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The Investigation of Anxiety and Depression in COPD Patients

KOAH Hastalarında Anksiyete ve Depresyon Araştırması

Serhat Özgün[1], Ersin Alkılınç[2], Ahmet Hamdi Ilgazlı[3]

1.Ankara Ataturk Sanatorium Training and Research Hospital, Occupational Diseases Training Clinic, Ankara, Türkiye.
2.Kocaeli City Hospital, Department of Pulmonology, Kocaeli, Türkiye.
3.MLPCARE, VM Medical Park Kocaeli Hospital, Department of Pulmonology, Kocaeli, Türkiye.

ABSTRACT

Aim: This study aimed to determine the prevalence of anxiety and depression among patients with chronic obstructive pulmonary disease (COPD) and examine the relationship between psychological symptoms and dyspnea severity across Global Initiative for Obstructive Lung Disease (GOLD) defined COPD stages.
Methods: A cross-sectional study was conducted between July 2018 and July 2019 at a pulmonary diseases outpatient clinic. Sixty-one patients with COPD were evaluated using the Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI), Hospital Anxiety and Depression Scale (HADS), and the Modified Medical Research Council (mMRC) dyspnea scale.
Results: Anxiety and depression scores increased significantly with higher mMRC grades (BAI: p = 0.012; BDI: p = 0.018). Using established cut-offs, clinically relevant anxiety was present in 9.8% (BAI ≥16; n = 6) and 8.2% (HADS-A ≥10; n = 5) of the patients. Clinically relevant depression was present in 11.5% (BDI ≥ 17; n = 7) and 26.2% (HADS-D ≥ 7; n = 16) of the patients. Dyspnea severity (mMRC) was moderately associated with anxiety scores (Spearman's ρ = 0.407, p = 0.001) and had a weaker, borderline association with depressive symptoms (ρ = 0.251, p = 0.051). Smoking status was correlated with depressive symptoms (BDI: p = 0.025; HADS-D: p = 0.012). Pack-years correlated weakly but significantly with anxiety (ρ = 0.371, p = 0.005) and depression (ρ = 0.309, p = 0.022). No association was detected between FEV1% and the psychological scale scores.
Conclusion: Dyspnea severity and smoking exposure were associated with greater psychological distress in patients with COPD. These findings support the integration of routine psychological screening into comprehensive COPD management strategies.

Keywords: COPD, anxiety, depression, dyspnea, smoking

ÖZ

Amaç: Bu çalışma, kronik obstrüktif akciğer hastalığı (KOAH) hastalarında anksiyete ve depresyon prevalansını belirlemeyi ve GOLD (Global Initiative for Obstructive Lung Disease) tarafından tanımlanan KOAH evrelerinde psikolojik semptomlar ile nefes darlığı şiddeti arasındaki ilişkiyi incelemeyi amaçlamıştır.
Yöntemler: Temmuz 2018 ile Temmuz 2019 tarihleri arasında Pulmoner Hastalıklar polikliniğinde kesitsel bir çalışma gerçekleştirilmiştir. Altmış bir KOAH hastası Beck Anksiyete Envanteri (BAI), Beck Depresyon Envanteri (BDI), Hastane Anksiyete ve Depresyon Ölçeği (HADS) ve mMRC nefes darlığı ölçeği kullanılarak değerlendirilmiştir.
Bulgular: Anksiyete ve depresyon puanları, mMRC dereceleri yükseldikçe önemli ölçüde artmıştır (BAI: p=0,012; BDI: p=0,018). Klinik eşik değerlerine göre anksiyete prevalansı BAI ≥16 için %9.8 (n=6) ve HADS-A ≥10 için %8.2 (n=5) olarak saptandı. Depresyon prevalansı BDI ≥17 için %11.5 (n=7) ve HADS-D ≥7 için %26.2 (n=16) idi. Nefes darlığı şiddeti (mMRC), anksiyete skorlarıyla orta düzeyde bir ilişki (Spearman'ın ρ = 0,407, p = 0,001) ve depresif semptomlarla daha zayıf, sınırda bir ilişki (ρ = 0,251, p = 0,051) göstermiştir. Sigara içme durumu depresif belirtilerle korelasyon gösterdi (BDI: p=0,025; HADS-D: p=0,012). Paket-yıl, anksiyete (ρ=0,371, p=0,005) ve depresyon (ρ=0,309, p=0,022) ile zayıf ancak önemli bir korelasyon gösterdi. FEV1% ile psikolojik ölçekler arasında herhangi bir ilişki tespit edilmedi.
Sonuç: Dispne şiddeti ve sigara maruziyeti, KOAH hastalarında artmış psikolojik sıkıntı ile ilişkili bulunmuştur. Bu sonuçlar, KOAH yönetiminde semptom değerlendirmesine ek olarak psikiyatrik komorbiditelerin rutin olarak taranmasının klinik açıdan gerekli olduğunu düşündürmektedir.

Anahtar kelimeler: KOAH, anksiyete, depresyon, dispne, sigara

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*Corresponding Author: Serhat Özgün, MD. Ankara Atatürk Sanatorium Training and Research Hospital /Ankara/ Türkiye. Phone: +905347382836 / mail: serhatozgun@hotmail.com / ORCID: 0000-0003-3410-4847

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Introduction

Chronic obstructive pulmonary disease (COPD) is a major global health problem and one of the leading causes of morbidity and mortality worldwide. Its prevalence continues to rise due to increasing tobacco use and population aging. COPD is associated with multiple comorbidities, among which anxiety and depression are particularly common and clinically significant [1,2].

Psychological symptoms contribute to a reduced quality of life, impaired functional capacity, increased healthcare use, and increased mortality. However, the relationship between different dimensions of COPD severity and psychological distress remains unclear. While some studies have reported weak associations between lung function and psychiatric symptoms, patient-reported dyspnea severity appears to be more consistently associated with anxiety and depression [3-7].

This study aimed to determine the prevalence of anxiety and depression in patients with COPD and examine their association with dyspnea severity, smoking exposure, and lung function. We hypothesized that higher dyspnea levels and greater smoking exposure are associated with increased anxiety and depression.

Methods

This cross-sectional study was conducted between July 2018 and July 2019 at the pulmonary diseases outpatient clinic of a faculty of medicine hospital. Ethical approval was obtained from the Institutional Ethics Committee (KU GOKAEK 2018/11.28; June 27, 2018), and all participants provided written informed consent in accordance with the Declaration of Helsinki.

A total of 61 adults aged ≥ 40 years with a confirmed diagnosis of COPD according to the GOLD criteria (post-bronchodilator $FEV_1/FVC < 0.70$) were included. Patients were recruited consecutively during outpatient visits and were required to be clinically stable at the time of evaluation. Individuals assessed during an acute exacerbation, those requiring inpatient management, those with prior psychiatric diagnoses, current use of psychotropic medications (antidepressants, anxiolytics, or antipsychotics), severe cognitive impairment, and those unable to complete questionnaires were excluded.

Spirometry was performed in accordance with the American Thoracic Society/European Respiratory Society standards using post-bronchodilator measurements. The best of at least three technically acceptable and reproducible maneuvers was recorded for each patient. Spirometric assessment and symptom questionnaires were obtained during the same outpatient visit or within a short time interval during a clinically stable period.

Dyspnea severity was assessed using the Modified Medical Research Council (mMRC) scale. Anxiety and depression were evaluated using the Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI), and Hospital Anxiety and Depression Scale (HADS). The Turkish-validated versions of all instruments were administered. Information on medical comorbidities (including hypertension, diabetes mellitus, coronary artery disease, cardiac rhythm disorders, and malignancy) and current respiratory medications was collected from the medical records and patient interviews. The exact numerical breakdown of the individual exclusion categories was not systematically recorded during the screening phase; therefore, exclusions are presented by category in the flow diagram.

Statistical analyses were performed using the Statistical Package for Social Sciences (version 20.0; BM Corp., Armonk, NY, USA). Data distribution was assessed using the Kolmogorov–Smirnov and Shapiro–Wilk tests. Group comparisons were conducted using the Mann–Whitney U or Kruskal–Wallis test, as appropriate. When overall differences across mMRC categories were identified, post hoc pairwise comparisons were performed using Bonferroni correction. Correlation analyses were conducted using Spearman's rho (ρ) correlation coefficient. Multivariable logistic regression models were used to explore the associations with clinically relevant anxiety and depressive symptoms. A two-sided p-value < 0.05 was considered statistically significant.

Results

A total of 61 patients who met the inclusion criteria and completed all the questionnaires were

included in the final analysis. During the study period, consecutive patients with a confirmed diagnosis of COPD were screened for their eligibility. Patients with acute exacerbations at the time of assessment, severe cognitive impairment, a prior psychiatric diagnosis, or current psychiatric medication use were excluded. A schematic flowchart of patient recruitment and inclusion is presented in Figure 1.

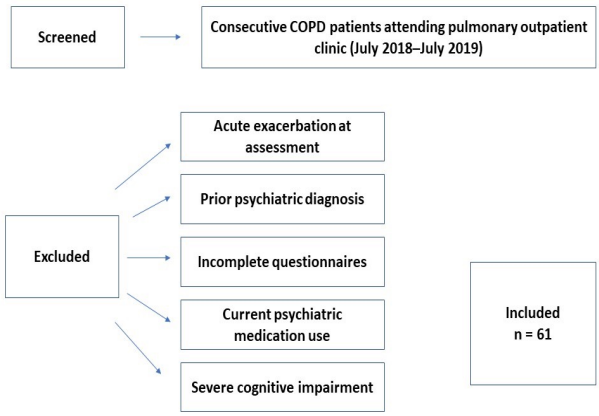

Figure 1. Patient flow diagram.

The mean age of the cohort was 62.3 ± 10.4 years, and 80.3% of the participants were male. Regarding smoking status, 8.2% had never smoked, 54.1% were ex-smokers, and 37.0% were current smokers. The mean cumulative smoking exposure was 41.2 ± 24.3 pack-years. Mean FEV_1% predicted was 49.1 ± 18.3, and the mean FEV_1/FVC ratio was 58.6 ± 8.4.

According to the GOLD staging, 5% of patients were classified as GOLD 1, 51% as GOLD 2, 24% as GOLD 3, and 20% as GOLD 4. Based on mMRC grading, 10% were grade 1, 48% grade 2, 26% grade 3, and 16% grade 4. The most common comorbidities were hypertension, diabetes mellitus, coronary artery disease, and malignancy. Most patients received guideline-based inhaled therapies, including long-acting bronchodilators with or without inhaled corticosteroids. None of the participants used psychotropic medications at the time of evaluation.

Associations between psychological scale scores (BAI, BDI, HADS-A, and HADS-D) and sociodemographic or clinical variables were evaluated using nonparametric tests. Dyspnea severity assessed using the mMRC dyspnea scale was significantly associated with anxiety (BAI, p = 0.012) and depressive symptom scores (BDI, p = 0.018). Post-hoc analyses demonstrated that higher mMRC grades were associated with progressively higher anxiety and depression scores (Table 1). Smoking status was significantly associated with depressive symptoms measured using the BDI (p = 0.025) and HADS-D (p = 0.012).

Table 1. Relationship Between Sociodemographic Characteristics and Psychological Scale Scores.

Variable	BAI (p)	BDI (p)	HADS-A (p)	HADS-D (p)
Gender	0.428	0.473	0.938	0.783
Marital Status	0.396	0.940	0.708	0.905
Education	0.627	0.638	0.267	0.474
Working Status	0.776	0.744	0.129	0.270
Monthly Income	0.181	0.733	0.775	0.608
GOLD Stage	0.381	0.450	0.538	0.228
mMRC Dyspnea	0.012*	0.018*	0.211	0.203
Smoking status	0.125	0.025*	0.055	0.012*

*p < 0.05

In the correlation analyses, cumulative smoking exposure (pack-years) exhibited weak but significant positive correlations with anxiety (BAI: ρ = 0.371, p = 0.005) and depression (BDI: ρ = 0.309, p = 0.022) scores. No significant correlations were observed between the spirometric indices (FEV_1% or FEV_1/FVC) and the psychological scale scores (Table 2).

Table 2. Correlation Between Clinical Variables and Psychological Scale Scores.

Variable	BAI (p)	BDI (p)	HADS-A (p)	HADS-D (p)
Age	0.112	0.085	0.075	0.078
BMI	-0.069	-0.060	-0.102	-0.008
Disease Duration	0.084	-0.086	0.026	-0.143
Pack-Years	0.371** (p = 0.005)	0.309* (p = 0.022)	0.175	0.232
FEV1%	-0.141	0.049	-0.089	0.159
FEV1/FVC	-0.182	-0.157	-0.182	-0.058
mMRC	0.407** (p = 0.001)	0.251† (p = 0.051)	0.245† (p = 0.057)	0.111
Smoking status	0.125	0.025*	0.055	0.012*

Spearman's correlation coefficients (ρ).

* p < 0.05; ** p < 0.01; † p = 0.05–0.10 (borderline significance).

When categorical cut-off values were applied, clinically relevant anxiety was present in 9.8% of patients according to the BAI (≥ 16; n = 6) and 8.2% according to the HADS-A (≥ 10; n = 5). Clinically relevant depression was identified in

11.5% of patients using the BDI (≥ 17; n = 7) and in 26.2% using the HADS-D (≥ 7; n = 16).

Dyspnea severity was moderately correlated with anxiety symptoms measured using the BAI (ρ = 0.407, p = 0.001). The association between dyspnea severity and anxiety, as measured by the HADS-A, was weaker and of borderline statistical significance (ρ = 0.245, p = 0.057), whereas no significant association was observed with depressive symptoms, as measured by the HADS-D (ρ = 0.111, p = 0.393).

In multivariable logistic regression analyses adjusting for age, sex, and smoking status, dyspnea severity was not independently associated with clinically relevant anxiety defined by BAI ≥ 16 or HADS-A ≥ 10, although a borderline association was observed for BAI-defined anxiety. Similarly, dyspnea severity was not independently associated with depressive caseness defined by BDI ≥ 17 or HADS-D ≥ 7. In the adjusted models, male sex was inversely associated with depressive symptoms defined by BDI scores ≥ 17, whereas current smoking status was independently associated with depressive symptoms defined by HADS-D scores ≥ 7 (Table 3).

Table 3. Adjusted regression models for anxiety and depressive symptoms in COPD. Panel A. Logistic regression – Anxiety severity (BAI ≥ 16) (Adjusted Model), Panel B. Logistic regression – Depression severity (BDI ≥ 17) (Adjusted Model), Panel C. Logistic regression – Anxiety severity (HAD-A ≥ 10) (Adjusted Model), Panel D. Logistic regression – Depression severity (HAD-D ≥ 7) (Adjusted Model).

	Variable	OR	95% CI	p-value
Panel A	mMRC	4.01	0.990-16.30	0.052
	Age	0.971	0.851-1.108	0.66
	Sex (male)	0.195	0.019-1.956	0.165
	Smoke status	5.205	0.577-46.95	0.142
Panel B	mMRC	1.758	0.9546-5.661	0.344
	Age	1.038	0.930-1.160	0.504
	Sex (male)	0.136	0.019-0.959	0.045*
	Smoke status	4.478	0.597-33.58	0.145
Panel C	mMRC	2.757	0.760-9.996	0.123
	Age	0.984	0.859-1.127	0.818
	Sex (male)	0.585	0.047-7.318	0.678
	Smoke status	3.198	0.359-28.45	0.297
Panel D	mMRC	1.448	0.612-3.424	0.400
	Age	1.014	0.933-1.102	0.747
	Sex (male)	0.715	0.124-4.119	0.707
	Smoke status	11.48	2.499-52.73	0.002*

*p < 0.05, OR: Odds ratio, CI: Confidence interval

Discussion

This study demonstrated that dyspnea severity and smoking exposure were associated with higher levels of anxiety and depressive symptoms among patients with COPD, whereas spirometric impairment measured by FEV□% was not. These findings reinforce the concept that the subjective burden of disease, particularly breathlessness and symptom perception, plays a central role in psychological distress in COPD beyond airflow limitation alone. Given the cross-sectional design, these relationships should be interpreted as associative rather than causal. In line with recent GOLD recommendations, our results further highlight the importance of symptom burden and comorbidity assessment, alongside spirometric evaluation, in comprehensive COPD management.

Recent systematic reviews and meta-analyses have underscored the high prevalence of anxiety and depression in COPD and their adverse effects on clinical outcomes. A comprehensive review reported widely ranging prevalence estimates for depressive and anxiety symptoms in COPD populations and demonstrated consistent associations with impaired quality of life and worse clinical outcomes [8]. Furthermore, a 2025 meta-analysis demonstrated that anxiety and depression are associated with an increased risk of COPD exacerbations and hospital readmissions, emphasizing the prognostic relevance of psychological comorbidities in this patient population [9].

When interpreted alongside previous Turkish studies, our findings help to contextualize the heterogeneous literature. While Ulubay et al. and Atacanlı et al. reported associations between FEV□ and psychological symptoms in selected COPD populations [10,11], other studies including those by Kocakaya et al. and Light et al., found no significant relationship between spirometric indices and anxiety or depression, but demonstrated stronger associations with dyspnea severity and symptom burden [12,13]. These observations are consistent with broader international data indicating that spirometric measures alone inadequately reflect the lived experience and psychological impact of COPD. Indeed, multidimensional indices incorporating

symptoms, functional limitations, and exercise capacity, such as the mMRC, CAT, or BODE index, have been found to better capture the risk of anxiety and depression, independent of FEV□ [14–16].

Our finding that dyspnea severity was more strongly associated with anxiety than with depressive caseness after adjustment aligns with prior evidence suggesting that breathlessness and activity restriction are particularly salient drivers of anxiety in COPD [15,17–19]. Conversely, the lack of an independent association between dyspnea severity and depressive caseness in adjusted models may reflect the multifactorial nature of depression in COPD, as well as limited statistical power due to the modest sample size and the low number of outcome events.

The observed association between smoking exposure and depressive symptoms further illustrates the complex interplay between nicotine dependence, chronic respiratory symptoms and mental health. Prior studies have identified current smoking as a risk factor for both anxiety and depression in COPD, suggesting a bidirectional relationship in which psychological distress impedes smoking cessation, while continued smoking perpetuates symptom burden and disease progression [15,20]. These findings support the integration of smoking cessation strategies with mental health assessment and intervention in COPD care.

This study has several limitations. First, the cross-sectional design precluded causal inference. Second, the relatively small sample size limits generalizability and may have reduced statistical power, particularly in multivariable analyses and outcomes with low event numbers. Third, the single-center design may not fully represent the broader COPD population. Fourth, psychiatric medication use was assessed using self-reports and may be subject to recall bias. Fifth, social support and certain comorbid conditions that may influence psychological status were not systematically evaluated. Although exploratory multivariable logistic regression analyses were performed, the limited number of outcome events may have affected the model stability; therefore, these results should be interpreted cautiously and viewed as exploratory rather than definitive.

In conclusion, this study indicates that greater dyspnea severity and cumulative smoking exposure are associated with increased psychological distress in patients with COPD, whereas spirometric indices such as FEV□% alone do not adequately capture the psychological burden of the disease. These findings underscore the clinical importance of symptom burden and smoking-related factors in the mental health of patients with COPD. Routine screening for psychological comorbidities and the integration of psychosocial and smoking cessation interventions may be key components of comprehensive COPD management. Future longitudinal multicenter studies with larger cohorts are warranted to further clarify these associations and inform targeted interventions.

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Informed Consent Statement: This study was designed as a prospective cross-sectional observational study.

Data Availability Statement: A data availability statement has been added, indicating that de-identified data can be made available upon reasonable request from the corresponding author.

Author Contributions: SÖ (0000-0003-3410-4847): Conception, design, supervision, resource, materials, data collection and processing, analysis and interpretation, literature review, writer, critical review. **EA (0000-0002-6456-6623):** Writer, critical review. **AHI (0000-0001-9017-2014):** Writer, critical review

Use of AI Statement: AI (Artificial Intelligence) was not used in this study.

Ethical Approval: Ethical approval for this study was obtained from the Clinical Research Ethics Committee of Kocaeli University Faculty of Medicine (Approval No: KU GOKAEK 2018/11.28; Date: June 27, 2018), and the study was conducted in accordance with the principles of the

Declaration of Helsinki.

Peer-review: Externally peer reviewed.

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