year 30). The co–morbid medical illnesses among the 100 included subjects were hypertension 8% (male 5% and female 3%); diabetes mellitus 5% (male 2% and female 3%); both hypertension and diabetes mellitus 3% (male 2% and female 1%); while the remaining 84% (male 65% and female 19%) had no co–morbidity.

The correlation between the severity of COPD and smoking was assessed in the present study and the correlation was statistically significant ($p < 0.05$) Table 1.

In the current study, the mean values of different parameters were compared among the included subjects with their different smoking status (non–smokers, smokers, and ex–smokers), it was found that there were significant statistical differences regarding symptoms, functional state and total score of CCQ ($p < 0.05$), while there were highly significant statistical differences regarding physical function, pain, and total score of SF–36 as well as mental state of CCQ ($p < 0.001$), whereas the remaining parameters (namely: symptoms, activity, impacts, and total score of SGRQ, energy/fatigue, emotional state, social function, and general health of SF–36) carried non–significant statistical differences ($p > 0.05$) Table 2.

There were highly significant ($p < 0.001$) statistical correlations between post–brochodilator FEV_1 and all total scores of the 3 questionnaires except for the correlation between FEV_1% predicted with the total score of SGRQ which was statistically non–significant ($p > 0.05$) Table 3.

Table 1. Correlation between COPD Severity & Smoking status.

| | | Smoking status | | | Total | Chi Square | P (Sig) |
		Non-Smoker	Smoker	Ex-Smoker			
Severity	Mild	7	7	4	18		
	Moderate	5	10	16	31		
	Severe	13	2	15	30	12.82	< 0.05 (S)
	Very Severe	7	5	9	21		
Total		32	24	44	100		

Table 2. Comparison between different smoking statuses as regards all quantitative parameters.

	Non-Smoker		Smoker		Ex-Smoker		Total		Anova test	P	Sig
	Mean	SD	Mean	SD	Mean	SD	Mean	SD			
SGRQ											
Symptoms	19.06	5.32	18.58	6.84	19.82	5.8	19.28	5.88	0.37	0.692	NS
Activity	1.16	0.57	1.17	0.64	1.25	0.62	1.2	0.6	0.27	0.765	NS
Impact	7.16	2.76	6.92	3.01	7.55	2.48	7.27	2.69	0.46	0.632	NS
Total	50.91	15.31	49.79	18.87	53.7	15.99	51.87	16.43	0.52	0.599	NS
SF36											
Physical function	14.28	4.39	11.04	4.85	14.77	3.00	13.72	4.21	7.35	0.001	HS
Energy Fatigue	8.97	1.56	8.58	1.32	8.59	1.81	8.71	1.62	0.6	0.552	NS
Emotional state	12.34	2.52	11.38	2.36	11.61	2.43	11.79	2.45	1.28	0.282	NS
Social function	4.13	0.66	4.21	0.51	4.27	0.66	4.21	0.62	0.51	0.6	NS
Pain	5.38	1.86	3.79	2.64	5.48	1.79	5.04	2.14	5.93	0.004	HS
General health	11.81	1.69	11.00	1.91	11.41	1.6	11.44	1.72	1.56	0.215	NS
Total	66.16	11.14	57.58	11.99	65.66	9.83	63.88	11.27	5.39	0.006	HS
CCQ											
Symptoms	15.00	3.72	12.5	4.32	15.00	3.96	14.4	4.08	3.6	0.031	S
Functional state	14.84	4.22	12.88	4.33	15.18	2.63	14.52	3.72	3.32	0.04	S
Mental state	7.72	1.96	6.42	2.13	8.27	1.65	7.65	1.99	7.69	0.001	HS
Total	37.56	9.32	31.79	10.2	38.45	7.6	36.57	9.16	4.71	0.011	S

CCQ: Clinical COPD Questionnaire; HS: highly significant; NS: non- significant; S: significant; SF-36: Short Form-36 Questionnaire; SGRQ: Saint George's Respiratory Questionnaire.

Table 3. Correlations between FEV_1 & Total Score of CCQ, SGRQ & SF-36.

		Total CCQ	Total SGRQ	Total SF-36
FEV_1 % pred (post)	Pearson Correlation	-0.266	-0.127	-0.368
	Sig.(2-tailed)	0.007 (HS)	0.208 (NS)	0.000 (HS)
FEV_1 (post) L	Pearson Correlation	-0.361	-0.261	-0.319
	Sig.(2-tailed)	0.000 (HS)	0.009 (HS)	0.001 (HS)

CCQ: Clinical COPD Questionnaire; FEV_1: forced expiratory volume in one second; L: liters; pred: predicted; SF-36: Short Form-36 Questionnaire; SGRQ: Saint George's Respiratory Questionnaire.

Correlation between SGRQ and CCQ: There were positively weak (Pearson's correlation < 0.3) highly significant (p < 0.01) statistical correlations between the 2 questionnaires regarding functional state, mental state and total score of CCQ with activity and impacts of SGRQ, also there were positively weak (Pearson's correlation < 0.3) highly significant (p < 0.01) statistical correlations between both mental state, total score of CCQ and total score of SGRQ, while there were positively weak (Pearson's correlation < 0.3) significant (p < 0.05) statistical correlations regarding symptoms of SGRQ with symptoms, mental state, functional state and total score of CCQ, and both impacts and activity of SGRQ with symptoms of CCQ, and total score of SGRQ with symptoms and functional state of CCQ Table 4, (Fig. 1).

Table 4. Correlation between SGRQ & CCQ.

SGRQ		CCQ			
		Symptoms	**Functional State**	**Mental State**	**Total**
Symptoms	Pearson Correlation P value	0.209 0.037 (S)	0.214 0.033 (S)	0.221 0.027 (S)	0.228 0.023 (S)
Activity	Pearson Correlation P value	0.213 0.033 (S)	0.287 0.004 (HS)	0.286 0.004 (HS)	0.274 0.006 (HS)
Impact	Pearson Correlation P value	0.247 0.013 (S)	0.287 0.004 (HS)	0.286 0.004 (HS)	0.289 0.00 (HS)
Total	Pearson Correlation P value	0.248 0.013 (S)	0.256 0.01 (S)	0.291 0.003 (HS)	0.277 0.005 (HS)

CCQ: Clinical COPD Questionnaire; HS: highly significant; S: significant; SGRQ: Saint George's Respiratory Questionnaire.
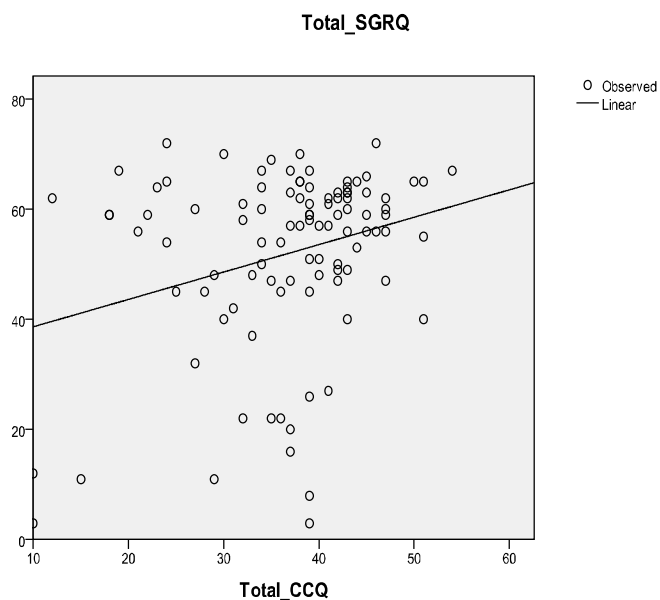
Total_SGRQ

Fig 1. Correlation between total score of SGRQ and total score of CCQ.

Correlation between SF–36 and SGRQ: There were positively weak (Pearson's correlation < 0.3) significant (p < 0.05) statistical correlations regarding pain and physical function of SF-36 with symptoms of SGRQ, general health of SF–36 with activity, impacts and total score of SGRQ, while there were positively moderate (Pearson's correlation 0.3–0.7) highly significant (p < 0.01) statistical correlations regarding pain and total score of SF–36 with activity, impacts and total score of SGRQ and also between physical function of SF–36 and impacts of SGRQ, but there were positively weak (Pearson's correlation < 0.3) highly significant (p < 0.01) statistical correlations between physical function of SF–36 and both activity and total score of SGRQ, and also between total score of SF–36 and symptoms of SGRQ. Whereas there were positively weak (Pearson's correlation < 0.3) non–significant (p > 0.05) statistical correlations regarding energy/fatigue, emotional state and social function of SF–36 with symptoms, activity, impacts and total score of SGRQ and also between general health of SF–36 and symptoms of SGRQ Table 5, (Fig. 2).

Table 5. Correlation between SF-36 & SGRQ.

SF-36		SGRQ			
		Symptoms	Activity	Impact	Total
Physical Function	Pearson Correlation	0.22	0.285	0.32	0.297
	P value	0.028 (S)	0.004 (HS)	0.001 (HS)	0.003 (HS)
Energy/Fatigue	Pearson Correlation	0.14	0.133	0.023	0.098
	P value	0.164 (NS)	0.188 (NS)	0.821 (NS)	0.333 (NS)
Emotional State	Pearson Correlation	0.142	0.056	0.029	0.102
	P value	0.158 (NS)	0.58 (NS)	0.777 (NS)	0.314 (NS)
Social Function	Pearson Correlation	0.174	0.032	0.026	0.066
	P value	0.084 (NS)	0.75 (NS)	0.797 (NS)	0.516 (NS)
Pain	Pearson Correlation	0.258	0.369	0.323	0.359
	P value	0.01 (S)	0.000 (HS)	0.001 (HS)	0.000 (HS)
General Health	Pearson Correlation	0.116	0.197	0.21	0.215
	P value	0.252 (NS)	0.05 (S)	0.036 (S)	0.031 (S)
Total	Pearson Correlation	0.274	0.304	0.301	0.331
	P value	0.006 (HS)	0.002 (HS)	0.002 (HS)	0.001 (HS)

HS: highly significant; NS: non- significant ;S: significant; SF-36: Short Form-36 Questionnaire; SGRQ: Saint George's Respiratory Questionnaire
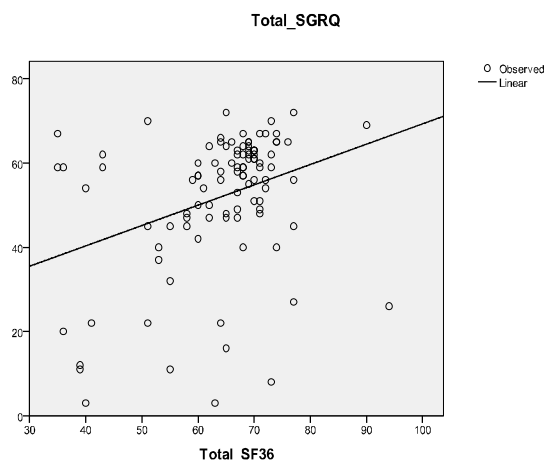

Fig 2. Correlation between total score of SGRQ and total score of SF-36.

Correlation between SF–36 and CCQ: There were positively moderate (Pearson's correlation 0.3–0.7) highly significant (p < 0.01) statistical correlations between SF–36 and CCQ regarding pain, general health and total score of SF–36 with symptoms, functional state, mental state and total score of CCQ, also between physical function domain of SF–36 and symptoms domain of CCQ. While there were positively strong (Pearson's correlation > 0.7) highly significant (p < 0.01) statistical correlations between physical function domain of SF–36 and functional state, mental state and total score of CCQ. But there were positively weak (Pearson's correlation < 0.3) significant (p < 0.05) statistical correlations between emotional state of SF–36 and symptoms, functional state, mental state and total score of CCQ. Whereas there were positively weak (Pearson's correlation < 0.3) non–significant (p > 0.05) statistical correlations between both energy/fatigue domain and social function domain of SF–36 and symptoms, functional state, mental state and total score of CCQ Table 6, (Fig. 3).

Table 6. Correlation between SF-36 & CCQ.

SF-36		CCQ			
		Symptoms	Functional State	Mental State	Total
Physical Function	Pearson Correlation P value	0.608 0.000 (HS)	0.728 0.000 (HS)	0.725 0.000 (HS)	0.724 0.000 (HS)
Energy/Fatigue	Pearson Correlation P value	0.113 0.264 (NS)	0.115 0.257 (NS)	0.100 0.323 (NS)	0.118 0.241 (NS)
Emotional State	Pearson Correlation P value	0.196 0.05 (S)	0.249 0.012 (S)	0.210 0.036 (S)	0.234 0.019 (S)
Social Function	Pearson Correlation P value	0.006 0.95 (NS)	0.105 0.299 (NS)	0.108 0.283 (NS)	0.069 0.496 (NS)
Pain	Pearson Correlation P value	0.554 0.000 (HS)	0.612 0.000 (HS)	0.595 0.000 (HS)	0.625 0.000 (HS)
General Health	Pearson Correlation P value	0.348 0.000 (HS)	0.392 0.000 (HS)	0.293 0.003 (HS)	0.378 0.000 (HS)
Total	Pearson Correlation P value	0.589 0.000 (HS)	0.698 0.000 (HS)	0.667 0.000 (HS)	0.69 0.000 (HS)

CCQ: Clinical COPD Questionnaire; HS: highly significant; NS: non- significant; S: significant; SF-36: Short Form-36 Questionnaire.
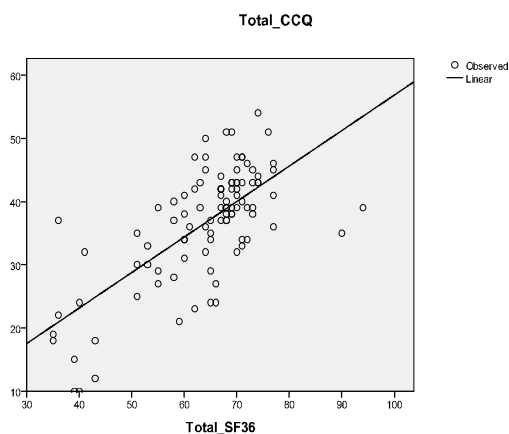

Fig 3. Correlation between total score of CCQ and total score of SF-36.

DISCUSSION

HRQL has been defined as the "functional effect of an illness and its consequent therapy upon a patient, as perceived by the patient" and therefore, questionnaires concerned with HRQL tend to focus mainly on the impairments that are important to the patients.[2]

The CCQ is a short health status questionnaire for patients with COPD. The main purpose of this questionnaire is to identify not only the clinical status of the airways but also activity limitation and emotional dysfunction in patients with breathing difficulties due to their illness. By measuring health status, the general practitioner, the specialist, and the patient can get better information on the severity of symptoms and limitations caused by the disease as well as the effect of treatment on symptoms and limitations.[2]

SF–36 questionnaire was developed as a measure of general health.[13] This questionnaire provides a descriptive measure of generic HRQL and is valid for use in COPD.[11]

The SGRQ is one of the most frequently used and translated disease specific health status instruments in COPD.[14-16] The SGRQ has been developed to allow comparative measurement of health between patient populations and to quantify changes in health following therapy.[7]

The correlation between the severity of airway obstruction in COPD and smoking was investigated among the 100 COPD patients included in the current study and was found to be statistically significant.

On comparing the mean values of different parameters among the included subjects with their different smoking status (non–smokers, smokers, and ex–smokers), only CCQ carried significant difference regarding both the overall score and the 3 domains. Conversely, SGRQ carried non–significant difference regarding both the overall score and the 3 subscales, whereas the SF–36 was only significantly different regarding the overall score and some scales. There are various studies for the association between smoking status and HRQL. One previous study showed that COPD patients who continue smoking have a significantly lower HRQL than those who quit smoking.[17] On the other hand, current smoking has been associated with a better HRQL in the study by *Wijnhoven et al.*[18] The possible explanation given was that subjects who do not quit smoking might be those with a less severe stage of disease. *Molen et al.*,[2] found that HRQL in CCQ were significantly worst in patients with COPD compared with the healthy ex–smokers. Conversely, *Ståhl et al.*,[19] declared that smoking status did not affect the subjects' HRQL once COPD had been established.

Previous studies have shown that the associations between spirometric values and disease specific quality of life questionnaires were weak possibly due to the influence of psychosocial variables on the HRQL outcome. Therefore, it has been generally recognized that these instruments contribute valid additional information about the daily functioning and wellbeing of patients with COPD.[20]

The total score of a questionnaire summarizes the impact of the disease on overall health status. In the present study, the correlations between post–bronchodilator FEV_1 and the total score of the 3 questionnaires were investigated. It was found that there were highly significant statistical correlations between FEV_1 and the total scores of the 3 questionnaires except for the correlation between FEV_1% predicted and the total score of SGRQ which was statistically non–significant. These results were in agreement with several previous studies. In an earlier study, *Nouraei et al.*,[21] investigated the correlation between FEV_1 and CCQ, their results identified significant statistical correlation (p<0.03). Similarly, both *Molen et al.*,[2] and *Damato et al.*,[22] found that there was highly significant statistical correlation between the total score of CCQ and FEV_1% predicted (p < 0.01). As regards the correlation between FEV_1 and SF–36, *Alonso et al.*,[11] results were in agreement with the results in the present study. The results in a previous study by *Rutten-van Mölken et al.*,[23] were matching with our results regarding the non–significant statistical correlation between FEV_1 and the total score of SGRQ.

Both CCQ and SGRQ were significantly correlated regarding the total scores as well as the individual domains of each questionnaire. This result was in agreement with several previous studies; *Ställberg et al.*,[24] demonstrated moderate to good correlations between CCQ and SGRQ. Moreover, *Molen et al.*,[2] and *Kooi et al.*,[8] revealed moderate to high statistical correlations between the 2 scores.

This study shows that SF–36 partially correlates with both CCQ and SGRQ; the overall correlations between the total score of SF–36 and the 2 other questionnaires (total score as well as individual domains) were significantly weak to moderate, whereas the individual domains of SF–36 showed either significant or non–significant statistical correlations. Several previous studies in literature matched these results.[2,8]

It is worth mentioning that the majority of patients enrolled in the current study had no co–morbid medical illness (84%). This was important to avoid the effect of co–morbidity on the HRQL.

This study has some limitations; the 3 questionnaires were

not applied to evaluate the effect of different medications in the follow up of COPD patients. Secondly, the 3 questionnaires were not evaluated during the exacerbations of COPD. Last limitation with the present results might be the low number of COPD subjects in the very severe stage group.

In conclusion, there is complementarity between the three questionnaires and spirometry in COPD. The SGRQ is a comprehensive questionnaire that covers a range of aspects of COPD, yet it is complicated and time–consuming to complete. On the other hand, SF–36 questionnaire provides a descriptive measure for generic HRQL in COPD and can be self–administered. Moreover, although there is significant correlation between CCQ and SGRQ yet, CCQ has the advantage of being an easy, short, simple, self–explanatory respiratory questionnaire that can be completed for most patients on their own.

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