Screening for Anxiety and Depression among Saudi Patients with Chronic Obstructive Pulmonary Disease: A Cross-sectional Study

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ABSTRACT

Anxiety and depression are two psychological illnesses that are linked to chronic obstructive pulmonary disease (COPD). In Saudi Arabia, no research has been done on the prevalence of psychological disorders among patients with COPD and their association with COPD severity. This study aims to screen for anxiety and depression among Saudi patients with COPD and to explore the impact of COPD severity on the patients’ psychological status. In this cross-sectional study, we recruited 70 stable patients with COPD from outpatient respiratory clinics. Anxiety and depression were evaluated using the Anxiety Inventory for Respiratory Disease (AIR) scale and Patient Health Questionnaire-9 (PHQ-9). The AIR identified that 46% of patients with COPD had anxiety and the PHQ-9 identified that 60% had depression. Patients with severe COPD stages were at greater risk of anxiety (AIR odds ratio (OR) = 2.54, 95% confidence interval (CI): 2.31-2.86) and depression (PHQ-9 OR = 3.08, 95% CI: 2.76-3.45). Patients with severe COPD stages are at increased risk of both anxiety and depression compared to patients with less severe COPD stages.

KEYWORDS

anxiety, depression, psychological illness, respiratory disease

INTRODUCTION

Anxiety disorders emerge among patients with chronic obstructive pulmonary disease (COPD) and increase the risk of panic disorders and generalized anxiety disorders (Fan et al., 2002; Halpin et al., 2021). The prevalence of anxiety among patients with COPD ranges from 13% to 46% (Adeloye et al., 2015). In Saudi Arabia, Allam et al. (2017) found that anxiety disorder affects 22% of patients with moderate COPD based on the Hospital Anxiety and Depression Scale (HADS). The anxiety disorder among patients with COPD may be highly associated with worsening symptoms, poor prognosis, and increased risk of mortality (Pumar et al., 2014).

The risk factors for psychological disorders, such as anxiety and depression, differ among patients with COPD, and a variety of factors, including ethnicity and society, may be involved (Maurer et al., 2008). The overlap of symptoms between COPD and anxiety such as breathlessness makes it difficult for respiratory clinicians to pinpoint the cause of these symptoms and implement proper management. Consequently, patients with COPD end up in a negative cycle between symptoms such as dyspnea resulting in anxiety and depression, and vice versa. In COPD, anxiety is usually underdiagnosed due to overlapping between somatic symptoms of anxiety and respiratory symptoms of COPD.

Furthermore, patients with COPD frequently experience unexpected attacks of breathing distress that may result in chronic anxiety. Several psychological screening tools include questions about somatic symptoms, which complicates their interpretation.

Screening for psychological illnesses, such as anxiety and depression, using a proper assessment tool designed especially for Arabic-speaking patients with COPD is lacking. The Anxiety Inventory for Respiratory Disease (AIR) is a specific screening tool for anxiety in patients with COPD that has been validated against nonsomatic questionnaires such as the Generalized Anxiety Disorder 7-Item Scale (GAD-7) and the Hospital Anxiety and Depression Scale Anxiety subscale (HADS-A) (DeJean et al., 2013). However, the AIR has not been used to assess the risk of anxiety in Saudi
population with COPD. Therefore, this study aims to screen for anxiety and depression among Saudi patients with COPD and to explore the impact of COPD severity on the patients’ psychological status.

MATERIALS AND METHODS

The current cross-sectional investigation was carried out in outpatient respiratory clinics at King Fahad and King Saud University Medical Cities in Riyadh, Saudi Arabia. The study was conducted in accordance with the Declaration of Helsinki. The ethical committees of both institutions gave their approval for this investigation (KSU-IRB 017E). Before being enrolled in the study, each participant signed a written informed consent form.

For this study, a convenience sample of participants aged 35 years or older with a physician-confirmed diagnosis of COPD who could read or interpret Arabic was recruited. The participants were excluded if they had a neurological (such as a stroke), musculoskeletal (such as shoulder and knee osteoarthritis), cardiovascular (such as heart failure), or pulmonary illness (other than COPD—such as pulmonary fibrosis). Also, patients with COPD who were experiencing an acute exacerbation were not included. All participants underwent demographic measurements and completed all three questionnaires in random order while they were waiting to be seen by their physician.

Demographic measurements

Height and weight were measured barefoot in lightweight indoor clothing, and the body mass index (BMI, kg/m²) was calculated.

Lung function measurement

All participants underwent a spirometry test according to the guidelines (Graham et al., 2019). The Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria were used to classify COPD disease severity (Marçôa et al., 2018). All participants with COPD performed spirometry (Vitalograph Alpha, Vitalograph Ltd, England, UK), to determine forced expiratory volume in 1 s (FEV1), forced vital capacity (FVC), and the FEV1:FVC ratio. A diagnosis of COPD was established according to the GOLD criteria (Graham et al., 2019). Participants with COPD were divided into two groups according to their FEV1% as follows: good lung function (>50% of FEV1% predicted) or poor lung function (<50% of FEV1% predicted).

The Hospital Anxiety and Depression Scale

The HADS is a patient self-reported, brief scale that contains 14 items to assess anxiety and depression symptoms (Rahi et al., 2023). The HADS was translated into Arabic and found to be reliable and valid (Terkawi et al., 2017). The HADS includes a total of 14 items divided equally into two subscales one concerning anxiety (HADS-A) and another concerning depression (HADS-D). Each item is rated on a scale from 0 to 3. The total score for each subscale is calculated separately with a total score for each subscale ranging between 0 and 21. The Cronbach’s alpha coefficients for HADS-A and HADS-D subscales were 0.730 and 0.770, respectively. The HADS-A has shown good sensitivity (63%), high specificity (85%), and the area under the receiver operating characteristic curve was 74% with a cut-off score of ≥8, among patients with COPD as compared with the Mini International Neuropsychiatric Interview (Rahi et al., 2023).

Anxiety Inventory for Respiratory Disease

The AIR is a patient self-reported, nonsomatic, reliable, and valid questionnaire measuring anxiety in Arabic patients with COPD (Wilgoss et al., 2013; Albarrati et al., 2021). The AIR contains 10 items with a 4-point response scale for each item, with 0 points indicating no anxiety symptoms at all and 3 points indicating that the patient is experiencing anxiety symptoms almost all of the time (Albarrati et al., 2021). The total score of the AIR ranges from 0 to 30 points, with higher scores indicating more anxiety symptoms.

Patient Health Questionnaire-9

The Patient Health Questionnaire-9 (PHQ-9) is a patient-self-administered three-page questionnaire (Spitzer et al., 1999). The PHQ-9 consists of nine items with scores ranging from 0 to 27. Each of the nine items can be scored from 0 (not at all) to 3 (nearly every day). The Arabic version of PHQ-9 is a valid and reliable tool to screen for depression in a Saudi sample (AlHadi et al., 2017). A cut-off score of 10 points or greater was used to define depression (Spitzer et al., 1999).

Statistical analysis

Using the level of significance (alpha = 0.05), power (0.8), and proportion across groups (0.52, 0.11) of the Farrington–Manning score test, the necessary sample size for each group to demonstrate real results was estimated (Farrington and Manning, 1990). A minimum sample size of 27 was specified for each group. The Kolmogorov–Smirnov test was used to determine whether the data were normal (Berger and Zhou, 2014). For continuous data, the descriptive statistics were provided as mean and standard deviation, whereas for categorical variables, count and percentages were employed. Comparisons were made using the independent Student’s t-test and the chi-square test. A Pearson correlation was employed to measure the strength of relationships between COPD severity and outcomes (Bland and Altman, 1999).

Using logistic regression analysis, we were able to compare the relationships between severe COPD, anxiety, and
depression to mild or moderate COPD. The link was discovered using both unadjusted and adjusted models. The adjusted model included age, sex, smoking status, and overweight. By applying the requirements that tolerance value and eigenvalues should not be below 0.1 and close to 0, respectively, multivariable regression analysis was performed to examine potential confounding interactions that could affect anxiety or depression occurrence with a high degree of collinearity. The covariates included were age, sex, height, weight, smoking status, and BMI. The covariates, such as sexual identity, smoking status, and BMI, were divided into two categories: men and women, current/former smokers and nonsmokers, and overweight and normal weight.

An odds ratio (OR) and a 95% confidence interval (CI) were displayed in the results. References included men, nonsmokers, with mild to moderate COPD, and those with normal weight. For all of the analyses, SAS 9.4 (SAS Corporation, Inc., Cary, NC, USA) for Windows was used.

### RESULTS

A total of 70 patients (56 males) were included in this study, and their physical and clinical characteristics are presented in Table 1. According to the GOLD classification of severity, there were 4 patients with mild COPD (5.7%), 36 patients with moderate COPD (51.4%), 27 patients with severe COPD (38.6%), and 3 patients with very severe COPD (4.3%).

The Arabic AIR showed a positive correlation with the Arabic HADS-A ($r = 0.78$, $P < 0.001$) and the PHQ-9 ($r = 0.87$, $P < 0.001$). The AIR identified that 46% of participants had elevated anxiety symptoms, while the PHQ-9 identified that 60% of patients with COPD had depression. Patients with poor lung function reported more anxiety and depression compared to patients with good lung function (Table 2). Patients with poor lung function had an increased risk of anxiety (AIR OR = 2.54 and PHQ-9 OR = 3.08) after controlling for confounding factors (Tables 3 and 4). Additionally, the HADS (OR = 2.11, 95% CI: 1.90-2.34) and its domains recognized that patients with poor lung function had a greater risk of anxiety (HADS-A OR = 1.95, 95% CI: 1.75-2.16) and depression (HADS-D OR = 1.68, 95% CI: 1.67-2.06) compared with those with good lung function.

### DISCUSSION

This study explored the link between COPD severity and anxiety and depression in the Saudi population and showed that patients with more severe COPD were more likely to have an increased risk of anxiety and depression.

The effect of COPD extends beyond the lung to several organs, including the brain. Psychological disorders such as...
anxiety and depression are reported in patients with COPD and their prevalence varies between the studies. In our study, the percentage of anxiety and depression based on the AIR and PHQ-9 scales is similar to those reported in previous studies from different population ethnicities (Lewis et al., 2007; Yohannes et al., 2010). In contrast, the prevalence of anxiety (20%) was lower in Pakistani patients with COPD compared to our population (Husain et al., 2021). This discrepancy was related to the type of outcome the authors used in their study, general anxiety disorder, which is not specific to COPD. In our study, we used a specific anxiety scale for patients with COPD, the AIR, which is specifically developed to recognize anxiety patients with COPD (Willgoss et al., 2013; Albarrati et al., 2021).

In our study, we found that females with COPD were at high risk of developing anxiety and depression. Similar studies (Di Marco et al., 2006; Laurin et al., 2007) showed that females with COPD report these psychological issues more frequently than males do. A meta-analysis from a prior review revealed that patients with COPD had a prevalence proportion of depressive symptoms that was 2.81 times higher than that of controls, but a subsequent meta-regression of that review revealed that neither clinical nor demographic factors were the main drivers of this heterogeneity (Zhang et al., 2011).

We demonstrated that COPD severity plays a significant role in increasing the risk of anxiety and depression. Patients with poor lung function were highly likely to present with anxiety and depression compared to those with good lung function. This is consistent with the results of a recent study that assessed the relationship of COPD severity with anxiety and depression in 57,779 Chinese patients with COPD (Huang et al., 2021). The results of that study showed that after adjusting for confounders, patients in the GOLD III-IV group had a significantly higher risk of anxiety, depression, and their coincidence after adjusting for age, sex, BMI, marital status, education, employment, family income, smoking index, stroke, coronary heart disease, hypertension, diabetes, and malignancy. However, the present study differs in setting and population from that study (Huang et al., 2021). A recent study on Jordanian patients with COPD found that the severity of COPD doubles the risk of anxiety and depression (Jarab et al., 2024). Another earlier study found that severe GOLD stages were associated with anxiety and depression, and they were dependent on many factors, including body weight and breathlessness (Tetikkurt et al., 2011). This is similar to our findings that being overweight and smoking increase the risk of anxiety and depression. A possible reason might be that obesity and smoking are associated with increasing circulatory inflammatory biomarkers such as interleukin-6 and C-reactive protein, which are known to play a significant role in developing depressive symptoms in patients with COPD (Lu et al., 2013; Yohannes and Alexopoulos, 2014). The pathophysiological mechanism of anxiety and depression in COPD is elusive. However, several theories have been proposed to explain this complex relationship between COPD, anxiety, and depression. One possible mechanism is that chronic inflammation associated with COPD could affect the mental health status (Maurer et al., 2008; Lu et al., 2013; Pumar et al., 2014).

The findings of our study are consistent with those of previous studies that suggest the multifactorial nature of the causes of anxiety and depression in patients with COPD. The severity of the disease in parallel with other contributing factors appears to have a significant impact on the levels of anxiety and depression in patients with COPD (Jarab et al., 2024). However, the onset of anxiety and depressive symptoms in COPD may be aggravated by dyspnea and physical inactivity (Hanania et al., 2011; Blakemore et al., 2014).

The findings from the current study have important implications for recognizing anxiety and depression in patients with COPD, particularly among patients with severe COPD. Evidence also suggests that pulmonary rehabilitation and mind–body exercise may improve anxiety and depression.

### Table 3: Association of COPD severity with the total AIR.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>AIR</td>
<td>2.57</td>
<td>2.31-2.86</td>
</tr>
<tr>
<td>Age (continuous)</td>
<td>1.03</td>
<td>1.02-1.03</td>
</tr>
<tr>
<td>Female</td>
<td>7.73</td>
<td>5.58-10.7</td>
</tr>
<tr>
<td>Current/former smokers</td>
<td>4.87</td>
<td>3.52-6.73</td>
</tr>
<tr>
<td>Overweight</td>
<td>1.99</td>
<td>1.76-2.25</td>
</tr>
</tbody>
</table>

Abbreviations: AIR, Anxiety Inventory for Respiratory Disease; CI, confidence interval; COPD, chronic obstructive pulmonary disease; OR, odds ratio.

### Table 4: Association of disease severity with the total PHQ-9.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>PHQ-9</td>
<td>2.57</td>
<td>2.31-2.86</td>
</tr>
<tr>
<td>Age (continuous)</td>
<td>1.05</td>
<td>1.00-1.01</td>
</tr>
<tr>
<td>Female</td>
<td>5.36</td>
<td>3.88-7.41</td>
</tr>
<tr>
<td>Current/former smokers</td>
<td>4.79</td>
<td>3.47-6.62</td>
</tr>
<tr>
<td>Overweight</td>
<td>3.56</td>
<td>3.14-4.04</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; OR, odds ratio; PHQ-9, Patient Health Questionnaire-9.
symptoms in this population (Pumar et al., 2014; Gordon et al., 2019; Li et al., 2019). In addition, randomized controlled trials have evaluated the benefits of psychological intervention for anxiety and depression in these patients in terms of healthcare resource use and effective COPD self-management (Sohanpal et al., 2020).

Limitations

The present study has several limitations. First, the cross-sectional design cannot assess any possible causal links between disease severity, anxiety, and depression. Second, possible confounders, such as medications, exercise measurements, and inflammatory factors, were not assessed (Duenas-Espin et al., 2016; Strollo et al., 2021). Finally, the majority of participants in the current study had either moderate (GOLD II) or severe COPD (GOLD III). Therefore, the results of the current study should be interpreted with caution for patients with mild (GOLD I) and severe diseases (GOLD VI). However, the primary strength of the present study is that this is the first study that examined the relationship between COPD severity, anxiety, and depression in the Saudi population. Future studies are required to assess the prevalence of anxiety and depression in mild and very severe stages of COPD and associated risk factors.

CONCLUSIONS

Increased risk of anxiety and depression in patients with COPD was associated with the disease severity. This risk was linked to other contributing factors, including age, female sex, current or past smoking status, and being overweight. Assessment of psychological status in patients with COPD is essential and should be integrated into routine clinical practice.

REFERENCES


and depression in COPD: a systematic review and meta-analysis. 


A. Albarrati et al.: Screening for Anxiety and Depression among Saudi Patients with COPD

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