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Original Research Article

Mental health, sleep and quality of life in patients with chronic obstructive pulmonary disease: a correlational study

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ABSTRACT

Background: Co-morbid psychological impairments (depression and anxiety) are common in COPD and are often associated with increased disability, health care usage and morbidity. They also impair quality of life in COPD and are often not fully explored in the clinical management of COPD patients. Psychological distress may, however, contribute to sleep difficulties in all stages of disease severity. Both anxiety and depression have been shown to have a negative effect on the sleep and quality of life (QoL). Objectives was to study the correlation between depression, anxiety and sleep with quality of life in patients with COPD.
Methods: In a Tertiary Care Hospital, this Observational study was conducted on 39 patients of age group 40-70 years, with spirometry confirmed COPD GOLD category I-IV and smokers with more than 5 years of disease who fulfilled the inclusion criteria were enrolled in the study. Quality of life was assessed using SGRQ-C, SF-12 and CAT. Depression, Anxiety and Sleep were assessed using PHQ-9, GAD-7 and PSQI questionnaires respectively. The correlation between quality of life scores and mental health scores were analysed using Pearson's correlation coefficient.
Results: Anxiety was significantly correlated with all the sub domains of SGRQ-C, PCS, MCS of SF-12 and the CAT score. (p value <0.001) Similarly, sleep was significantly correlated with all the three QoL Scales. (p value< 0.001) However, depression significantly correlated with all the subdomains of SGRQ-C and CAT except activity sub-domain of SGRQ-C and MCS of SF-12 (p value<0.001).
Conclusions: Anxiety, Depression and Sleep moderately correlated with QoL scores in patients with COPD.

Keywords: Anxiety, COPD, Depression, Quality of life, SGRQ-C

INTRODUCTION

COPD is one of the principle causes of major morbidity and mortality that affects the population worldwide with higher incidence in men than women.[1] Nearly half of all Chronic Obstructive Pulmonary Disease (COPD) patients suffer from mental health conditions, such as depression and anxiety. The impact of these disorders on quality of life remains poorly understood.[2-5] Previous research has shown that there is a high prevalence of anxiety and depression among COPD patients and psychological distress has a profound impact on how persons with COPD experience and manage their disease.[6] Sleep disturbance has been found to be the third most common symptom associated with COPD, and studies have revealed that low total sleep time, frequent arousals and awakenings, and reduced amount of slow wave and rapid eye movements seem to characterize the sleep of COPD

patients.[7] Sleep disturbance in patients with severe COPD may be related to symptoms, such as nocturnal cough, wheezing and dyspnea as a consequence of impaired pulmonary functions and gas exchange during sleep.[6]

The presence of depression in COPD may have additive effects on sleep quality which is also a major determinant of health related quality of life in COPD and their day time symptoms.[7] Thus, increased efforts to diagnose and to treat poor sleep quality in COPD patients may improve their quality of life. Sleep impairment not only worsens quality of life but also aggravates symptoms of underlying medical disorder.[6] Thus, further investigations of associations between sleep problems, psychological distress and health status in COPD is needed, thus the rationale of the present study. Disease-specific quality of life is being recognised as an important outcome when evaluating patients with COPD because it facilitates understanding of the impact of the disease on patient's lives.[8]

More recently, some reviews have highlighted the negative impact of psychological comorbidity on HRQoL in COPD patients and have found association between psychological impairment (i.e. anxiety and/or depressive symptoms) and worse respiratory-specific HRQoL, independent of COPD severity, however less attention is paid to poor sleep quality and alterations in sleep.[9]

There is a complex interaction between factors like anxiety, depression and sleep with marked reduction in exercise capacity, reduced mobility and life style restrictions resulting in impaired quality of life. Mental health and sleep are often neglected aspects which have major impact on quality of life of COPD patient. Very few studies are available wherein sleep is included in the mental aspect of health and very few studies are available in Indian scenario is the rationale for conducting the present study.

METHODS

An observational study was carried out at a Tertiary Care Academic Institute in Central India, with a primary objective to correlate depression, anxiety and sleep scores of chronic obstructive pulmonary disease patients as measured by PHQ-9, GAD-7 and PSQI respectively and their health status evaluated by health-related quality of life (HRQoL) questionnaires namely, St. George's respiratory questionnaire-C (SGRQ-C), Short-form-12 (SF-12) and COPD Assessment Test (CAT). The secondary objective was to correlate disease severity as evaluated by (GOLD staging and mMRC dyspnea scale) with depression, anxiety, sleep and QoL scores. The subjects were clinically stable cases of COPD attending Pulmonary Medicine OPD between the age group of 40-70 years of either gender, with duration of symptoms for at least 5 years, irrespective of smoking status and spirometry confirmed COPD Gold category I-IV, were included in the present study. COPD patients with acute or recent history of exacerbation or on home oxygen therapy with co-morbid conditions namely asthma, tuberculosis, diagnosed cancer, uncontrolled hypertension, uncontrolled diabetes mellitus, cardio-vascular, neurological and/or osteoarticular disease with functional limitations, psychiatric illness, cognitive limitations, and patients not willing to participate were excluded. Patient's detailed history, baseline demographic data and disease severity evaluation were recorded in a pre-designed proforma. The study factors like depression, anxiety and sleep scores were recorded using PHQ-9, GAD-7 and PSQI questionnaires respectively. Quality of life questionnaires namely SGRQ-C, SF-12 and CAT were administered in their local dialect and scores were recorded.

Statistical analysis was done using Epi Info software version 6. Pearson's Correlation was used at a level of significance (p=<0.05). Sample size was calculated considering social functioning component of SF-36 and anxiety as correlational measures derived from a study by Cully et al, in 179 COPD patients with a weighted Pearson score of 0.0434, considering alpha at 0.05 and beta of 0.2, the sample size calculated was 39.

RESULTS

A total of 39 patients were enrolled in the study, of them 36 were males and 3 were females with mean age of 57.28±8.098 and 56.66±12.05 respectively (Range 41-70 years). The mean Body mass Index (BMI) of the patients was 21.55±4.49 with a range of 12.19 to 32.6. The mean duration of disease as ascertained by the symptoms was 7.82±5.17 with a range of 5 to 26 years.

Out of 39 patients, 3 (7.69%) patients were non-smokers, 26 (66.66%) were smokers with 25.56±13.45 mean pack-years of smoking and 5(12.82%) patients had biomass smoke exposure. Five patients had other causes of smoke exposure. On evaluation of disease severity using GOLD staging, 17(43.58%) patients were in stage 2 and 08 patients, (20.51%) each in stage 1 and 4 and rest 6 (15.38%) patients were in stage 3. On assessment of dyspnoea using mMRC scale, 17 (43.58%) patients belonged to grade 2, 15 (38.46%) patients to grade 3, rest were 5 (12.82%) in grade 4, and 2 (5.12%) in grade 1 and none were in grade 0 (Table 1).

29 (74%) patients had varying degrees of symptoms of anxiety. The mean anxiety score as recorded by GAD-7 was 9.23±4.46 with 7 (17.9%) subjects having mild anxiety, 14 (35.89%) having moderate anxiety and 8 (20.51%) having severe anxiety. Likewise, 32 patients were found to have varying degrees of depression on PHQ-9 Scale, with a mean of 11.51±5.90. 7 (17.94%) patients had mild depressive symptoms, 14 (35.89%) had moderate symptoms, 8 (20.51%) had moderately severe symptoms and 3 (7.69%) had very severe depressive symptoms. It is stated that score >= 5 is said to have sleep disturbances in patient population. In our study, 35

(89.74%) COPD patients reported with sleep problems (score>5). In the present study, the mean QoL scores for total SGRQ-C was 65.771 ± 17.552, the physical health component score of SF-12 was 32.761±8.171, the mental health component score of SF-12 was 36.666±9.962 and the mean CAT was 23.794±6.530, as observed across the varying disease severity states, which implies that most of the patients had a moderately affected health status in our patient population according to CAT scoring.[9]

Table 1: Mean and standard deviation for age BMI, duration of disease, smoking and disease severity parameters.

Parameter	No. of Patients	Mean ±SD	Range
Age	Male- 36	57.285±8.098	41-70
	Female-3	56.666±12.055	
BMI		21.55±4.493	12.19-33
Duration of disease (Years		7.820± 5.170	5-26
Gold stage	I 8	2.358±1.038	1-4
	II 17		
	III 6		
	IV 8		
MMRC Grade	1 2	2.589±0.785	1-4
	2 17		
	3 15		
	4 5		
FEV1		53.128±21.007	13-92
Duration of smoking in years		20.28±16.08	5-60

On carrying out correlational analysis, Anxiety showed statistically significant moderate correlation with the symptom, impact and total SGRQ-C scores (r=0.529, p value=0.0005, r=0.656, p value <0.0001 and r=0.657, p value<0.0001 respectively) and CAT score (r=0.754, p value<0.0001). However, weak correlation was found between anxiety and physical component summary, mental component summary of SF-12, and activity sub-domain of SGRQ-C. (r=-0.403, p value=0.011, r=-0.445, p value=0.004, r=0.476, p value=0.002) respectively.

Depression showed moderate correlation with impact and total SGRQ-C scores (r=0.610, p value <0.0001, r=0.524, p value=0.0006 respectively) and CAT score (r=0.675, p<0.001). Depression weakly correlated with physical component summary score of SF-12 and symptom SGRQ-C score (r=-0.403, p value=0.011, r=0.483, p value=0.0018) respectively. There was no association found between depression scores and mental component summary score of SF-12 and activity sub-domain of SGRQ-C. These findings indicate that mental health distress is strongly related to health status affecting the physical component more than mental component.

Sleep showed moderate correlation with activity, impact and total SGRQ-C scores, physical component summary score of SF-12 and CAT score. (r=0.514, p value=0.0008, r=0.603, p value<.001, r=0.626, p value<0.0001, r=-0.560, p value=0.002, r=0.656, p value<0.001) respectively. These findings indicate that sleep alterations can present as activity limitations. However, the symptom SGRQ-C and mental component summary score of SF-12 showed no correlation with the sleep (Table 2).

Table 2: Correlation of anxiety (GAD-7), depression (PHQ-9) and sleep (PSQI) scores with various parameters with QOL scores.

Correlation of anxiety (GAD-7), depression (PHQ-9) and sleep (PSQI) scores with SGRQ-C score, SF-12, CAT score								
		SGRQ-C				SF-12		CAT Score
Parameters/ HRQoL		Symptom score (%)	Activity score (%)	Impact score (%)	Total score (%)	Physical health score	Mental health score	
GAD-7	r	0.529	0.476	0.656	0.657	-0.403	-0.445	0.754
	p-value	0.0005	0.002	<0.001	<0.0001	0.011	0.004	<0.0001
PHQ-9	r	0.483	0.268	0.610	0.524	-0.403	-0.217	0.675
	p-value	0.0018	0.09	<0.0001	0.0006	0.011	0.184	<0.0001
PSQI	r	0.472	0.514	0.603	0.626	-0.560	-0.355	0.656
	p-value	0.0024	0.0008	<0.0001	<0.0001	0.0002	0.026	<0.0001

r=Pearson's correlation, p value=Statistical Significance.

There was no correlation found between GOLD stages and scores of various qualities of life questionnaire scores. The mMRC dyspnea grade was found to be moderately correlated with impact and total score of SGRQ-C and CAT score (r=0.415, p value=0.008, r=0.525, p value=0.0006, r=551, p value=0.0002 and r=0.527, p value=0.0005 respectively). No correlation was found with generic questionnaire SF-12 (Table 3).

DISCUSSION

In recent study, correlational analysis was used in order to determine the relationship between mental health and

various scales of QoL (generic and disease specific) in patients with COPD of varying disease severity. COPD is a highly incapacitating health problem affecting physical functioning, leisure and professional activities as well as emotional and sexual relationships.[10] Symptoms of fatigue and dyspnea affects patient's exercise tolerance, having a major impact on their ability to carry out daily activities, thus resulting in reduced quality of life. Health-related QOL assessment is performed using either generic or disease-specific questionnaire and is more specific as it includes dimensions such as general health status, mental, psychological and sleep status, ability to proceed with daily life and social activities and is frequently used as an outcome measure and a major goal of patient care.[6]

Table 3: Correlation of mMRC, GOLD staging with SGRQ-C, SF-12 and CAT.

Parameter	Correlational coefficient/statistical significance	SGRQ-C				SF-12		CAT
		Symptom score	Activity score	Impact score	Total SGRQ score	PCS	MCS	CAT score
GOLD staging	r	0.005	-0.059	0.029	0.052	-0.186	-0.020	0.127
	p- value	0.975	0.721	0.860	0.753	0.256	0.903	0.441
mMRC	r	0.229	0.415	0.525	0.551	-0.172	-0.239	0.527
	p-value	0.160	0.008	0.0006	0.0002	0.295	0.142	0.0005

r=Pearson's correlation, p value=Statistical Significance.

St. George's respiratory questionnaire is useful instruments to quantify the patient's perception of the general effects of COPD on their daily life and well-being.[10] It has a total score and three component score for: symptoms, activity and impact; each score ranges from 0 (no impairment) to 100 (worst possible). The SF-12 is a generic measure and does not target a specific age or disease group. It has been developed to provide a shorter, yet valid alternative to the SF-36, which has been seen by many health researchers as too long to administer to studies with large samples. The SF-12 is weighted and summed to provide easily interpretable scales for physical and mental health.[11] CAT (COPD assessment test) is developed as a short, validated COPD specific questionnaire for assessing the impact of COPD on health status. It provides a reliable measure of overall COPD severity from the patient's perspective, independent of the language. CAT, a simple short questionnaire, is also used in this present study for assessing QOL in patients with COPD.[12]

The presence of anxiety was assessed by GAD-7, Depression was assessed by PHQ-9 and Sleep disturbances were assessed by PSQI scale.[6] Generalised anxiety disorder-7 (GAD-7) total score for the seven items ranges from 0 to 21. Score of 5, 10 and 15 represents cut points for mild, moderate, and severe anxiety, respectively. It is designed primarily as a screening and severity measure for generalised anxiety disorder.[13] Patient health questionnaire-9 (PHQ-9) total score for nine items ranges from 0 to 27. Scores of 5, 10, 15 and 20 represents cut points for mild, moderate and moderately severe and severe depression respectively.[13] The pittsburgh sleep quality index (PSQI) is a self-assessment scale developed to provide information on the subjective quality of sleep. It is validated, standardized and reliable tool, the final score ranges from 0 (better sleep) to 21 (worst sleep), where a value >5 indicates the presence of sleep disorder.[7]

Statistically significant mild- moderate correlation of anxiety as recorded by GAD-7 scale was found with all the scales of QoL viz. SGRQ-C, SF-12 and CAT. Cully Graham et al, found that mental health symptoms, and in particular symptom of anxiety was the most salient factor associated with health status outcome.[14] Our results are in line with that of Hynninen MJ, which concluded that impaired health status is positively associated with psychological distress.[6] The authors concluded that even patients with mild to moderate COPD may report substantially impaired health, and that mental health distress is more strongly related to health status than COPD severity or medical co-morbidity. Similar conclusions were drawn from our study, wherein no correlation was found between disease severity, i.e. GOLD staging and QoL.

Depression also showed moderate correlation with all the quality of life scales except mental component summary of SF-12 and activity sub-domain of SGRQ-C. Although sustained and persistent feelings of frustration, hopelessness and helplessness are likely causes for the frequency of depression and patients of COPD are faced with additional burden of coping with the unpredictable and fear invoking symptoms of breathing distress, which may lead to increased anxiety.

Anxiety and depressive symptoms are common in patients with COPD, regardless of whether they are considered separately or as a combined construct, these symptoms adversely affect HRQoL and are likely to

contribute to the physical disability and economic burden resulting from the disease.[15]

Several mechanisms, not mutually exclusive, may explain the link between anxiety and functional impairment in patients with COPD. First, anxiety may increase disability in COPD by increasing vigilance for, and amplification of, distressing respiratory sensations. These reactions would again lead to avoidance of physical activity and limit exercise performance. In addition, a vicious circle may ensue, in which dyspnea leads to anxiety, which produces a rapid, shallow breathing pattern, leading to air trapping and hyperinflation, creating further dyspnea and exercise limitations.[16]

Depressive disorders in COPD may be difficult to recognize and are associated with substantial impairments in the psychological, physical and social functioning that determine QoL.[15] The emotional response to chronic respiratory disorder contribute greatly to the resulting morbidity in COPD and dyspnea, inactivity with subsequent deconditioning resulting in further inactivity and social isolation, fear and depression further contribute to poor QoL.[15] Our results are consistent with and complement those of previous studies that identified a relationship between psychological impairment and reduced HRQoL in COPD patients.[9]

There is an association between chronic airflow limitation and sleep complaints in patients with COPD. Sleep disorders are very common and highly prevalent in patients with airway obstruction.[6] Sleep was altered (PSQI >5) in 89.74 % of subjects and our findings show a statistically significant moderate correlation between sleep and QoL scores, which are in line with the study of Lucia 2016.[17]

Maximum affection was seen in sleep latency and sleep disturbance component on PSQI. The association of sleep disorder with respiratory disease could be explained by atleast two mechanisms-horizontal position increases both work of breathing and airflow resistance and lowers the threshold for dyspnea in subjects with chronic airflow limitation. High prevalence of sleep disturbance in patients with COPD seems to be caused by symptoms such as dyspnea, cough and mucus overproduction. Poor or inadequate sleep also affects physical and emotional functions, causes anxiety and day time fatigue.[6] Physical limitations due to breathlessness is known to affect their social functioning and participation thereby affecting QoL, which is reflected by the impact domain of SGRQ-C which showed moderate correlation with sleep score ($r= 0.603$, $p<0.0001$) which is suggestive of major impact of sleep on QoL. Similar conclusion was drawn by Scharf et al, which showed that poor sleep quality is predictor of poor QoL in patients with COPD as measured with both specific and generic tools.[7] Proven relationship between depressive trait of mood and sleep disturbances confirms the association of anxiety and depression with sleep problems found in our study.[6]

The mMRC scale is the most commonly used scale because of its simplicity, ease of administration and established validation as a useful marker in COPD. The relation with dyspnea and QoL in COPD has previously been indicated in a few studies.[8] Dyspnea, a significant predictor for HRQoL represent the most disabling symptom of patients with COPD has shown a negative correlation with QoL scores. Statistically significant moderate correlation of mMRC scores with activity, impact and total scores of SGRQ-C and CAT scores were found in our study.

The physiological basis can be explained by the fact that COPD patients show deterioration of pulmonary function caused by hyperinflation with a consequent increase in FRC and decrease in FVC, factors that are responsible for the development of dyspnea, which in turn has a major negative impact on functional capacity, thereby affecting patients ability to perform various daily activities and interference with patients HRQoL. Patients with COPD frequently decrease their activities in order to avoid the unpleasant sensation of breathlessness, which in turn affects their QoL. Breathlessness, physical impairments and decrease ADL had significant impact on HRQoL in patients with COPD. Our findings are quite consistent with study of Hiu and Meek that examined the relationship of breathlessness and disease severity to HRQoL.[18]

In our study, disease severity as ascertained by GOLD staging (post-bronchodilator FEV1) did not correlate with QoL. Similar conclusion was drawn from other studies which concluded that perceived dyspnea was shown to have a stronger correlation with HRQoL than spirometric or functional measurements in these patients.[18]

Also, dyspnea showed weak correlation with anxiety (GAD-7) and depression (PHQ-9) scores. It is proposed that reduced physical activity due to dyspnea is probably the primary factor leading to psychiatric morbidities.[19] Individuals with COPD describe episode of heightened and intractable dyspnea as being inextricably associated with anxious feelings.[15] Furthermore, feelings anger or frustration are frequently identified as a potent trigger for anxiety in turn, heightens the sensation of dyspnea.

Few limitations of the present work needs to be discussed. One possible limitation of the study is that the research was conducted considering only the perceived anxiety, depression and sleep quality measured by respective scales and did not include any objective measures. Given the design of the study, the lack of objective data, such as those obtained from polysomnography, limits our understanding of sleep complaints. Indeed, we could not verify whether and to which extent sleep apnoea, which is highly prevalent in the elderly and in patients with COPD, accounted for the observed sleep disturbances. Since the study was designed as a cross-sectional study, it does not allow us to clarify causality of the observed relationships.

Therefore, it is highly recommended that psychological variables should be taken into account when treating COPD patients. Comorbid psychological problems may increase functional disability, thereby reducing the quality of life of the COPD patients.

CONCLUSION

Anxiety, depression and sleep scores have moderate to strong correlation with QoL in COPD patients. Quality of life scores have moderate correlation with dyspnoea grade but not with GOLD staging.

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