Original Article

Study of Predictors of Quality of Life and its Association with Anxiety and Depression in Chronic Obstructive Pulmonary Disease in Industrial Workers

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Abstract

Introduction: Chronic diseases such as chronic obstructive pulmonary disease (COPD) have an adverse impact on the quality of life (QOL) of the patient. Anxiety and depression have an association with QOL in COPD. However, this area has not been studied in the Indian subcontinent, especially in reference to the industrial population, which is vulnerable to such chronic disease. The present study aims to assess the prevalence of anxiety and depression and its association with QOL in COPD patients. This study has also examined the other predictive factors associated with QOL in COPD. **Materials and Methods:** This cross-sectional study involved 50 cases of COPD and an equal number of age- and sex-matched healthy controls. The severity of COPD was classified as per the global initiative for chronic obstructive lung disease recommendation. Participants were assessed for anxiety, depression, and QOL on generalized anxiety disorder 7, Patient Health Questionnaire nine-item and WHOQOL (World Health Organization Quality of Life Instrument)-BREF, respectively. **Results:** The study sample was predominantly of men (n = 47) with a mean age of 57 years. The mean score of QOL in all domains was significantly lower in COPD cases than control. The prevalence of anxiety and depression was 38% and 44%, respectively, among COPD cases. Odds ratios predicted more risk of developing anxiety and depression in COPD as the OR for depression and anxiety, with 95% confidence intervals were 3.2 (1.2–8.3 and 4.8 (1.8–12.8), respectively. QOL had a strong association with anxiety, depression, chronicity, and the severity of the disease. **Conclusion:** Anxiety and depression are highly prevalent in COPD and appear to be strong predictors of poor QOL.

Keywords: Anxiety, chronic obstructive pulmonary disease, depression, quality of life

Introduction

Almost 5% of deaths worldwide are caused by Chronic Obstructive Pulmonary Disease (COPD), which is likely to become the third-leading cause of death by 2030.[1] The recent "Indian Study of Asthma, Respiratory Symptoms and Chronic Bronchitis" (INSEARCH) of adults (>35 years) including 85,105 men and 84,470 women from 12 urban and 11 rural sites reported the prevalence of chronic bronchitis as 3.49% (4.29% in males and 2.7% in females).[2]

COPD progressively reduces the breathing capacity of an individual, causing difficulties in activities of Daily Living, thereby affecting Health-Related Quality of Life (HRQL), which includes physical, social, and psychological domains.[3] HRQL reflects the patient's experience and can broadly be defined as the patient's perception of the impact of health status on satisfaction with daily life.[3,4]

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The range of psychological factors other than disease has been predicted that may explain variation in HRQL in COPD. Depression and anxiety have been found to be important predictors of HRQL in COPD in many cross-sectional studies.[5-7] Mood disorders such as major and minor depression and anxiety disorders are common in patients with COPD.[8,9] Schneider *et al*.[9] have reported incidence of depression as high as 16.2 cases/1000 person-years in the COPD group compared with 9.4 cases/1000 person-years in nonCOPD control group.

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Similarly, the prevalence of clinical anxiety ranged from 10% to 55% among inpatients and 13%–46% among outpatients with COPD in a systematic review of the literature.[10]

There is a paucity of the literature regarding factors affecting Quality of Life (QOL) of COPD patients and implications of comorbid depression and anxiety on QOL in the Indian subcontinent, especially in reference to the industrial population, which is more predisposed to such chronic disease. Hence, the present study is aimed at assessing the prevalence of anxiety and depression and its association with QOL in COPD patients. This study has also examined the other predictive factors associated with QOL in COPD.

Materials and Methods

This cross-sectional observational study was carried out in the OPD of Pulmonary Medicine department in collaboration with the Psychiatry Department of a secondary care referral center.

Formula $n = z^2 \times pq/d^2$ was used to determine the study sample size where n represents a total number of sample, z corresponds to value at 95% confidence interval (CI), *P* stands for the prevalence of anxiety and depression in previous study and d represents allowable error. Fifty established cases of COPD as defined by the presence of a compatible history forced expiratory volume in 1 sec/forced vital capacity (FEV1/FVC) <0.70 on spirometry, and no known history of asthma or cystic fibrosis were recruited for the study. An equal number of age- and sex-matched healthy controls were also recruited to serve as a control group. Informed consent was obtained from the participants.

Patients with acute exacerbation of COPD 4 weeks prior, history of depression before the onset of COPD or any other major psychiatric illness, history of substance abuse disorder except smoking, other chronic systemic illnesses such as diabetes, coronary heart disease, or renal disease were excluded from the study.

Spirometry was performed using a pulmonary function testing system (Spirolab). Pre- and postbronchodilator (salbutamol 400 mcg) maneuvers were done by qualified technicians following American Thoracic Society standards.[11]

COPD was documented by airflow obstruction showing FEV_1/FVC < 70% and < 200 cc increase in FEV_1 post bronchodilator. Depending on the postbronchodilator FEV_1 value, the severity of COPD was classified as per global initiative for chronic obstructive lung disease recommendation, i.e., Stage I ($FEV_{1\%}$ ≥80), Stage II (50% ≤ $FEV_{1\%}$ <80), Stage III (30 ≤ $FEV_{1\%}$ <30–49), and Stage IV ($FEV_{1\%}$ <30).[12]

Sociodemographic and clinical characteristics of the participants were assessed on a self-designed semi-structured pro forma by examining the participants and exploring medical records. All the participants were assessed for the presence of depression, anxiety, and QOL using the Patient Health Questionnaire nine-item (PHQ-9), generalized anxiety disorder 7 (GAD-7), and WHOQOL-BREF, respectively.

Depression was assessed by administering nine-item Patient Health Questionnaire PHQ-9, which assesses the presence of major depressive disorder using modified Diagnostic and Statistical Manual, 4th edition criteria. (Kappa = 0.65; overall accuracy, 85%; sensitivity, 75%; specificity, 90%).

In this study, the Hindi version of PHQ-9 was used. It has been validated in the Indian population and is considered to be a reliable tool for the diagnosis of depression.[13]

For the diagnosis of depression, we defined clinically significant depression as: a PHQ-9 score of 10 or above in this study as the same cut off has been used by many other studies assessing the prevalence of depression.[14]

QOL was assessed by WHOQOL-BREF.[15] QOL questionnaire aims to assess the extent to which significant aspects of a person's life have been affected, rather than what symptoms and disabilities are present. The WHOQOL-BREF, was developed by the World Health Organization QOL Group, in 15 international field centers.

It is a self-report questionnaire that contains 26 items, and each item represents one facet. The facets are defined as those aspects of life that are considered to have contributed to a person's QOL. Among the 26 items, 24 of them make up the four domains of physical health (7 items), psychological health (6 items), social relationships (3 items), and environment (8 items). The other two items measure overall QOL and general health. It can be conveniently used in studies which assess QOL. In this study, the Hindi version[16] was used. QOL can be an additional outcome variable giving information about the individual's life that other variables cannot.

GADs were assessed on GAD-7 anxiety severity.[17] GAD-7 total score for the seven items ranges from 0 to 21.The internal consistency and test-retest reliability of the GAD-7 has been found excellent (Cronbach $\alpha = 0.92$, intraclass correlation = 0.83). In this study, Hindi version of GAD-7 anxiety severity was used. It has been validated in the Indian population and is considered to be a reliable tool for the diagnosis of anxiety disorders. When screening for anxiety disorders, a recommended cut-point for further evaluation is a score of 10 or greater.

Statistical analysis

One-way analysis of variance (ANOVA) was used to determine the significance of the difference of means among more than two groups, and unpaired *t*-test was applied to find out the significance of the difference between two groups. Statistical Software Primer (version 6) was used for this purpose. Odds ratio (OR) was used to find out risk in two groups. For significance $P = 0.05$ or less was considered significant.

Results

A total of 50 patients of COPD consisting 47 males (94%) and 3 females (96%) with age ranging from 20 to 60 years (mean age 57 years) were recruited along with equal number of

age- and sex-matched healthy control to constitute the study sample. The control group was recruited from family members of the cases to maintain the homogeneity of the study sample and to minimize the confounding factors.

COPD patients had significantly lower Mean QOL in all the four domains (Physical, Psychological, Social, and Environmental) of QOL than the control group ($P < 0.001$) [Table 1].

The prevalence of anxiety was 38% among COPD cases as compared to 16% in age- and sex-matched controls. COPD cases had 3.2 times more risk of developing anxiety than controls (OR [95% CI] =3.218 [1.2–8.3]). The prevalence of depression was 44% and 14%, respectively, in COPD and controls. The risk of developing depression was 4.8 times higher in COPD cases than controls. (OR [95% CI] = 4.827 [1.821–12.792]) [Table 2].

Although, sociodemographic variables (age, sex. Family income, Smoking) did not show statistically significant association with the mean QOL,[16] however, disease-specific variables (duration of illness and severity of illness) had a significant association with mean QOL which was lower in all four domains in COPD patients who endured disease for >1 year as compared to those suffering from the disease for <1 year ($P < 0.01$). Similarly, as the severity of illness increased, mean QOL scores in all four domains progressively decreased and the association was highly significant ($P < 0.01$) in D1, D2 D3 domains, and significant in D4 domain ($P < 0.05$) on applying ANOVA test [Table 3].

Anxiety was significantly associated with marked mean low QOL scores in all four domains in COPD cases ($P < 0.05$). Similalrly, in COPD cases with comorbid depression, mean QOL scores in all the domains were lower than in COPD cases without depression, and the association of depression was found to be highly significant with mean QOL scores in D1 and D3 domain and significant in D2 and D4 domain [Table 4].

Discussion

Our study population was implicitly closed to the age and sex distribution of COPD in the general population. The mean age of patients was 57 years. A recent study in Indian adults (INSEARCH) has also reported that advancing age is associated with increased odds of COPD.[2]

Male patients dominated the study sample. A similar observation has been made by Zamzam *et al*.[18] who reported predominance of male patients (97.5%) in his study of QOL in COPD patients.

The high prevalence of COPD in males is due to higher rates of smoking and more frequent occupational exposure. The cultural taboo associated with smoking in women in the Indian subcontinent, preventing them from seeking medical help could have been a reason for male preponderance.

The prevalence of anxiety and depression in COPD cases was 38% and 44%, respectively. Studies in the past have reported a prevalence rate of anxiety from 28% to 80% in COPD patients.[19] Similarly, the prevalence of depression in previous studies[19] has been found, ranging from19% to 80%.

Negi *et al*.[20] has recently reported the presence of depression in 49.2% of his 126 patients who were studied to find out risk factors for depression as measured on PHQ-9.

The variation in the prevalence of anxiety and depression can partly be attributed to the use of different tools used to measure anxiety and depression. A bidirectional relationship between depression and COPD has been proposed by a recent systematic review and meta-analysis of 25 long-term follow up studies as depression may both be cause and consequence of COPD.[21] Emerging evidence has suggested that chronic inflammation facilitates the association of depressive symptoms and COPD. Increased inflammatory markers have been documented both in late-life depression[22]and COPD.[23] Lu *et al*.[24] in their study of the older population have found an elevated level of inflammatory biomarkers interleukin-6 and c-reactive protein accounted in part for the association of depressive symptoms with pulmonary function. In addition, biological, social, and behavioral factors may contribute to increasing physical impairment and social isolation in COPD patients, perpetuating mood and anxiety symptoms.

QOL in COPD patients in the present study was significantly poor in all the domains. Shavro *et al*.[25] has reported significantly poor QOL in all domains of 58 consecutive Indian patients of COPD who were measured on WHOQOL-BREF. Similar observations have been made in many other studies indicating the adverse impact of COPD on QOL.[26] Chronicity of the disease, physical disability, difficulty in the job, financial burden, social isolation, and comorbid psychological conditions may have been accountable for this.

None of the sociodemographic variables had a significant impact on QOL. Almost similar kinds of results were

Table 1: Quality of life in Chronic obstructive pulmonary disease cases and controls

Variable	*n*	Physical (D1)		Psychological (D2)		Social (D3)		Environmental (D4)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Control	50	64.0	19.6	66.5	19.9	68.2	23.9	65.1	18.8
Cases	50	48.3	20.6	47.0	17.4	43.9	19.9	47.9	15.1
Unpaired *t*-test *P* value LS		0.000 (HS)		0.000 (HS)		0.000 (HS)		0.000 (HS)	

LS: Level of significance, SD: Standard deviation, HS: High significance

produced by Shavro *et al*.[25] in Indian patients. It could have been possible due to participants belonging to similar socio-demographic profile and support systems in our social matrix still provide a buffer.

Longer duration of illness was associated with poor QOL. This finding is supported by Halvani *et al*.[27] who has reported worsening of QOL with an increase in the duration of disease.

As the duration of disease increases, the likelihood of irreversibility enhances, comorbidity increases, physical impairment gets worsened, financial and social aspects of life are compromised, leading to poor QOL.

With the increase in the severity of disease, severity QOL deteriorated. Agrawal *et al*.[28] have reported a strong association between increased severity of COPD with poor QOL in a correlation study of COPD severity with HRQL in 129 patients. In another study, Uppal *et al*.[29] established inverse correlation between all the stages of disease severity and QOL in COPD patients.

It is expected that with increased severity of disease dyspnea, fatigue, physical impairment gets accentuated, and comorbidity also takes place more frequently. These cascade of events adversely influences QOL adversely.

The mean score of all the domains of QOL was inversely correlated with both anxiety and depression. Balcells E *et al*.[7] in his analysis of 337 clinically stable COPD patients using St. George's Respiratory Questionnaire (SGRQ) and Hospital Anxiety and Depression Scale (HADS) concluded a significant association between anxiety and depression with QOL across all the stages of disease severity. A similar kind of association was proposed by Omachi *et al*.[30] in a large study sample of 1202 adults with COPD who had an inverse correlation of QOL with the presence of depression. Blakemore *et al*.[31] in his systematic review and meta-analysis of depression and anxiety as a predictor of HRQL have correlated anxiety and depression with prospective HRQL.

Patients with anxiety and depression are prone to experience exacerbated physical symptoms than their normal counterparts.

Table 2: Prevalence of anxiety and depression among chronic obstructive pulmonary disease cases and controls

	n	Anxiety	Depression
Cases (%)	50	19 (38)	22 (44)
Control (%)	50	8 (16)	7 (14)
OR (95% CI)		3.218 (1.2-8.3)	4.8 (1.8-12.8)

OR: Odds ratio, CI: Confidence interval

Table 3: Association between disease characteristics and quality of life scores in chronic obstructive pulmonary disease cases

Variable	*n*	D1		D2		D3		D4	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Duration of illness (years)									
<1	23	62.1	20.0	57.9	17.5	53.8	24.2	56.3	15.9
>1	27	36.4	11.9	37.7	10.8	35.5	9.7	40.8	10.1
Unpaired *t*-test *P* value LS		0.000 (HS)		0.000 (HS)		0.000 (HS)		0.000 (HS)	
Severity of illness									
Mild	3	73	22.0	60.6	14.4	68.6	38.9	60.6	19.8
Moderate	13	62.6	16.2	60.1	17.6	57.2	7.4	55.9	16.5
Severe	23	43.0	18.9	43	14.4	40.0	16.2	46.4	13.8
Very severe	11	35.5	13.4	36.2	13.0	29.6	5.6	38.2	7.6
ANOVA test *P* value and LS		0.000 (HS)		0.000 (HS)		0.000 (HS)		0.011 (S)	

LS: Level of significance, SD: Standard deviation, HS: High significance, S: Significance, ANOVA: Analysis of variance

Table 4: Association anxiety and depression with quality of life scores in chronic obstructive pulmonary disease cases

QOL	*n*	D1		D2		D3		D4	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Anxiety									
Yes	19	38.3	13.5	39.6	11.9	31.1	11.2	38.1	10.1
No	31	54.3	21.9	51.5	18.8	51.8	20.1	54	14.6
Unpaired *t*-test *P* value LS		0.006 (HS)		0.018 (S)		0.000 (HS)		0.000 (HS)	
Depression									
yes	22	40.0	20.6	40.6	12.4	35.2	13.5	43.4	14.6
No	28	54.6	22.2	52.0	19.2	50.7	21.6	51.5	14.8
Unpaired *t*-test *P* value LS		0.000 (HS)		0.021 (S)		0.005 (HS)		0.048 (S)	

LS: Level of significance, SD: Standard deviation, HS: High significance, S: Significance, QOL: Quality of life

Social isolation, poor treatment compliance, uncertainty about future in these patients further complicates their life, thereby affecting QOL adversely.

Limitations

The sample size of the study was small. Therefore, future studies with larger sample sizes are recommended to replicate the findings of this study with even more robust results.

Conclusion

QOL in COPD patients is compromised as compared to the healthy population. Disease-specific and psychological variables such as anxiety and depression are strong predictors of poor QOL in COPD. Brief psychological assessment may help in identifying comorbid psychological problems and their treatment, thus improving QOL in these patients.

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Conflicts of interest

There are no conflicts of interest.

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