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Association of Self-Reported Disease Severity with Depression and Anxiety among COPD Patients

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Abstract

Background: This study was conducted to estimate the proportion of patients who experience a high impact from chronic obstructive pulmonary disease (COPD) on their health status and those who also experience symptoms of depression and anxiety. It also sought to determine whether the health impact of the disease is associated with anxiety and depression.

Methods: An analytical cross-sectional study was conducted among 177 randomly selected patients with COPD seeking treatment in various primary health centers in Al Ahsa, Saudi Arabia. The COPD Assessment Test (CAT) was used to determine the impact of COPD on health generally, and the Hospital Anxiety and Depression Scale was used to determine the presence of anxiety and depression symptoms. Multiple logistic regression was performed to determine the association between the health impact of COPD on the respondents and the presence of symptoms of anxiety and depression.

Results: Patients who had a CAT Score of >21 were 17.37 times more likely to experience anxiety. Patients with COPD who had a CAT Score of >21 were 5.62 times more likely to experience depression.

Conclusion: COPD had a severe impact on the health of nearly 30% of the patients affected. The high impact of COPD on health increases the likelihood of having anxiety and depression symptoms.

Keywords: anxiety disorders, chronic obstructive, comorbidity, depression, pulmonary disease, tobacco smoking

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is now the third highest cause of death globally, accounting for 90% of all deaths in low- and middle-income countries (LMICs),[1–3] and its prevalence is expected to double by 2030 unless urgent steps are taken to reduce the underlying risk factors, primarily tobacco smoking and passive exposure to environmental pollutants.[4] COPD is a heterogeneous lung condition marked by chronic respiratory symptoms resulting in a persistent, often progressive, airflow obstruction.[5] A review of the Global Burden of Disease 2019 dataset shows that approximately half a million people in Saudi Arabia suffer from COPD, corresponding to a 329.82% increase over the number of people diagnosed in 1990.[6] In Saudi Arabia, the burden of COPD is anticipated to increase even further due to the relatively high smoking rate (19.8% overall, 30% for men, and 4.2% for women) among Saudis over 40 years old.[7] Moreover, the frequent exposure of the population to non-smoking factors (e.g., biomass fuel, dust, gases, and outdoor pollution) adds to the burden of the disease.[7] Substantial evidence has demonstrated the association of COPD with reduced physical activity,[8] low productivity,[9,10] rehospitalization,[11–17] and even death.[18] In addition, the negative effect of COPD can be further aggravated by the increasing prevalence of clinical comorbidities such as lung cancer, cardiovascular disease, and diabetes,[19] and psychological comorbidities such as depression and anxiety,[20–24] that have been shown to affect the disease prognosis, quality of life, and survival of patients with COPD.

As of 2020, over 300 million people worldwide suffer from depression, the leading cause of disability. Aside from depression, anxiety disorders are among the most common psychiatric disorders, affecting more than 260 million people worldwide. Depression and anxiety often occur as comorbidities, and prevalence rates continue to rise, especially in LMICs.[25] In Saudi Arabia, depression and anxiety are believed to affect between 22% and 71% of the population.[26] High comorbidity (>50%) exists between depression and anxiety disorders.[24] Furthermore, depression and anxiety are linked to worse health outcomes, particularly when they co-occur with long-term physical health conditions.[27,28] Patients with depression are more likely than those without depression to experience episodes of COPD exacerbation, and even moderate co-morbid depression is linked to twice as

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much use of hospital emergency services.[29] Both depression and anxiety are linked with less favorable outcomes, higher mortality, higher rates of hospitalization, and lower quality of life in patients with COPD.

Underdiagnosed and untreated depression in older patients with COPD may result in inadequate prognosis and health outcomes. However, if clinicians had a better grasp of how depression affects these two conditions, they might be able to offer patients and their caregivers the right kind of support and treatment plans.[28] Therefore, this study was conducted to estimate the proportion of Saudi patients with COPD who experience anxiety and depression and to determine whether the severity of the impact of COPD is associated with the development of anxiety and depression.

METHODS

The research proposal was approved by the Research and Ethics Committee at King Fahad Hospital Hofuf, Al Ahsa, Kingdom of Saudi Arabia (IRB KFHH NO. H-05-HS-065). The aim of the study was explained to the patients and their informed consent was obtained. Participation in this study was voluntary and the ability to withdraw from the study at any time and the confidentiality, privacy, and anonymity of the patients and their responses were assured. The study was conducted in accordance with the Declaration of Helsinki and followed ethical principles.

This study used an analytic cross-sectional approach involving COPD patients in Al Ahsa in the Eastern Region of Saudi Arabia. The participants in the study consisted of patients who attended respiratory and smoking cessation clinics at randomly selected primary healthcare centers in Al Ahsa. This study is a subgroup analysis of 177 patients with COPD from an original data set consisting of 390 patients with chronic respiratory diseases (COPD and bronchial asthma). The original sample size of 386 was calculated using Epi Info with the following parameters: a total population of 316,841 (based on the 2022 data from the Planning Department), 95% confidence level and 80% power.

Data collection took place from October 2021 to March 2022. COPD patients were deemed eligible to participate if they were over 18 years old, able to comprehend and verbalize, not previously diagnosed with mental disorders, and able to provide consent voluntarily to participate. A structured data collection instrument was used. The first section consisted of questions about demographic characteristics—age, gender, level of education, and marital status. Two standardized tools were used to assess disease severity and detect the presence of anxiety and depression.

The COPD Assessment Test (CAT) was utilized to determine the impact of current illness on patients' health. The CAT is a validated, short (8-item), and simple patient-completed questionnaire with good discriminant properties developed for use in routine clinical practice to gauge the health status of patients with COPD. Despite its small number of component items, it covers a broad range of effects of COPD on patients' health. In addition, studies have shown that it is responsive to change and treatment.[30] For this study, the impact of COPD on the patients was classified as severe when the CAT Score was >20, including those classified as high (>20) and very high (>30). For those patients with CAT scores of 10–20 (medium) and <10 (low), the impact of COPD on their health was classified as not severe.

The second tool was the Hospital Anxiety and Depression Scale (HADS), a self-report tool often used in non-psychiatric settings to detect the two most common expressions of distress: anxious and depressive states.[31] The HADS consists of seven questions for anxiety and seven for depression. Each item is measured on a four-point scale, with a score of 0 indicating "not present" and 3 indicating a "considerable event," giving a total score ranging from 0 to 21 on each of these two subscales. The cut-off score was eight or more. A score of more than eight was considered indicative of a severe case for both the depression and anxiety subscales. For anxiety, the HADS has a specificity of 0.78 and a sensitivity of 0.9, and for depression, it has a specificity of 0.79 and a sensitivity of 0.83.[32,33] The Arabic version of this test was used for this study. Cronbach's alpha was 0.83 (95% confidence interval: 0.79–0.88) for the HADS anxiety subscale and 0.77 (0.7–0.83) for the HADS depression subscale.[30]

Data were entered and analyzed using Epi Info 7. Descriptive statistics were performed for the categorical and continuous variables. Estimation of proportion using the default test provided in Epi Info (Exact Interval) was performed to determine the relative proportion of patients who experience a severe health impact of COPD and those who manifest symptoms of anxiety and depression. The proportion of respondents who perceive the impact of their illness as severe and not severe, and those with or without anxiety and depression, were tabulated with their corresponding frequencies and confidence intervals. Multiple logistic regression was applied to test the association between the perceived severity of the health impact of COPD and the presence of anxiety and depressive symptoms. A p-value of <0.05 was considered significant, with a confidence interval of 95%.

RESULTS

The study participants consisted of 177 patients with COPD currently being seen in the respiratory and smoking cessation clinics of health centers in Hofuf, Al Ahsa, Saudi Arabia. The demographic characteristics of the

respondents are presented in Table 1. The mean age of participants was 46.7 ± 10.49. Among the 177 patients, COPD had a low impact on the health of 64 (36.16%, 95% CI: 28.91–43.47%), a moderate impact on the health of 64 (36.16%, 95% CI: 29.44–44.05%), a high impact on the health of 34 (19.21%, 95% CI: 13.61–25.66%) and a very high impact on the health of 15 (8.47%, 95% CI: 4.79–13.52%).

Chronic obstructive pulmonary disease had a combined low and moderate impact on the health of 128 patients (72.32%, 95% CI: 65.29–78.89%), and a high and moderately high impact on the health of 49 patients (27.68%, 95% CI: 21.11–34.71%). The relative proportions of patients according to the health impact of COPD are presented in Table 2.

Symptoms of anxiety were present in 63 (35.59%, 95% CI: 28.38–42.90%) of the COPD cases, whereas 114 patients (64.41%, 95% CI: 57.10–71.62%) had a HADS score below eight and, therefore, did not experience anxiety. Of the 49 patients with high to very high CAT scores, 36 (73.47%, 95% CI: 58.92–85.05%) had anxiety symptoms, while only 13 (26.53%, 94% CI: 14.95–41.08%) did not. Among those with low to moderate CAT scores, 27 patients (21.09%, 95% CI: 14.27–28.97%) had anxiety symptoms, while in the same group, 101 (78.91%, 95% CI: 71.03–85.73%) did not have symptoms of anxiety. The relative proportions of patients according to the presence of symptoms of anxiety across sociodemographic groups are presented in Table 3.

Symptoms of depression were seen in 84 patients (47.46%, 95% CI: 39.68–54.80%), while the remaining 93 patients (52.54%, 95% CI: 45.20–60.32%) did not report symptoms of depression. Of the 49 patients with high to very high CAT scores, 36 patients (73.47%, 95% CI: 58.92–85.05%) had depression symptoms, while only 13 (26.53%, 94% CI: 14.95–41.08%) did not. Among those with low to moderate CAT scores, 48 patients (37.50%, 95% CI: 28.86–46.61%) had symptoms of depression. In the same group, 80 (62.6%, 95% CI: 53.84–71.14%) did not have symptoms of depression. The relative proportions of patients according to the presence of symptoms of depression across sociodemographic groups are presented in Table 4.

As seen in Table 5, patients with COPD with a CAT Score of >21 were 10.47 times more likely to experience anxiety than those patients whose CAT Score was less than 20 ($p < 0.0001$). In addition, older COPD patients were 57.97% less likely to experience anxiety than younger patients with COPD ($p = 0.0137$). Also, married patients with COPD were 1.93 times more likely to experience anxiety compared to unmarried patients ($p = 0.0438$). When the effects of gender, age, level of education, and marital status remained constant, patients who claimed that COPD had a high or very high impact on their health were 17.37 times more likely to have depressive symptoms than those who reported that their current illness had a medium or low impact on their health status ($p < 0.0001$).

TABLE 1. Demographic characteristics of patients with COPD, Al Ahsa, Saudi Arabia (N = 177)

Variables	N	%
Gender		
Male	112	63.28
Female	65	36.72
Age		
<46.7	114	64.41
>46.8	63	35.59
Marital status		
Single	77	43.50
Married	100	56.50
Level of education		
Pre-university	126	71.19
University	51	28.81

As seen in Table 6, patients with COPD with a CAT Score of >21 were 4.67 times more likely to experience depression ($p < 0.0001$). In addition, patients with COPD who have completed university education were 69.7% less likely to experience depression than those with a pre-university education level ($p = 0.0010$). When the effects of gender, age, level of education, and marital status remained constant, patients who claimed that COPD had a high or very high impact on their health status were 5.62 times more likely to have depressive symptoms than those who reported that their current illness had a medium or low impact on their health status ($p = 0.0002$).

DISCUSSION

This study sought to determine whether the health impact of disease is associated with anxiety and depression. Using a cross-sectional study design, the severity of the health impact of COPD and the prevalence of anxiety and depression symptoms among patients with COPD were estimated. In addition, the association between disease severity and the presence of anxiety and depression symptoms was calculated.

According to the World Health Organization (WHO), patient adherence to long-term treatment for COPD is influenced by how the illness is perceived.[34] Among COPD patients, the perception of illness has a substantial impact on their medical behavior and their levels of anxiety and depression. Consequently, the perception of illness requires regular evaluation in clinical practice.[35]

In the present study, 27.63% (95% CI: 21.11–34.71%) of patients reported that their illness impacted their health severely. However, a study in Greece found that the majority of patients with COPD perceived their respiratory condition as being of moderate to mild severity.[36]

TABLE 2. Health impact category of patients with COPD according to demographic characteristics (N = 177)

Variables	Non-Severe			Severe		
	N	%	95% CI	N	%	95% CI
Gender						
Male	92	82.14	73.78 – 88.74	20	17.86	11.26 – 26.22
Female	36	55.38	42.53 – 67.73	29	44.62	32.27 – 57.47
Age						
<46.7	74	64.91	55.41 – 73.62	40	35.09	26.38 – 44.59
>46.8	54	85.71	74.98 – 93.36	9	14.29	6.64 – 25.02
Marital status						
Single	63	81.82	71.38 – 89.69	14	18.18	10.31 – 28.62
Married	65	65.00	54.82 – 74.27	35	35.00	25.73 – 45.18
Level of education						
Pre-university	85	67.46	58.54 – 75.54	41	32.54	24.46 – 41.46
University	43	84.31	71.41 – 92.98	8	15.69	7.02 – 28.59

TABLE 3. Distribution of anxiety according to demographic characteristics of patients with COPD

Variables	Anxiety Positive			Anxiety Negative		
	N	%	95% CI	N	%	95% CI
Gender						
Male	42	37.50	28.53 – 47.15	70	62.50	52.85 – 71.47
Female	21	32.31	21.23 – 45.05	44	67.69	54.95 – 78.77
Age						
<46.7	48	42.11	32.92 – 51.71	66	57.89	48.29 – 67.08
>46.8	15	23.81	13.75 – 35.69	48	76.19	64.31 – 86.25
Marital status						
Single	63	81.82	71.38 – 89.69	56	72.73	61.38 – 82.26
Married	65	65.00	54.82 – 74.27	58	58.00	47.71 – 67.80
Level of education						
Pre-university	56	44.44	35.60 – 53.56	70	55.56	46.44 – 64.40
University	7	13.73	5.70 – 26.26	44	86.27	73.74 – 94.30

TABLE 4. Distribution of depression according to demographic characteristics of patients with COPD

Variables	Depression Positive			Depression Negative		
	N	%	95% CI	N	%	95% CI
Gender						
Male	56	50.00	40.40 – 59.60	56	50.00	40.40 – 59.60
Female	28	43.08	30.85 – 55.96	37	56.92	44.04 – 69.15
Age						
<46.7	60	52.63	43.06 – 62.06	54	47.37	37.94 – 56.94
>46.8	24	38.10	25.70 –50.49	39	61.90	49.51 – 74.30
Marital status						
Single	35	45.45	34.06 – 57.21	42	54.55	42.79 – 65.94
Married	49	49.00	38.86 – 59.20	51	51.00	40.80 – 61.14
Level of education						
Pre-university	70	55.56	46.44 – 64.40	56	44.44	35.60 – 53.56
University	14	27.45	15.89 – 41.74	37	72.55	58.26 – 84.11

The presence of a lower proportion of patients who reported that COPD has a high to very high impact on their health may be attributed to the fact that the respondents were ambulatory patients who attended primary healthcare centers. The WHO states that factors influencing patient adherence to long-term treatment for COPD include how they perceive the illness, the type of medication used, the effectiveness of the communication between the patient and the healthcare practitioner, and the social environment. When patients think their treatment will improve the management or control of their disease, or when they anticipate serious negative effects from non-adherence, they are more likely to maintain compliance with it.[34]

The review of pertinent literature shows that patients have an unclear perception of COPD, and this kind of perception is widespread among those in the terminal stage of their life.[20,23,24,26,28,29] Patients with COPD who had recently experienced exacerbated symptoms and severe

TABLE 5. Crude and adjusted association between disease severity and anxiety

Variables	Crude Association			Adjusted Association		
	Odds Ratio	95% CI	*p*	Odds Ratio	95% CI	*p*
COPD impact on health						
Severe	10.461	4.877 – 22.436	0.000	17.372	5.733 – 52.645	0.000
Not severe[Ref]						
Gender						
Male	0.795	0.417 – 1.516	0.487	0.255	0.088 – 0.741	0.012
Female[Ref]						
Age						
<46.7	0.421	0.211 – 0.837	0.013	0.826	0.337 – 2.023	0.675
>46.8[Ref]						
Marital status						
Single	1.930	1.018 – 3.660	0.043	1.410	0.640 – 3.109	0.393
Married[Ref]						
Level of education						
Pre-university	0.198	0.083 – 0.475	0.000	0.215	0.082 – 0.567	0.001
University[Ref]						

TABLE 6. Crude and adjusted association between disease severity and depression

Variables	Crude Association			Adjusted Association		
	Odds Ratio	95% CI	*p*	Odds Ratio	95% CI	*p*
COPD impact on health						
Severe	4.666	2.254 – 9.661	0.000	5.617	2.293 – 13.755	0.000
Not severe[Ref]						
Gender						
Male	0.756	0.409 – 1.399	0.374	0.427	0.191 – 0.957	0.038
Female[Ref]						
Age						
<46.7	0.540	0.288 – 1.009	0.053	0.797	0.372 – 1.707	0.560
>46.8[Ref]						
Marital status						
Single	1.152	0.635 – 2.091	0.640	0.879	0.448 – 1.724	0.707
Married[Ref]						
Level of education						
Pre-university	0.303	0.149 – 0.615	0.001	0.332	0.157 – 0.701	0.003
University						

breathlessness were more likely to describe their symptoms as severe or very severe.[36] Most COPD patients view their symptom burden as a substantial and continuous barrier to their activities of daily living.[37]

In the current study, symptoms of anxiety were present in 63 (35.59%, 95% CI: 28.38–42.90%) of the COPD cases, while symptoms of depression were seen in 84 patients (47.46%, 95% CI: 39.68–54.80%). In the current study, there was a lower proportion of anxiety among those who had completed university education, older patients, and those who were unmarried, while the relative proportion of anxiety was found to be fairly equal across gender groups. In addition, a lower proportion of patients with depression included those with a university education and those in the older age group. The differences found in the level of significance when multiple logistic regression was performed may have been due to effect modification of age, gender, level of education and marital status. However, the confounding effect of these variables were not tested as this was beyond the scope of study.

Age, gender, and poor quality of life, among other conditions, are associated with depression and anxiety symptoms.[38–40] For this reason, the Global Initiative for Chronic Obstructive Lung Disease has placed considerable emphasis on evaluating these conditions as part of a patient's evaluation of stable COPD.[41]

Patients with a CAT Score of >21 were 17.37 times more likely to experience anxiety. Among the sociodemographic variables considered in this study, significant associations with anxiety were found independently for age, level of education, and marital status. For example, older patients with COPD with university-level education were found to have a lower risk

of developing anxiety. However, married patients were nearly twice as likely to develop anxiety as unmarried patients with COPD.

It was seen in this study that patients with COPD who had a CAT Score of >21 were 5.62 times more likely to experience depression. Among the sociodemographic variables considered, only the level of education was independently associated with depression. Patients with COPD who had completed university education were found to be less likely to develop depression than those with lower levels of educational attainment.

A cross-sectional study carried out across China revealed that patients with mild COPD living in urban communities had higher rates of anxiety and depression than those in rural areas.[42] Anxiety or depression was associated significantly with female gender and poor health. More interventions should be developed to reduce the risks of anxiety and depression in the early stages of COPD.[42] Regardless of the clinical severity of COPD, patients under 60 were more likely to have clinically significant amounts of anxiety and depression.[34] Older patients with COPD had a considerably lower likelihood of experiencing anxiety or depression than younger ones.[38]

Although the exact mechanisms behind the association of depression and anxiety with COPD remain unclear, it has been suggested that mood disorders result from feelings of hopelessness, social isolation, reduced physical functioning, and lifestyle changes.[43] Some studies have hypothesized that the association may be partly mediated by chronic inflammation.[44]

This study had several limitations. First, the results apply only to patients who consulted the primary health centers of Al Ahsa at the time of the data collection. Selection bias could not be completely discounted as patients with COPD who consult the outpatient departments of the hospitals in the area were not considered in this study. Second, misclassification was probable in terms of segregating patients based on the severity of the impact of COPD on their health status. Third, the symptoms assessed by the CAT are time-varying variables and may thus be affected by recent exacerbations of respiratory symptoms. Similarly, anxiety and depression symptoms vary over time and may affect the result by the misclassification of patients into anxiety and depression categories.

CONCLUSIONS

Chronic obstructive pulmonary disease had a severe impact on the health of nearly 30% of patients seen in primary healthcare centers. Anxiety and depression symptoms are fairly common among patients with COPD and tend to vary across demographic variables. However, Saudi patients with COPD whose illness severely impacts their well-being are also highly likely to develop anxiety and depression. The patient-reported impact of illness and the presence of anxiety and depression should be clinically validated. In addition, health personnel in primary healthcare facilities must be trained to recognize early manifestations of the social and mental effects of COPD, as patients with COPD (with anxiety or depression) experience more acute exacerbations, instances of rehospitalization, and a greater risk of mortality than those with no comorbidities. Finally, a community-based support system must be developed among patients with COPD to reinforce appreciation for the holistic management of this chronic respiratory disease.

CONFLICT OF INTEREST

None declared.

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