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Health Status and Quality of Life in Chronic Obstructive Pulmonary Disease Patients: Correlation with Airflow Limitation at a Tertiary Care Centre

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ABSTRACT

Background: Similar to other illnesses, Chronic Obstructive Pulmonary Disease (COPD) tremendously impacts the quality of life and health status of patients. Measurement of parameters for COPD is important for complete disease management. The association between lung function and health status may help in adjusting individualized treatment plans.

Objective: To evaluate the health status and quality of life (QOL) of COPD patients, utilizing validated measurement instruments, and to assess their association with airflow limitation.

Methodology: This cross-sectional study included 120 COPD patients. All study cases were assessed using the COPD Assessment Test (CAT), Clinical COPD Questionnaire (CCQ), and St. George's Respiratory Questionnaire (SGRQ). For study cases, few additional tools also included like the Sleep Impact Scale (CASIS), the Functional Performance Inventory-Short Form (FPI-SF), and the COPD and Asthma Fatigue Scale (CAFS). Airflow limitation was measured by spirometry. For data analysis, SPSS version 25 was used.

Results: Results of the present showed a strong correlation between health status scores and airflow limitation ($p < 0.001$). Results showed that increased COPD severity was linked to higher CAT and CCQ scores (kappa = 0.33, $p < 0.001$). The results support the use of these assessment tools for evaluating disease severity and quality of life in patients with COPD.

Conclusion: The present study concluded that integrating Health-Related Quality of Life (HRQL) measurement tools into routine COPD management provides a practical alternative for assessing severity of disease in settings where spirometry is unavailable or its use is limited.

Keywords: COPD; Health-Related Quality of Life; Spirometry; GOLD Guidelines

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a prevalent and progressive lung disease defined by a chronic limitation of airflow and a persistent inflammatory response in the lungs and airways. COPD is caused by inhalation of noxious particles or gases (e.g., tobacco smoke, environmental exposure).[1] It is one of the top causes of morbidity and mortality globally, being ranked the 3rd most common cause of death globally. The burden of COPD is comprised of low- and middle-income countries.[2] In Pakistan, the prevalence of COPD is increasing. In addition to high rates of smoking, the use of biomass fuel indoors, air pollution of urban areas, and occupational exposure to toxic fumes, COPD is linked to pollution and chronic bronchitis.[3]

Historically, the diagnosis and assessment of COPD severity have focused on spirometric tests, particularly the forced expiratory volume in one second (FEV1), as recommended by the Global Initiative for Chronic Obstructive Lung Disease (GOLD).[4] Spirometric tests alone might not capture the entire clinical profile of the disease. Individuals with comparable airflow limitations can have various degrees of dyspnea, exercise tolerance, and psychosocial distress. This suggests that impairment of lung function does not necessarily correlate with health-related quality of life (HRQL).[5] The realization has resulted in the application of multi-dimensional measures that assess both objective physiological alterations and subjective perception of health.

Past GOLD revisions have identified a full strategy for assessing COPD. This involves examining symptom burden, frequency of exacerbations, and health-related quality of life (HRQL) during routine evaluations.[4] Measurement instruments such as the COPD Assessment Test (CAT) and the Clinical COPD Questionnaire (CCQ) are highly validated for determining the impact COPD has on everyday life and management of symptoms.[6] These devices assist in individualized treatment strategies. They provide clinicians with a clearer picture of disease severity, beyond spirometry, and enable them to track disease progression and treatment response over time.

Despite their global applicability, there is limited evidence available regarding the use and interpretation of these HRQL instruments among the Pakistani population. Variability of culture, language, and healthcare systems can influence patient-reported outcomes and may compromise the reliability and validity of questionnaires in local settings.[7,8] Moreover, in resource-poor settings where diagnostic spirometry might be limited, symptom-based instruments may provide a convenient alternative to inform clinical decisions.[9]

The purpose of this study is to investigate the relationship between airflow limitation and health-related quality of life in patients with COPD at a tertiary care center in Pakistan. Spirometry is crucial for the diagnosis and staging of COPD, but it tends not to accurately reflect patients' day-to-day experiences. With the help of proven health-related quality of life instruments such as the CAT and CCQ, disease management can be optimized, particularly in resource-limited healthcare settings. By investigating the relationship between subjective and objective measures, this research aims to provide local evidence that may motivate the integration of health-related quality of life assessment within routine clinical practice. This will ensure more well-rounded and patient-focused care for COPD.

Objective

To assess the health status and quality of life (QOL) of COPD patients, using validated assessment tools, and to evaluate their correlation with airflow limitation.

Methodology

A cross-sectional analysis was conducted at the Department of Pulmonary Medicine, Bolan Medical College, Quetta, from April 2022 to August 2023. A total of 120 COPD patients were enrolled in this study. Selection of patients were according to GOLD 2020 guidelines and informed consent were obtained from all the study cases. Inclusion criteria include patients aged 18 years and above with confirmed COPD. On the other hand, those patients having acute exacerbations, critical illness, or comorbid conditions such as tuberculosis, carcinoma, severe cardiovascular disease, or renal impairment were excluded. Pregnant or lactating women, as well as patients who were unable to undergo spirometry or complete the questionnaires, were also excluded from this study.

Demographic and clinical data were collected from each participant. They were classified into GOLD grades 1-4 and based on their forced expiratory volume in 1 second (FEV1), using their pulmonary function and spirometry as established in guidelines. They were also assessed using other HRQL assessment tools; the COPD Assessment Test (CAT), Clinical COPD Questionnaire (CCQ), St. George's Respiratory Questionnaire (SGRQ), COPD and Sleep Impact Scale (CASIS), Functional Performance Inventory-Short Form (FPI-SF), and COPD and Asthma Fatigue Scale (CAFS). The questionnaires assess the severity of symptoms, functional limitations, sleep disturbance, and fatigue in patients with COPD.

For data analysis, IBM SPSS Statistics version 22.0 was used. Initially, descriptive statistics were used to summarize both categorical and numerical variables. The Kolmogorov-Smirnov test was used to determine if the data followed a normal distribution. Accordingly, normally distributed data were presented as mean ± standard deviation, while skewed data were shown as median and

interquartile range. Furthermore, the relationship between spirometry results and HRQL scores was assessed using the Spearman correlation coefficient. Throughout the analysis, a p-value of less than 0.05 was considered statistically significant.

Results

A total of 120 patients with COPD were included in this study. The majority of patients were aged 60 years or older (45.9%), with a significant proportion between 51 and 60 years (35.8%). Males constituted the vast majority (96.7%) of the study population. More than half of the participants (53.3%) resided in rural areas, and a considerable portion (70.8%) were illiterate. Additionally, 29.1% of the patients were engaged in labor or agricultural work, indicating a potential occupational risk factor for COPD (Table 1).

Table 2 presents the correlation between CAT and CCQ scores and the percentage of FEV1 predicted. Higher CAT scores, reflecting worse COPD symptoms, are associated with lower %FEV1 ($p < 0.001$). Similarly, patients with higher CCQ scores, indicating severe disease impact, have lower %FEV1 values ($p<0.001$). This strong inverse relationship shows that worsening symptom burden and quality of life are associated with declining lung function in COPD.

Table 3 shows the correlation between GOLD grade and health-related quality of life (HRQL) scores (CAT, CCQ, SGRQ). As COPD severity increases from mild (GOLD 1) to very severe (GOLD 4), mean HRQL scores rise, reflecting worsening symptoms, greater disease impact, and lower quality of life ($p<0.001$). Patients with GOLD 4 COPD have the highest CAT, CCQ, and SGRQ scores, indicating significant functional limitations and disease burden. This correlation highlights COPD's progressive nature and the need for comprehensive assessment.

Discussion

This research was conducted to identify how airflow limitation (as calculated by spirometry) correlates with the quality of life in patients with COPD. Our findings clearly indicate that patients with a greater severity of COPD, as classified by GOLD grades, had poorer scores on questionnaires assessing quality of life, such as CAT, CCQ, and SGRQ. That is, when lung function declined, patients reported more symptoms, greater difficulty with

Table 1. Demographic and Clinical Characteristics of the study cases

Characteristic	Number (%)
Age	
41-50	22 (18.3%)
51-60	43 (35.8%)
>60	55 (45.9%)
Gender	
Males	116 (96.7%)
Females	4 (3.3%)
Residency	
Rural Residence	64 (53.3%)
Urban Residence	56 (46.7%)
Literacy Rate	
Illiterate	85 (70.8%)
Employed in Labor/Agriculture	35 (29.1%)

Table 2. Correlation Between CAT, CCQ Scores and Lung Function

CAT Score Group	%FeV1 Predicted (Mean ± SD)
0-10 (Low)	65.2 ± 14.1
11-20 (Medium)	52.9 ± 13.3
21-30 (High)	38.5 ± 14.0
31-40 (Very High)	27.0 ± 10.5
p-value	<0.001
CCQ Score Group	%FeV1 Predicted (Mean ± SD)
<1 (Acceptable)	68.0 ± 12.1
1-2 (Moderate)	57.9 ± 12.3
2-3 (Severe)	45.2 ± 14.0
≥3 (Very Severe)	33.0 ± 11.6
p-value	<0.001

everyday activities, and overall poorer health.8 These results serve to underscore that depending solely on lung function measures such as FEV_1 does not tell the full story of how severely COPD impacts a patient's quality of life. Rather, incorporating patient-reported outcome measures provides a richer and more informative picture.

The research conducted by Ibrahim et al. (2021) revealed that poor health-related quality of life is common among southern Indian patients with COPD, with chest pain and dyspnea associated with poor SGRQ-C scores. The results highlight the necessity of community awareness and physician sensitization to address the everyday impact of COPD.[9] Another investigation, Pati et al. (2021), discovered that COPD considerably disables health-related quality of life (HRQoL) in elderly patients, women, rural dwellers, and those with increased comorbidities.[10]

If we compare our findings with those of international studies, we notice the same exact pattern. Ghobadi et al. (2012) demonstrated that CAT scores increase with decreasing FEV_1, indicating a greater symptom burden with deteriorating airflow limitation.[11] The CCQ has also been validated in various countries and consistently indicates a high correlation with disease severity and functional limitation. The SGRQ, which is more precise, has been extensively applied in both hospital and community environments. In a study by Konwar, it was found that SGRQ scores increase substantially as the GOLD stage progresses from mild to very severe.[12] Our results are hence in concurrence with these genuine studies, validating that symptom-based questionnaires are effective tools in the management of COPD.

Other research also shows that these questionnaires measure not only symptoms but also predict outcomes and risks. For instance, CAT and CCQ were found to correlate with the BODE index. This index predicts survival and hospitalizations. Studies by Singh et al. (2018) and Kaur et al. (2022) revealed that CAT and CCQ scores correlated significantly with lung function (FEV_1%), BODE index, and its components, proving their reliability.[13,14] This means patients with higher CAT or CCQ scores will have poorer outcomes, even if their lung function is not very poor. This is very relevant because it shows that questionnaires like CAT and CCQ are not only easy and time-efficient but also meaningful for guiding treatment.

Our research also addresses the local context in Pakistan. Most of our patients were of advanced age, male, and rural, with a significant proportion of them illiterate. Many were engaged in agricultural or labor work, exposing them to dust, biomass fuel smoke, and occupational hazards. These results align with earlier local studies that identify smoking, biomass fuel use, and indoor air pollution as key causes of COPD in Pakistan. A meta-analysis of 35 studies by Pathak et al. (2020) suggests that exposure to indoor air pollution from biomass fuels greatly increases the risk of COPD (OR 2.65) and chronic bronchitis (OR 2.89). The most significant link was found in Africa and Asia. This points to biomass smoke as a major global risk

Table 3. Correlation Between GOLD Grade and HRQL Scores

GOLD Grade	CAT (Mean ± SD)	CCQ (Mean ± SD)	SGRQ (Mean ± SD)
1 (Mild)	13.1 ± 5.6	1.50 ± 0.97	22.8 ± 10.5
2 (Moderate)	17.2 ± 4.9	2.05 ± 0.63	35.3 ± 12.9
3 (Severe)	21.8 ± 3.8	2.60 ± 0.46	49.0 ± 11.7
4 (Very Severe)	25.6 ± 3.7	3.05 ± 0.41	55.2 ± 9.9
p-value	<0.001	<0.001	<0.001

factor for COPD.[15] In such populations, where access to advanced investigations such as spirometry may be low, simple measures like CAT and CCQ can be very helpful. No machines are required for these, making them suitable for use in outpatient departments or even primary care facilities.

Our findings are significant because they confirm that simple questionnaires, such as the CAT and CCQ, provide important data that extend beyond lung function, supporting their use. This is also supported by international data. The current GOLD guidelines state that COPD must be assessed not just by spirometry but also by symptoms, exacerbation history, and patient-reported outcomes. This reinforces our findings.

Lung function tests indicate the extent of lung damage. Patient questionnaires reveal the extent to which life is disrupted for the individual. Both are important for managing COPD. In healthcare systems with limited resources, such as those seen in Pakistan, spirometry may not always be available. Routine use of the CAT and CCQ can offer significant value in diagnosis, follow-up, and treatment decisions.

Conclusion

Overall, COPD has an influence on the life of the individual in all dimensions, beyond its common assessment of lung function. The current study enhances the evidence for this comment, demonstrating an association between spirometric indices (such as FEV1%) and an array of relevant health-related quality-of-life measures, including CAT, CCQ, and SGRQ. It is noted to be escalating severity of disease exacerbates symptoms and functional impairment, and decreases quality of life. This study highlighted that COPD assessments are multi-dimensional, and that combining spirometry with Health-Related Quality of Life (HRQL) tools gives a complete picture of the disease burden. Bringing these assessments into the clinical setting and applying an integrated approach is critical for improving the management of the disease, facilitating early intervention, and ultimately enabling a focus on person-centred care. The future research should use longitudinal investigations to assess how a standardized package of HRQL tools can be introduced to track patients longitudinally to assess survivorship and long-term disease progression and treatment outcomes.

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