

# Correlation of health-related quality of life with other disease severity indices in Indian chronic obstructive pulmonary disease patients

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**Background:** Improvement in quality of life (QOL) has become a focus for the management of incurable chronic diseases, including chronic obstructive pulmonary disease (COPD). This study investigates factors influencing the QOL of patients with COPD in India.

**Methods:** Seventy-three consecutive COPD patients visiting an outpatient pulmonary clinic underwent health-related QOL (HRQOL) assessment using the World Health Organization's QOL abbreviated questionnaire and St George's Respiratory Questionnaire (SGRQ). Symptom severity and grade of dyspnea were estimated by the Chronic Lung Disease Severity Index (CLD) and Medical Research Council assessments, and patient demographic data were collected. Spirometry and 6-minute walk tests were performed to assess lung function and functional status.

**Results:** Patients with COPD showed significantly reduced HRQOL when measured by the World Health Organization's QOL abbreviated questionnaire and the SGRQ. CLD estimate for severity of lung disease ( $P < 0.001$ ), Medical Research Council assessment for dyspnea ( $P < 0.01$ ), and duration of illness ( $P < 0.05$ ) showed close correlation with HRQOL. Worsening forced expiratory volume in 1 second and 6-minute walk test results closely correlated with poorer HRQOL ( $P < 0.01$ ). No association between QOL and age, quantum of smoking, education, comorbid illnesses, or occupational exposure was found.

**Conclusion:** This study showed that Indian patients with COPD had reduced HRQOL. Longer disease duration, patient perception of disease severity, and worsening dyspnea impacted negatively on HRQOL.

**Keywords:** quality of life, COPD, disease severity, India, questionnaire

## Introduction

The Global Initiative for Chronic Obstructive Lung Diseases (GOLD) 2001 defined chronic obstructive pulmonary disease (COPD) as a disease state characterized by chronic airflow obstruction that is not fully reversible. This airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases.<sup>1</sup> COPD progressively reduces breathing capacity and impairs patients' ability to carry out activities of daily living, thereby adversely affecting health-related quality of life (HRQOL). A World Health Organization (WHO)/World Bank study estimated the prevalence of COPD per 1000 population in India as 4.38 in males and 3.44 in females.<sup>2</sup> With the increasing prevalence of smoking in developing countries, it is projected that COPD-related mortality and morbidity will dramatically impact Asian and African countries.<sup>3</sup> COPD is an irreversible and progressive disease, and hence medical and surgical care results in very little improvement of lung function

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or survival of these individuals, aside from the benefits seen with use of long-term oxygen treatment. Patients with COPD experience reduced HRQOL. Some factors such as depression, poor mobility, dyspnea, and inadequate social support adversely affect HRQOL, and these factors may be more amenable to treatment than treating only lung function impairment. Patient-focused HRQOL studies will provide the health care personnel with specific information regarding the problems that these patients experience and will thereby enable them to develop interventions directed toward improving their care.

There is a paucity of published literature regarding factors affecting the QOL of COPD patients in India. The present study aimed at determining the relationship between QOL and selected demographic and physiologic variables and symptom severity scores of patients with COPD.

## Materials and methods

### Study design

Patients visiting their pulmonologist for initial consultation for dyspnea or follow-up outpatient visits for COPD were invited to participate in this study. Basic demographic data and the generic WHOQOL abbreviated questionnaire (WHOQOL-BREF)<sup>4</sup> were completed on the first visit, and 1 week later the disease-specific St George's Respiratory Questionnaire (SGRQ)<sup>5</sup> clinical and physiologic data were gathered. This prospective study was approved by the Christian Medical College, Vellore, South India, and the hospital's institutional review board.

### Patient population

Seventy-three consecutive COPD patients were enrolled over a 2-month period in this study, which was performed at the pulmonary medicine outpatient clinic at Christian Medical College and hospital, a 2100-bed tertiary referral hospital and medical school in Tamilnadu, South India. Inclusion criteria for patient participation consisted of age over 40 years and irreversible airway obstruction on spirometry. Fifteen subjects were ineligible due to their inability to perform a 6-minute walk (nine), refusal to participate (three), additional coexisting lung disease (two), and flare-up of COPD (one).

### Testing methods

Spirometry was performed using a pulmonary function testing system (MasterScreen PFT®; Jaeger, Höchberg, Germany). Pre- and postbronchodilator (salbutamol 400 mcg) maneuvers were done by qualified respiratory

therapists following American Thoracic Society standards.<sup>6</sup> COPD was documented by airflow obstruction showing forced expiratory volume in 1 second (FEV<sub>1</sub>)/forced vital capacity (FVC) <70% and less than 200 cc increase in FEV<sub>1</sub> post bronchodilator. Disease severity was classified according to GOLD criteria. A 6-minute walk test was performed in a 30-meter corridor.

HRQOL was measured using two questionnaires: the generic WHOQOL-BREF<sup>4</sup> and the disease-specific SGRQ.<sup>5</sup>

The WHOQOL-BREF has 26 questions, of which the first two yield information about the individual's overall perception of QOL and overall perception of health. The remaining questions assess QOL in four domains: physical, psychological, social relationships, and environmental. It is a positively scored questionnaire, with the scores of the negatively worded questions being reversed for total score calculation. Higher scores indicate better QOL. The final scores were interpreted as follows:  $\geq 75\%$  = good QOL, 50%–74% = fair QOL, and  $< 50\%$  = poor QOL.

The SGRQ is a standardized questionnaire used to assess the effect of respiratory diseases on QOL. It is divided into three sections: "symptoms" deals with the frequency and severity of respiratory manifestations, "activity" relates to activities that cause or are limited by breathlessness, and "impacts" covers the aspects of social function and psychosocial disturbances that result from respiratory diseases.

Scores were expressed as percentage of overall impairment, where 100 represents worst possible health and 0 indicates best possible health status. Higher status on SGRQ indicates poorer QOL.

The Chronic Lung Disease Severity Index (CLD)<sup>7</sup> was used to quantify respiratory symptoms. This short six-item questionnaire evaluated dyspnea, wheezing, and productive cough. Raw scores were added and transformed to a scale of 0 (normal) to 100 (most severe). Dyspnea was assessed by the Medical Research Council (MRC) five-point scale for breathlessness.

The demographic variables, such as education, occupation, and smoking status, were analyzed with the mean QOL scores using the Kruskal-Wallis test, and the relationship between HRQOL scores and continuous variables were assessed using Spearman's correlation coefficient (*r*). A *P*-value of  $< 0.05$  was considered statistically significant.

## Results

Patient demographic results show a mean age of 62 years. Fifty-four were male (93%), 56 were married (97%),

**Table 1** Demographic characteristics of 58 subjects with chronic obstructive pulmonary disease

Characteristic	Value
Mean age $\pm$ standard deviation (years)	62.4 $\pm$ 7.83
<b>Sex</b>	
Male	54 (93%)
Female	4 (7%)
<b>Marital status</b>	
Unmarried	0
Married	56 (97%)
Widowed/widower	2 (3%)
Divorced	0
<b>Education</b>	
Illiterate	9 (15%)
Primary	7 (12%)
Secondary	28 (48%)
Graduate and above	14 (24%)
<b>Smoking status</b>	
Never smoked	10 (17%)
Quit smoking	39 (67%)
Current smoker	9 (16%)
Mean pack-years of tobacco smoked ( $\pm$ standard deviation)	32 $\pm$ 34.55

49 completed some formal schooling (86%), and 48 were current or ex-smokers (83%), with an average 32 pack-year smoking history (Table 1).

Clinical characteristics showed a mean duration of illness of 6 years; a mean CLD index of 55, indicating moderately

**Table 2** Clinical characteristics of the 58 study subjects

Clinical variables	Values
Mean duration of illness $\pm$ standard deviation (years)	6.07 $\pm$ 6.06
Mean CLD Severity Index	55.03 $\pm$ 14.19
<b>Comorbid condition (number of patients)</b>	
Nil	20 (34%)
Gastric disease	12 (21%)
Hypertension	11 (19%)
Diabetes mellitus	10 (17%)
Cataract	9 (16%)
Heart disease	9 (16%)
Prostatic disease	4 (7%)
Osteoarthritis/rheumatoid arthritis	4 (7%)
Miscellaneous	6 (10%)
<b>Number of patients with comorbid conditions</b>	
0	20 (34%)
1	17 (29%)
2	14 (24%)
$\geq 3$	7 (12%)
Mean dyspnea score (MRC grade) $\pm$ standard deviation	2.6 $\pm$ 1.35
<b>Long-term oxygen therapy</b>	
Yes	0%
No	58% (100%)

**Abbreviations:** CLD, Chronic Lung Disease Severity Index; MRC, Medical Research Council.

**Table 3** Spirometry and 6-minute walk results of the study subjects

Physiological variables	Values
<b>Disease severity (%)</b>	
Stage I ( $FEV_1 \geq 80\%$ of the predicted value)	1 (2%)
Stage IIA ( $FEV_1 50\%$ – $79\%$ of the predicted value)	25 (43%)
Stage IIB ( $FEV_1 30\%$ – $49\%$ of the predicted value)	21 (36%)
Stage III ( $FEV_1 < 30\%$ of the predicted value)	11 (19%)
Mean $FEV_1$ % predicted $\pm$ standard deviation	47.6 $\pm$ 18.38
Mean 6-minute distance walked $\pm$ standard deviation (meters)	359.2 $\pm$ 92.52

**Abbreviation:**  $FEV_1$ , forced expiratory volume in 1 second.

severe disease; a dyspnea severity score of 2.6, indicating moderately severe dyspnea; and comorbid illness found in 65% (Table 2).

Spirometry showed that one subject was GOLD (2001) Stage I, 46 were Stage II, and eleven were Stage III. Mean 6-minute walk was 359 meters (Table 3).

WHOQOL-BREF results showed that 14 patients rated QOL to be good, 31 fair, and 13 poor (Tables 4 and 5). When separate domains were analyzed, the worse the overall QOL, the worse the physical symptoms, whereas trends with psychological and social scores suggested that these remained relatively high despite advanced disease. The SGRQ scores likewise showed significant impairment in all three domain measures, symptoms, activity, and impacts, when compared with reference values<sup>5</sup> (Table 4).

No association was identified between QOL and the demographic variables age, education, occupation exposure, smoking status, or pack-years of tobacco smoked (Table 6).

Duration of illness showed a significant correlation with the WHOQOL-BREF questionnaire ( $P < 0.05$ ), indicating that as duration of illness increased, the QOL

**Table 4** Mean health-related quality of life scores

Quality of life	Mean	Standard deviation	Range
<b>WHOQOL-BREF</b>			
Physical domain	51.60	23.47	6–94
Social domain	62.03	27.26	6–100
Psychological domain	71.78	19.56	25–100
Environmental domain	64.29	14.23	30–94
Total	62.50	15.63	28–94
<b>SGRQ</b>			
Symptoms	41.64	20.99	0–93
Activity	62.57	24.61	0–100
Impacts	39.21	23.52	0–92
Total	46.69	21.61	0–88

**Abbreviations:** SGRQ, St George's Respiratory Questionnaire; WHOQOL-BREF, World Health Organization's quality of life abbreviated questionnaire.

**Table 5** WHOQOL-BREF results showing number of patients with chronic obstructive pulmonary disease by total, domain, and mean score

	Good (>75)	Fair (50–75)	Poor (<50)	Mean/ standard deviation
Patients, total	14	31	13	62.5 ± 15.6
<b>Patients by domain</b>				
Physical	13	18	27	51.6 ± 23.5
Social	25	15	18	62.0 ± 27.3
Psychological	38	13	7	71.8 ± 19.6
Environmental	16	34	8	64.3 ± 14.2

**Abbreviation:** WHOQOL-BREF, World Health Organization's quality of life abbreviated questionnaire.

worsened (Table 8). The CLD severity index correlated significantly with both the WHOQOL-BREF ( $P < 0.05$ ) and SGRQ ( $P < 0.001$ ), suggesting that the greater the severity of symptoms, the poorer the QOL. The MRC dyspnea grade also showed significant correlation ( $P < 0.001$ ) with both QOL questionnaires. No association was found between comorbid illness and QOL (Table 7).

Lung function as measured by  $FEV_1$  showed significant correlations with both WHOQOL-BREF ( $P < 0.001$ ) and SGRQ ( $P < 0.001$ ) QOL assessments, indicating that poorer lung function was associated with poorer QOL (Table 8). Likewise, the  $FEV_1/FVC$  showed correlation to a lesser degree with the WHOQOL-BREF ( $P < 0.05$ ) and SGRQ ( $P < 0.05$ ). The 6-minute walk, a functional assessment for lung disease, showed significant correlation with WHOQOL-BREF ( $P = 0.001$ ) and SGRQ ( $P = 0.005$ ) (Table 8).

## Discussion

This study showed that 58 consecutive Indian patients with COPD had significantly impaired QOL when measured by the generic questionnaire WHOQOL-BREF and the

disease-specific questionnaire SGRQ. When examining specific domains, all showed impairment; however, no clear trends were apparent. The social and psychological domains on the WHO questionnaire were rated less impaired; however, the “impacts” domain (social and psychosocial) on the SGRQ appeared more impaired. Jones and Spencer<sup>5</sup> suggested that a four-unit difference in SGRQ score between groups of patients indicated a clinically significant difference. Components adversely affecting HRQOL include frequency and severity of respiratory symptoms, breathlessness causing limitations of activity, poor social functions, and psychological disturbances. By concentrating investigation and treatment on these selected components, it is hoped that patients with COPD might lead fuller and more satisfying lives. Antidepressants are helpful for psychological disturbances, bronchodilators and narcotics can help dyspnea, and pulmonary rehabilitation programs, which are a rarity in India, show functional improvement of the 6-minute walk. Improvements in peer groups and family support may benefit patients by providing more social structure.

Measures of perceived severity of illness (CLD) and dyspnea (MRC) likewise showed tight correlation with QOL measurements in the study, similar to prior studies.<sup>8,9</sup> QOL is defined by the WHO as an individual's perceptions of their position in life in the context of the culture and value systems in which they live. This study shows that in India, COPD patients suffer similar reductions in QOL as do COPD patients from other countries, as reported previously.<sup>10,11</sup>

Lung functions as measured by  $FEV_1$  and classified as per GOLD criteria showed in this study that the lower the  $FEV_1$ , the lower the patient's QOL. This association of  $FEV_1$  and QOL confirms findings from previous studies<sup>10,12</sup> and was anticipated. With worsening lung function, normal activity is limited or curtailed. All QOL domains appeared

**Table 6** Correlation of SGRQ and WHOQOL-BREF scores with demographic variables

Variable	SGRQ				WHOQOL-BREF
	Symptom	Activity	Impacts	Total	
Age <sup>a</sup> , <i>r</i> -value	0.079	0.175	0.035	0.056	−0.135
Pack-years of tobacco smoked <sup>a</sup> , <i>r</i> -value	0.16	0.19	0.19	0.18	0.03
<b>Education<sup>b</sup>, mean (standard deviation)</b>					
Illiterate	43.06 (20.9)	63.44 (28.2)	39.38 (21.2)	47.38 (20.8)	59.88 (16.3)
Secondary school	44.32 (21.9)	63.25 (21.9)	41.68 (23.1)	48.64 (20.9)	61.21 (14.9)
Graduate/professional	34.64 (19.1)	60.21 (27.2)	34.07 (27.5)	42.00 (24.7)	68.07 (16.07)
<b>Smoking status<sup>b</sup></b>					
Never	46.2	66.1	43.2	50.7	52 (16.8)
Ex-smoker	41.1	63.69	37.5	46.05	64.46 (14.7)
Never-smoker	38.9	53.78	42.1	45	65.67 (14.9)

**Notes:** <sup>a</sup>Spearman's rank correlation coefficient; <sup>b</sup>Kruskal-Wallis test.

**Abbreviations:** SGRQ, St George's Respiratory Questionnaire; WHOQOL-BREF, World Health Organization's quality of life abbreviated questionnaire.

**Table 7** Correlation of clinical disease severity indices (illness duration, CLD, MRC grade for dyspnea) and comorbid illness with WHOQOL-BREF and SGRQ

Characteristics	Health-related quality of life score									
	Total score		SGRQ							
	WHOQOL-BREF		Symptoms		Activity		Impacts		Total score	
	r-value	P-value	r-value	P-value	r-value	P-value	r-value	P-value	r-value	P-value
Illness duration <sup>a</sup>	-0.22	0.017*	0.039	0.679	0.07	0.492	0.13	0.69	0.12	0.363
CLD <sup>a</sup>	-0.28	0.003**	0.57	<0.001***	0.52	<0.001***	0.41	<0.001***	0.66	0.001***
MRC grade for dyspnea <sup>a</sup>	-0.51	<0.001***	0.37	<0.001***	0.60	<0.001***	0.55	<0.001***	0.7	<0.001***
Comorbid condition <sup>b</sup>	-0.14	0.167	-0.15	0.146	-0.03	0.778	-0.07	0.474	-0.08	0.436

**Notes:** <sup>a</sup>Spearman's rank correlation coefficient; <sup>b</sup>Kruskal-Wallis test; \* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ .

**Abbreviations:** CLD, Chronic Lung Disease Severity Index; MRC, Medical Research Council; SGRQ, St George's Respiratory Questionnaire; WHOQOL-BREF, World Health Organization's quality of life abbreviated questionnaire.

to be similarly impaired by the reduced FEV<sub>1</sub>. There were similar findings when results of the 6-minute walk, an objective measurement of lung and overall fitness, were analyzed. The shorter the distance a patient could walk in 6 minutes, the worse perception of his/her QOL.

In previously reported studies, older age, presence of comorbid illness, less education, and greater smoking consumption resulted in lower QOL.<sup>10,11,13–15</sup> Surprisingly, no worsening HRQOL measurement correlated significantly with these variables studied in our group of Indians with COPD. The cause for this difference in findings in our patients compared with patients previously reported is not apparent from our data. It may result from small sample size, or it may be related to a unique aspect of the Indian culture regarding aging and age expectations, appreciation for education, or social structure. Ninety-seven percent of the patients studied here were married, and the rest were widowed/widowers. This reflects the very low overall divorce rate in India, and it may be that spousal and societal support may contribute in a significant way to improved QOL. This is an area that warrants further study.

Limitations of this study include the small sample size of 58 patients and the fact that 54 of the 58 subjects were male. The latter may be explained by the fact that tobacco smoking

is almost exclusively confined to the male population in India. Also, nine of the original group of 73 were excluded because they were unable to participate in the 6-minute walk, and this may have excluded some patients with more severe disease. However, because this study was performed in a pulmonary diseases clinic, individuals with more severe disease were likely to have been studied. Finally, none of the subjects was on long-term oxygen treatment. This is probably because oxygen concentrators, which have to be paid for by the individuals in the present health care scenario, are not easily available and are prohibitively expensive. Thus, COPD patients who are older and have generally exhausted their resources paying for medical care over the years are unlikely to be in a position to afford this treatment.

## Conclusion

Indian patients with COPD show significantly reduced QOL as measured by standardized questionnaires the WHOQOL-BREF and the SGRQ, similar to COPD patients in other countries. All domains measured, including physical, psychological, social relationships, environmental, symptoms, activity, and impacts, were impaired. Severity of symptoms, duration of illness, and level of dyspnea also influenced the QOL for these individuals. Because COPD is

**Table 8** Correlation of spirometry and 6-minute walk with WHOQOL-BREF and SGRQ

Characteristic	Health-related quality of life scores									
	Total score		SGRQ							
	WHOQOL-BREF		Symptoms		Activity		Impacts		Total score	
	r-value	P-value	r-value	P-value	r-value	P-value	r-value	P-value	r-value	P-value
Lung function (FEV <sub>1</sub> )	0.35	0.001***	-0.27	0.015*	-0.39	0.001**	-0.36	0.001**	-0.39	<0.001***
FEV <sub>1</sub> /FVC%	0.22	0.018*	-0.18	0.053	-0.30	0.002**	-0.17	0.063	-0.23	0.013*
6-minute walk test	0.36	<0.001***	-0.06	0.501	-0.28	0.003**	-0.27	0.003**	-0.26	0.005**

**Notes:** \* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ .

**Abbreviations:** FEV<sub>1</sub>, forced expiratory volume in 1 second; FVC, forced vital capacity; SGRQ, St George's Respiratory Questionnaire; WHOQOL-BREF, World Health Organization's quality of life abbreviated questionnaire.

an incurable slowly progressive chronic illness, and because only minimal improvement in actual lung function and FEV<sub>1</sub> can occur, concentrating therapy on selected potentially more treatable aspects of QOL may result in more effective care.

Further studies should be considered to evaluate the impact of social support, family support, and pulmonary rehabilitation programs on the QOL of COPD patients in India. Also, in view of the increased prevalence of biomass fuel for cooking and heating in rural Indian households, studies need to be conducted to study these effects on patients, particularly women and their QOL.

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## Disclosure

The authors report no conflicts of interest in this work.

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