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Original Research Article

Assessment of the correlates of respiratory morbidity related quality of life, using St George Respiratory Questionnaire (SGRQ) among male COPD patients

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ABSTRACT

Background: COPD is ranked eighth among the top 20 conditions causing disability globally. Assessment in subjective areas such as dyspnea and HRQL provides complementary information to physiologic measurements. Lower Health-Related Quality of Life has been associated with mortality and morbidity in COPD.
Methods: The study was conducted at the Department of Respiratory Medicine and at Vallabhbhai Patel Chest Institute and the associated, Vishwanathan Chest Hospital, University of Delhi. Between September 2012 to August 2013. We conducted present study on 40 male COPD subjects aged more than 45 years, divided into 4 groups based on CT phenotype as normal, Airway Dominant (AD), Emphysema Dominant (ED) and mixed types. We compared the St. George Respiratory Questionnaire scores, 6 Minutes' walk Distance scores, Clinical parameters, Spirometry indices across these phenotypes.
Results: The mean SGRQ score in present study was 54.07 ± 17.24 (Range :17.3 to 84.57). The Mean 6MWD in present study was 434.58 ± 125.47 metres. The significant parameters which had correlation with SGRQ total score were Age (r=0.343, p = 0.03), 6MWD (-0.397, p = 0.011), FEV1 /FVC (0.499, p< 0.001), DLCO (-0.601, p <0.001), Low attenuation areas in CT (0.606, p< 0.001).
Conclusions: 6MWD, FEV1/FVC, age, Low attenuation areas in CT, DLCO had an influence on the quality of life as measured by SGRQ scores in present study. Therapeutic approaches to improve the quality of life in COPD should take these indices into consideration.

Keywords: Chronic obstructive pulmonary disease (COPD), CT phenotype, Health-related quality of life (HRQL), Morbidity, St George's Respiratory Questionnaire (SGRQ)

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is ranked eighth among the top 20 conditions causing disability globally as measured by disability-adjusted life years (DALYs) in 2015.[1] In COPD, there is expiratory airflow limitation, which is due to greater resistance in the smaller airways caused by inflammation and remodeling and increased compliance of the lung due to the emphysematous destruction of the terminal airspaces.[2,3] The term COPD includes a spectrum of heterogeneous conditions characterized by not fully reversible airflow limitation by spirometry, whose presentation may be different clinically. The Global COPD prevalence was

estimated in the range of 5% to 10%, while incidence rates varied between 2 to 6 cases per 1,000 person-years, depending on the study population and criteria used.[4,5] In a systematic review and meta-analysis, the global prevalence of physiologically defined COPD in adults aged >40 year was reported to be approximately 9-10 per cent.[4] The Indian Study on Epidemiology of Asthma, Respiratory Symptoms and Chronic Bronchitis in Adults had shown that the overall prevalence of chronic bronchitis in adults >35 year is 3.49 percent ranging from 1.1% in Mumbai to 10% in Thiruvananthapuram.[6] According to a systematic review in 2012, the prevalence of COPD in India was reported to be between 6.6 to 7.7 %.[7]

Spirometry does not provide information on structural pulmonary abnormality seen in COPD whereas radiological imaging allows for regional assessment of the components involved of which CT is the most accurate.[8-10] Forced Expiratory Volume in 1 second is the hallmark variable in COPD determining the presence of disease, its severity, and the response to treatment.[11,12] But physiologic measurements do not give a complete picture of the morbidity and mortality. The measurement of HRQL (Health Related Quality of Life) allows us to obtain a better picture of how patients are affected by their illness. Assessment in subjective areas such as dyspnea and HRQL provides complementary information to physiologic measurements. Lower HRQL has been associated with mortality and morbidity in COPD.

Several studies have evaluated the impact of COPD on Quality of Life13-16 (QOL) and physical performance.[13-17] Chen LF et al described that COPD associated with emphysema on HRCT is characterized by more severe lung function impairment, greater exercise impairment, and cardiopulmonary dysfunction.[17] The use of HRQL measures in COPD has currently achieved widespread acceptance. HRQL, both generic and specific, are independent risk factors for respiratory and all- causes mortality.[14] Only generic measures of HRQL have been abundantly used in the literature, and studies evaluating the independent risk of specific HRQL for COPD is very limited.[14] Since cure is still impossible for most COPD patients, a major goal of care is to improve HRQL. But, only limited attempts have been made to identify the factors that are related to the different aspects of specific HRQL in COPD. The St. George Respiratory Questionnaire (SGRQ) is one of the most widely used instruments for assessing HRQL in respiratory disease.[16, 18,19]

Hence, we carried out present study with the objective to assess the respiratory morbidity related quality of life among male COPD patients using SGQR and to assess the correlation between various clinical, spirometry, CT phenotypic, nutritional indicators and SGRQ scores. To assess the respiratory morbidity related quality of life among male COPD patients using St. George respiratory questionnaire to assess the correlation between various clinical, spirometry, CT phenotypic, nutritional indicators and SGRQ scores among the study population.

METHODS

The study was conducted at the Department of Respiratory Medicine and at Vallabhbhai Patel Chest Institute and the associated, Vishwanathan Chest Hospital, University of Delhi. Between September 2012 to August 2013

The study design consisted of a total population of 40 diagnosed subjects of COPD, attending the outpatient clinics at the hospital were CT phenotyped as normal, Airway Dominant (AD), Emphysema Dominant (ED) and mixed types. Body Mass Index (BMI) and Quality of Life (QoL) were compared to AD and ED CT phenotypes and relationships of these parameters were examined.

Inclusion Criteria

- Adult male patients of age >45 years.
- Established diagnosis of COPD diagnosed as per Global Initiative for Obstructive Lung Diseases (GOLD) 2010 guidelines.

Exclusion Criteria

- Established diagnosis of asthma.
- Active or late sequelae of pulmonary tuberculosis, lung cancer, and other associated respiratory disorders.
- Acute exacerbation in the 4 weeks preceding study entry.
- History of systemic steroid intake in the 4 weeks preceding the study.
- Associated comorbid conditions like Diabetes Mellitus, hypertension, and ischemic heart disease.
- History of any thoracic surgical intervention.

Methodology

Following thorough history, clinical examination, all the participants were subjected to pulmonary function testing. All the key PFT parameters like FEV1, FVC, FEV1/FVC etc were noted. Patients were invited to complete a self-administered questionnaire (Saint George's Respiratory Questionnaire), which is validated a tool to assess health impairment in patients with airways disease such as asthma and COPD. 6 Minutes' Walk Distance was used as an index of functional capacity. During the test, patients were required to walk as far as possible in 6 minutes at their own pace.

Statistical Analysis

SGRO total score was considered as the outcome variable. Baseline character was considered as an explanatory variable. Descriptive analysis was carried out by mean and standard deviation for quantitative variables,

frequency, and proportion for categorical variables. Data was also represented using appropriate diagrams like bar diagram, pie diagram, and box plots. Association between quantitative explanatory and outcome variables was assessed by calculating person correlation coefficient and the data was represented in a scatter diagram.

P value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.

RESULTS

A total of 40 subjects were included in the analysis. The mean age (in years) was 58.63 ± 8.45 minimum age was 46 years and maximum age was 80 years in the study population. The mean height (in cm) was 162.98 ± 5.63, minimum height was 152 cm and maximum height was 173 cm in the study population. The mean weight (in kg) was 61.9 ± 14.23, minimum weight was 39 kg and maximum weight was 97 kg in the study population. The mean BMI was 23.05 ± 4.91, minimum level was 14.50 and maximum level was 33.10 in the study population. The mean fat-free mass index (FFMI) (by calculation) was 16.89 ± 2.78, minimum level was 11.52 and maximum level was 22.70 in the study population. The mean fat-free mass index (FFMI) (by bioimpedance analysis) was 16 ± 2.25, minimum level was 11.93 and maximum level was 20.38 in the study population. The mean smoking index (packs-year) was 42.19 ± 31.03, minimum 2 (packs-year) and maximum 130 (packs-year) in the study population. The mean FVC (% predicted) was 92.8 ± 21.72, minimum percentage predicted was 22.84 and maximum percentage predicted was 130 in the study population. The mean FEV1 (% predicted) was 56.43 ± 22.55, the minimum was 21% and the maximum was 110% in the study population. The mean FEV1/FVC was 48.23 ± 13.78, the minimum was 27 and maximum was 69 in the study population. The mean DLCO (ml/min/mmHg) was 20.28 ± 7.97, minimum level was 8.37 and maximum level was 41 in the study population. The mean wall area (%) was 80.84 ± 4.15, the minimum was 71.98% and the maximum was 90.18% in the study population. The mean low attenuation area (%) was 24.18 ± 16.41, the minimum was 3% and the maximum was 58% in the study population. The mean 6MWD (m) was 434.58 ± 125.47, minimum was 108 m and the maximum were 660 m in the study population. The mean SGRQ total score was 54.07 ± 17.24, minimum score was 17.30 and the maximum score was 84.57 in the study population. The mean hemoglobin (g/dl) was 13.87 ± 1.49, minimum level was 10.30 (g/dl) and maximum level was 17.30 (g/dl) in the study population. The mean total protein (g/dl) was 8.55 ± 8.86, minimum level was 5.60 (g/dl) and maximum level was 63.00 (g/dl) in the study population. The mean albumin (g/dl) was 3.84 ± 0.43, minimum level was 2.90 (g/dl) and maximum level was 4.60 (g/dl) in the study population.

Table 1: Summary of baseline characteristic (N=40).

Baseline characteristic	Summary	Minimum	Maximum
Age (in years) (Mean ±SD)	58.63±8.45	46.00	80.00
Height (in cm) (Mean ±SD)	162.98±5.63	152.00	173.00
Weight (in kg) (Mean ±SD)	61.9±14.23	39.00	97.00
Body Mass Index (kg/m^2) (Mean ±SD)	23.05±4.91	14.50	33.10
Fat-Free Mass Index (by calculation) (Mean ±SD)	16.89±2.78	11.52	22.70
Fat-Free Mass Index (by bioimpedance analysis) (Mean ±SD)	16±2.25	11.93	20.38
Smoking index (pack-years) (Mean ±SD)	42.19±31.03	2.00	130.00
FVC (% predicted) (Mean ±SD)	92.8±21.72	22.84	130.00
FEV1 (% predicted) (Mean ±SD)	56.43±22.55	21.00	110.00
FEV1/FVC (Mean ±SD)	48.23±13.78	27.00	69.00
DLCO (ml/min/mmHg) (Mean ±SD)	20.28±7.97	8.37	41.00
Wall area (%) (Mean ±SD)	80.84±4.15	71.98	90.18
Low attenuation areas (%)	24.18±16.41	3.00	58.00
6MWD (m) (Mean ±SD)	434.58±125.47	108.00	660.00
SGRQ total score (Mean ±SD)	54.07±17.24	17.30	84.57
Haemoglobin (g/dl) (Mean ±SD)	13.87±1.49	10.30	17.30
Total protein (g/dl) (Mean ±SD)	8.55±8.86	5.60	63.00
Albumin (g/dl) (Mean ±SD)	3.84±0.43	2.90	4.60
Triglycerides (mg/dl) (Mean ±SD)	129.92±38.54	64.00	253.00
Total Cholesterol (Mean ±SD)	182.39±30.98	104.00	242.00
CT phenotype			
Airway Dominant (AD) (%)	16 (40%)	-	-
Emphysema Dominant (ED) (%)	15 (37.5%)	-	-
Mixed (%)	4 (10%)	-	-
Normal (%)	5 (12.5%)	-	-

The mean triglycerides (mg/dl) was 129.92 ± 38.54, minimum level was 64 (mg/dl) and maximum level was 253 (mg/dl) in the study population. The mean total cholesterol (mg/dl) was 182.39 ± 30.98, minimum level was 104 (mg/dl) and maximum level was 242 (mg/dl) in the study population. Among the study population, 16 (40%) had airway dominant (AD), 15 (37.5%) had emphysema dominant (ED), 4 (10%) had mixed, and 5 (12.5%) had normal (Table 1).

Among the study population, SGRQ total score median was 46.86 (IQR 31.35 to 54.84) of airway dominant, 65.52(IQR 56.46 to 78.04) of emphysema dominant, 57.59 (IQR 47.35 to 65.91) of mixed and 36.17 (IQR 34.97 to 46.27) of normal. The difference in between Ct phenotype and SGRO total score was statistically significant (P Value <0.001) (Table 2).

Table 2: Comparison of SGRO total sore across CT phenotype(N=40).

CT phenotype	SGRQ total score (Median IQR)	P value (Kruskal Wallis test)
Airway dominant(AD)	46.86 (31.35 to 54.84)	<0.001
Emphysema dominant(ED)	65.52(56.46 to 78.04)	
Mixed	57.59 (47.35 to 65.91)	
Normal	36.17 (34.97 to 46.27)	

There was a weak positive correlation between SGRO total score and age (r value: 0.343, P value: 0.030). There was a weak negative correlation between SGRO total score and BMI (r value: -0.221, P value: 0.171). There was a weak negative correlation between SGRO total score and fat-free mass index (by calculation) (r value: -0.202, P value: 0.212). There was a weak negative correlation between SGRO total score and fat-free mass index (by bioimpedance analysis) (r value: -0.288, p value: 0.072). There was a weak negative correlation between SGRO total score and hemoglobin (r value: -0.178, P value: 0.272).

There was a weak negative correlation between SGRO total score and total protein (r value: -0.111, P value: 0.496). There was a weak negative correlation between SGRO total score and albumin (r value: -0.177, P value: 0.276). There was a weak negative correlation between SGRO total score and FVC (r value: -0.078, P value: 0.633). There was a weak negative correlation between SGRO total score and FEV1 (r value: - 0.281, P value: 0.079). There was a weak positive correlation between SGRO total score and FEV1/FVC (r value: 0.499, P value: <0.001).

There was a weak positive correlation between SGRO total score and smoking index (pack years) (rs value: 0.072, p value: 0.660). There was a moderate negative correlation between SGRO total score and DLCO (r value: - 0.601, P value: <0.001). There was a weak negative correlation between SGRO total score and well area (r value: - 0.298, P value: 0.062). There was a weak negative correlation between SGRO total score and 6MWD (r value: -0.397, P value: 0.011). There was a weak positive correlation between SGRO total score and low attenuation areas (rs value: 0.606, P value: <0.001). There was a weak negative correlation between SGRO total score and 6MWD (r value: -0.397, P value: 0.011) (Table 3).

Table 3: Correlation between age and SGRO total score in the study population (N= 40).

Parameter	Pearson Correlation	P value
Age	0.343	0.030
Nutritional parameters		
BMI	-0.221	0.171
Fat-free mass index (by calculation)	-0.202	0.212
Fat-free mass index (by bioimpedance analysis)	-0.288	0.072
Hemoglobin	-0.178	0.272
Total protein	-0.111	0.496
Albumin	-0.177	0.276
Pulmonary function test		
FVC (% predicted)	-0.078	0.633
FEV1 (% predicted)	-0.281	0.079
FEV1 /FVC	0.499	<0.001
Smoking index (pack years)	0.072	0.660
DLCO	-0.601	<0.001
Well area	-0.298	0.062
Low attenuation areas	0.606	<0.001
6MWD	-0.397	0.011

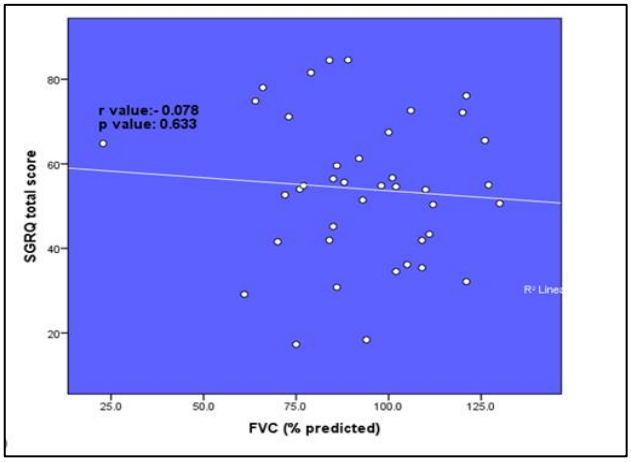


Figure 1: Correlation between FVC (% predicted) and SGRQ total score in the study group(N=40).

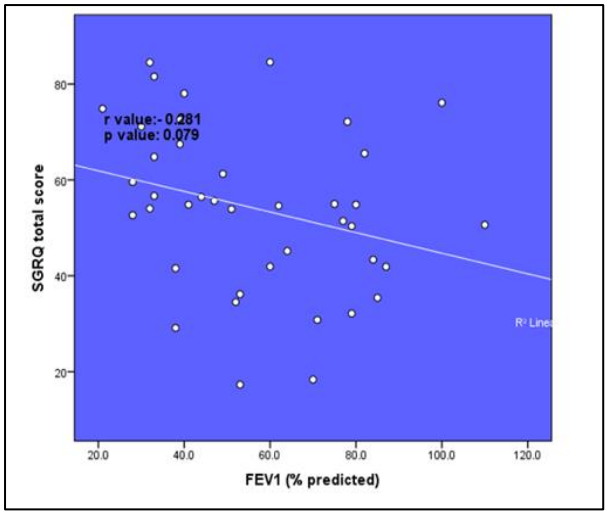


Figure 2: Correlation between FEV1 (% predicted) and SGRQ total score in the study group(N=40).

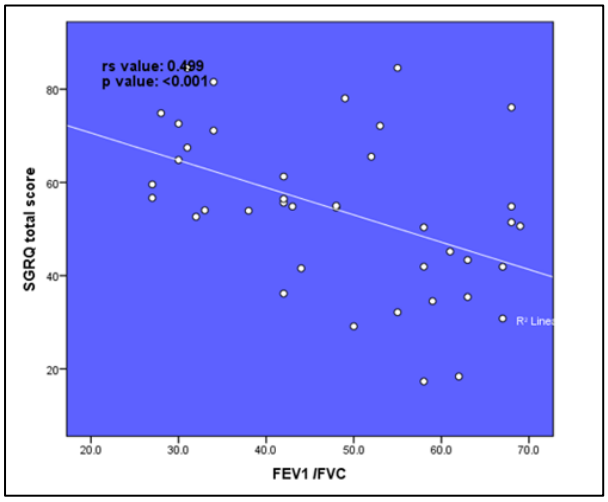


Figure 3: Correlation between FEV/FVC (% predicted) and SGRQ total score in the study group(N=40).

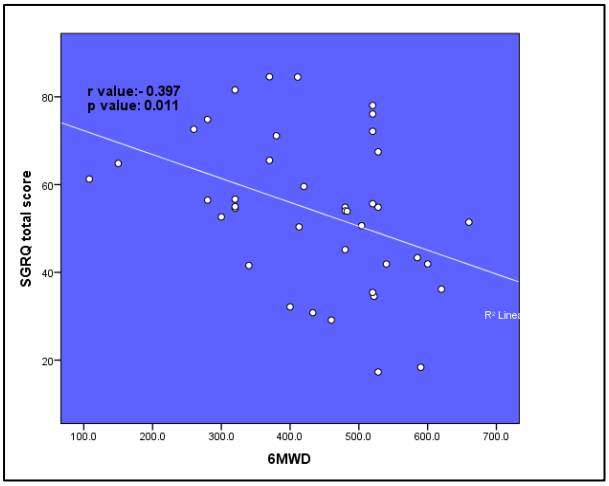


Figure 4: Correlation between 6MWD and SGRQ total score in the study group(N=40).

DISCUSSION

COPD is associated with several manifestations occurring systemically which result in impaired functional capacity, worsening dyspnea, and increased morbidity which can't be quantified by spirometry.[20,21] HRQL is a valid measure of disease activity in patients with COPD and should be considered, in addition to lung function, to more properly assess patients with COPD. So, we used Respiratory disease-specific SGQR to assess the respiratory morbidity related quality of life and 6 Minute Walking Test to assess the functional exercise tolerance in terms of the changes of walking distance.[22] We conducted present study on 40 male COPD subjects aged more than 45 years., divided them into 4 groups based on CT phenotype as normal, Airway Dominant (AD), Emphysema Dominant (ED) and mixed types. We assessed the various clinical, spirometry and nutritional indices among these phenotypes with relation to SGRQ scores.

Our baseline study population comprised of only males, similar to that of Domingo-Salvany A et al, Chen LF et al. Seemungal TA et al also reported that nearly 75% of their participants were males with Engstrom CP et al reporting that nearly two-third of their participants were males.[13,14,15,17] The mean age of present study population was lower (58.63±8.45 years) compared to other studies (60 to 75 years), which may be due to the fact that over the years, with an increase in awareness and accessibility to healthcare facilities, subjects with COPD are being reported at earlier ages. Similar to present study participants, Chen LF et al17 also reported a mean BMI in the range of 22 to 24.[17] Marti S et al (2006) have reported that in COPD, BMI was one of the significant predictive factors of respiratory mortality.[23] In present study, the difference of age across various phenotypes was statistically significant and it may be due to the early onset presentation of symptoms in the AD group. In present study population, 40% had airway dominant (AD) CT phenotype which was the most frequent. About 37.5% had emphysema dominant while 10% had a mixed phenotype. 12.5% of present study subjects had normal CT appearance.

The mean SGRQ score in present study was 54.07±17.24 with a minimum of 17.3 and a maximum of 84.57. Normal scores in SGRQ range between 0 (no impairment) to 100 (Worst possible health).[19] Similar to present study, Osman IM et al reported a mean score of 52.7±13.1 while Engstrom CP et al reported a mean of 46.0 ± 18.3 and Seemungal TA et al reported a similar score of 48.9±15.6 in those with less than 2 exacerbations of COPD in a year.[14,15,24] This minor difference may be due to subjects presenting at various stages of COPD in various studies and treatment received.

Among the study population, SGRQ total score median was 46.86 (IQR 31.35 to 54.84) of airway dominant,

65.52 (IQR 56.46 to 78.04) of emphysema dominant, 57.59 (IQR 47.35 to 65.91) of mixed and 36.17 (IQR 34.97 to 46.27) of normal. The median SGRQ score was highest in the Emphysema dominant subjects at 65.52 while it was lowest in the normal CT phenotypes at 36.[17] This difference of 29.35 in SGRQ scores between the groups was statistically significant (P Value <0.001). In present study, we compared the SGRQ scores across the various phenotypes, while other authors compared it across groups characterized by COPD excaerbations, FEV1 scores.[14,15,16]

The Mean 6MWD in present study was 434.58±125.47 meters. Chen LF et al in their study reported a slightly lower distance of 380.6±51.9 meters in their study while Engstrom CP et al reported only a mean 6MWD of 260.7 ±95.7 meters in their study. This difference may be due to the inclusion of severe COPD patients in their studies who had restricted mobility.[14,17]

COPD is a disease associated with several systemic manifestations, resulting in significant disability with progressive disease. Measures of lung function such as FEV1 may not accurately predict disability. Respiratory disease-specific questionnaires, such as the SGRQ, provide sensitive measurements of disturbance to daily life and well-being. So, we assessed the correlation between SGRQ total scores and various clinical, nutritional, PFT parameters in present study. In present study, the correlation between nutritional parameters like BMI, FFMI, Hb was negative (weak) and also statistically not significant (p>0.05). The statistically significant parameters in present study which had a correlation with SGRQ total score were Age (r=0.343), 6MWD (-0.397), FEV1 /FVC (0.499), DLCO (-0.601, p <0.001), Low attenuation areas in CT (0.606).

With regards to spirometry, both FEV1 and FVC had weak negative correlation with SGRQ scores which was statistically not significant in present study (p>0.05). Engstrom CP et al also observed a negative correlation with FEV1 (0.42, p <0.001) in their study.[14] Similar to present study Obaseki DO et al also observed a weak negative correlation of SGRQ total scores with FEV1 (-0.31, p < 0.05) FVC (-0.24, p>0.05).[25] In present study, FEV1/FVC had a moderately positive correlation with SGRQ total score which was statistically very significant (p < 0.001). Similar to present study, Dourado VZ et al in their study found statistically significant moderate correlations of SGRQ impact scores with FEV1/FVC (r = -0.61; p = 0.014).[26] But Obaseki DO et al observed a nonsignificant weak negative correlation (r=−0.18) in their study.[25] In present study with regards to functional parameters, there was a statistically significant weak negative correlation between SGRQ total score and 6MWD (r value: -0.397, P value: 0.011). Similarly, Engstrom CP et al14 (r = - 0.61) and Obaseki DO et al (r= -0.3) also observed a statistically significant negative correlation in their study. [25]

In present study, there was a weak positive correlation between SGRQ total score and age (r value: 0.343, P value: 0.030) which was statistically significant. In contrast to present study, Obaseki DO et al in their study observed that correlation with age was not significant.[25] They also observed that correlation with smoking index in pack-years was not significantly similar to present study. But Engstrom CP et al in their study observed little or no correlation between age, sex, and SGRQ scores.[14]

It has also been observed that subjects with poor SGRQ scores are at greater risk of hospital re-admission. Health-Related Quality of Life has become a central feature of studies in COPD as the treatment in COPD is largely symptomatic.[24] So, there is a need for better understanding of measures such as SGRQ which can aggregate into a single score the summed effect of the multiple pathophysiological processes that involve different organs and systems, which is addressed by present study. It was a hospital-based survey and as such, the participants included in the study may be skewed towards the very sick patients. A larger multi-centre study involving females, COPD with different severity, and correlation with the subparts of SGRQ scores–symptoms, impact, action is needed. Patients often do not access health care in low resource settings until their clinical condition becomes very dire because of the cost of care. This potentially limits the ability to generalize the results of this study to all COPD patients. Various aspects such as anxiety, depression which may interfere with QOL could not be studied due to practical reasons.

CONCLUSION

Physiologic measurements alone cannot give a complete picture of the morbidity and mortality in COPD. The measurement of HRQL (Health Related Quality of Life) allows us to obtain a better picture of how patients are affected by their illness. The use of quality of life instruments such as SGRQ holds potential use in rural and suburban health facilities in developing countries where access to spirometry and other objective measures of lung function may be lacking. 6MWD, FEV1/FVC, DLCO had an influence on the quality of life as measured by SGRQ scores in present study. Present study concludes that these parameters with significant correlation with SGRQ total score can be focused and followed upon during treatment and prognosis rather than giving symptomatic treatment alone with further future evidence.

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